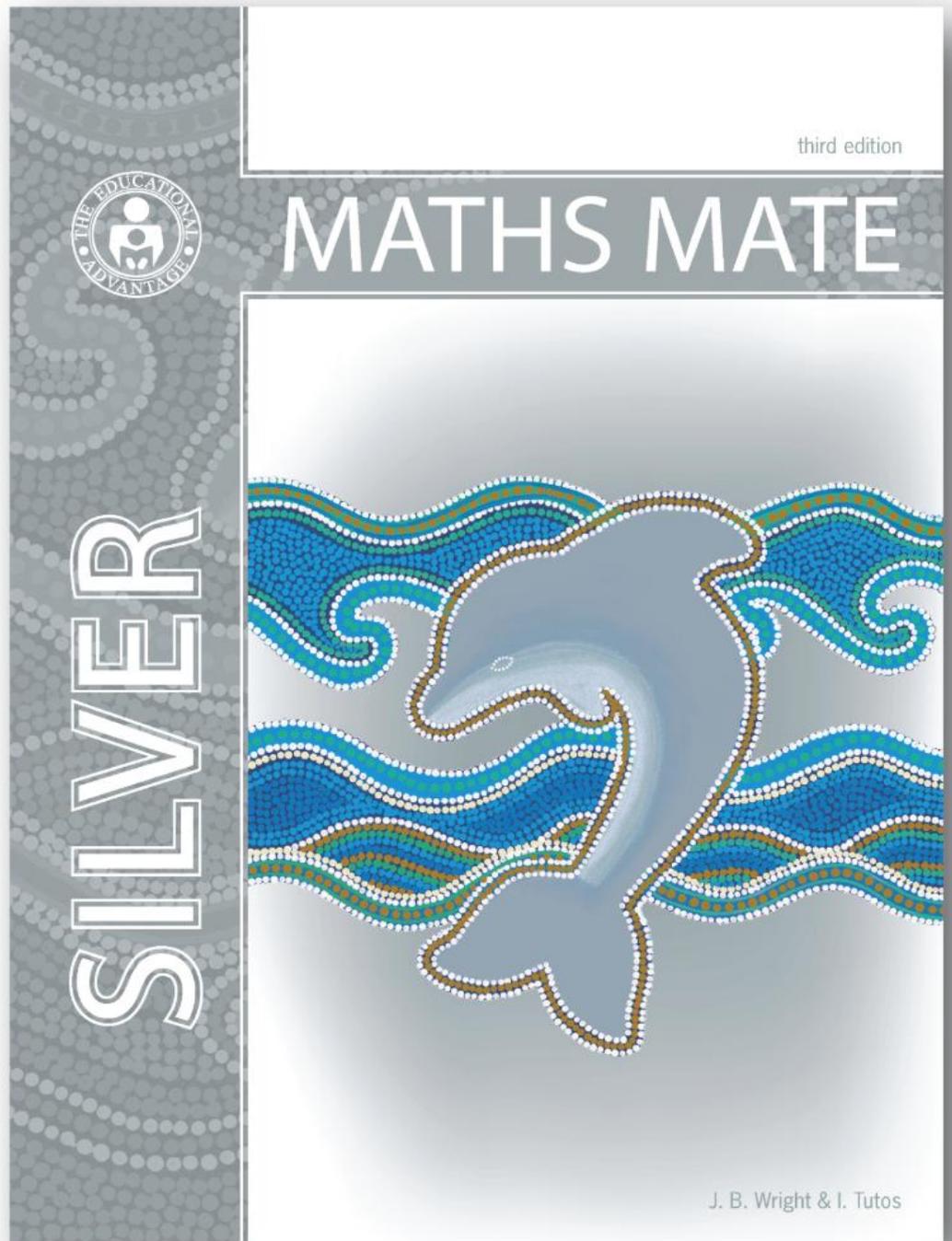


TEACHER RESOURCES

MATHS MATE



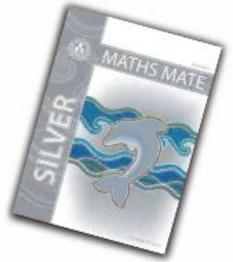
J. B. Wright & I. Tutos

third edition



MATHS MATE

Teacher Resource Silver (Maths Mate year 10 advanced)



- ▶ Teacher's Guide to the Use of Maths Mate
- ▶ Student Workbook Answers
- ▶ Student Workbook Short Answers
- ▶ Problem Solving Hints & Solutions
- ▶ Test Masters
- ▶ Test Answers
- ▶ Record Keeping Sheets
- ▶ www.mathsmate.net

SILVER

MATHS MATE



Teacher Resource



Teacher's Guide to the Use of Maths Mate

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Student Workbook Short Answers

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Problem Solving Hints & Solutions

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Test Masters

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Test Answers

pages 1 - 32



Record Keeping Sheets

pages 1 - 10

This Teacher Resource PDF
comes with a limited
Lifetime Update Guarantee.

Each time a new edition of the
Maths Mate Program is released,
an **upgrade** for your
Teacher Resource PDF is available
FREE* of charge
when you contact us direct.

This ensures that each teacher can have the latest edition without your school having to incur any further costs. We have chosen to do this to demonstrate the strength of our belief that access to a Teacher Resource PDF is important in the smooth running and success of the program.

* The free Teacher Resource PDF is limited to schools that continue to purchase at least 25 student workbooks.





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J. B. Wright & I. Tutos

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Preface

The Maths Mate Review Program is designed to be used in schools by students from years 3 to 10 (Australia) and years 4 to 11 (New Zealand). Emphasis is placed on the review and gradual development of basic skills.

It is not expected that all students will be able to complete every question from week one. Some questions have been designed to offer a real challenge. However, a major strength of the program is that students are consistently confronted with problems relating to their understanding of the same basic skill, encouraging them to see the need to master that skill in order to progress.

RECOMMENDED GRADE / YEAR LEVEL INDICATOR

		AUS 1	2	3	4	5	6	7	8	9	10	11	12
Orange	Student Workbook - 2nd Ed.												
Rose	Student Workbook - 2nd Ed.												
Yellow	Student Workbook - 5th Ed.												
Red	Student Workbook - 5th Ed.												
Blue	Student Workbook - 6th Ed.												
Green	Student Workbook - 6th Ed.												
Mauve	Student Workbook - 6th Ed.												
Coffee	Student Workbook - 3rd Ed.												
Lime	Student Workbook - 6th Ed.												
Silver	Student Workbook - 3rd Ed.												

NZ Y2 Y3 Y4 Y5 Y6 Y7 Y8 Y9 Y10 Y11 Y12 Y13

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Maths Mate Silver cover painting

Dolphin - 2003
 Acrylic on canvas 45 × 60 cm
 by Australian artist Susan Betts - Kokata, Mirning and Wirangu.

'Dolphin' was purchased by The Educational Advantage who have been kindly given permission to reproduce the painting. This contemporary Aboriginal artwork combines traditional and modern techniques. Susan's rich and vibrant art reflects the Australian landscape and wildlife, both flora and fauna.

PREFACE

The Author

Joseph Wright has taught in a number of schools throughout Australia and also in the United States of America. His experiences led him to the firm belief that there was a real need for a Mathematics program which was based on a constant review of the basic skills which students acquire. The Maths Mate Program was designed to meet that need.

Acknowledgements

“The completion of this project was made possible by the hard work and inspiration of Joanna Tutos, Lou McKenna and Julie Moyle. Thanks to John and Wilma McCormack and the many colleagues and friends who contribute to the overall program. Special thanks to my wife Trish and our children, Peter, David, Rebecca, Paul and Anthony for their investment of time, energy, encouragement and faith.”



Preface

The Maths Mate Program has been designed to be used in schools by students from Years 3 to 10 (Australia) and Years 4 to 11 (New Zealand). Emphasis is placed on the review and gradual development of basic skills so that students keep their skills up to date and teachers need to spend less class time on revision when starting new or subsequent topics.

The program is designed to have students complete eight worksheets each term. It is not expected that all students will be able to complete every question from week one. Some questions have been designed to offer a real challenge. However, a major strength of the program is that students are consistently confronted with problems dealing with their understanding of the same basic skills, encouraging them to see the need to master those skills in order to progress.

Maths Mate is a very comprehensive program which is not only structured to help students see a logical progression in their work but also to make life easier for teachers. Easy to use record keeping sheets have been provided on the Teacher Resource PDF. The tests, which are given twice a term, provide a very good indication of individual student strengths and weaknesses and this information can also be very valuable for addressing specific problems as well as assessing progress.

Aims of the Maths Mate Program

- Provide students with regular work that helps maintain and develop skills acquired throughout the year.
- Present a structured approach so that students can see their development in specific skill areas.
- Encourage students to take responsibility for their own learning.
- Provide a challenging level of work for all students.
- Encourage parental involvement in the learning process.
- Assist teachers in the diagnosis of student strengths and weaknesses.
- Provide teachers with a concrete method of assessing students' effort and progress on a regular basis.
- Provide a consistent review program which ensures students are regularly being exposed to the Mathematical skills appropriate to their ability level.

A Teacher's Guide to the successful Implementation of the
MATHS MATE PROGRAM

The Maths Mate Program offers many valuable benefits, including the aspects of parental involvement, systemised revision, individual and group diagnostics, enhanced professional standing for teachers, and most importantly, improved efficiency in student learning. However, a number of these factors may be negated or even lost if an individual teacher or school does not effectively implement the program. The Maths Mate Program was designed with an awareness of the increasing time demands placed on classroom teachers by ever-changing curriculum development and more involved assessment and reporting procedures. Maths Mate is a dynamic tool for classroom teachers designed to effectively improve student outcomes in Mathematics, to report accurately on these and to do so within a manageable time frame.

This guide was written to assist with the implementation of Maths Mate. This first page sets out the planning and preparation required by the Head of Mathematics and/or Maths Mate Coordinator, where one is appointed, before beginning the program. The following pages are a guide for classroom teachers using the program.

SUGGESTIONS FOR PREPARATION AND ORGANISATION:

Make sure parents are given advanced notice of the implementation of the Program. This might include an introduction at Parent Information meetings at the end of the year in preparation for the next.

At the start of the new school year a letter should be sent home to parents (see PDF ~ Teacher's Guide to the use of Maths Mate, or the editable word.doc, or www.mathsmate.co.nz ~ Downloads). Parental involvement should be encouraged. Their checking to see that work is completed weekly, and their signing of each sheet, should be stressed as important to the program's success. (A follow up reminder later in the year should also be considered.)

If you are fortunate enough to have audio visual screens in your classrooms, you might consider showing the answers from the Student Workbook Answers PDF files.

Thoroughly brief teachers on the use and advantages to them of the Maths Mate Program. Greater commitment will be given by all teachers if they are aware of the goals underlying the program and have a thorough understanding of the most efficient ways of implementation.

Give a demonstration of marking and recording procedures. The pages that follow may be of assistance here.

Important: If the school has purchased the student workbooks for the students, you may be able to organise the separation of the workbooks (see page iv) prior to the start of the year, perhaps even at the end of the current year.

Reminder: The Teacher Resource PDF will be replaced free of charge when a class set of a revised edition is purchased.



It is often possible for The Educational Advantage to send a representative of the Maths Mate Program to visit your school. Should you consider this assistance advantageous, please contact us to arrange a visit.

Phone: 03 9899 9065 (Australia)

Email: info@mathsmate.net

Phone: 07 929 4063 (New Zealand)

Email: info@mathsmate.co.nz

A Teacher's Guide to the Use of the
MATHS MATE PROGRAM

The effective use of Maths Mate requires some good house-keeping on the part of teachers involved.

STARTING THE YEAR:

Each student will receive a Maths Mate Student Workbook appropriate to his or her level. This workbook will contain 32 worksheets of increasing difficulty. (Having 8 worksheets per term allows some flexibility to schools.)

Collect the workbooks from the students on the first day of the year. Use a class list to be sure that any student who has not yet obtained a copy is identified.

Organise for the pages of the student workbooks to be separated so that class sets of each worksheet can be placed in manila folders or plastic pockets for distribution to students on a weekly basis. (The help of teacher assistants, students or a parent support group may be useful here.) This avoids problems with a student losing a workbook and having trouble completing Maths Mate work for the remainder of the year. The covers can be used as a colourful divider to mark a section for Maths Mate work should the students be using a binder.

At the start of the year, brief your class on the advantages of the program. 'Sell' them the gains they can make with its effective use. Emphasise that, because of the nature of human memory, this program with its systematic, cyclic revision allows for maximum 'absorption' of learned procedures and for the strong reinforcement of important skills. These skills are a necessary prerequisite to problem-solving. Also explain that this is one of their responsibilities in the 'Teaching-Learning Process' and that as they progress further through the educational system, they will need to accept greater personal responsibility for their own learning.

Ensure that you take the time to fully explain the use of the program, how it will be marked, the recording process of results.

See that each child receives a letter to parents informing them of the Maths Mate Program. Stress the parental involvement and the need for signatures on each sheet and see that you collect all the return slips for your class.

When submitting work, students might be asked to attach a separate sheet showing appropriate steps in their working. If the question can be answered in a single step, there is little to be gained from asking students to copy the question. If an intermediate step is required to obtain the answer, the student should set the question out appropriately. Such questions are marked with an asterisk ' * ' to indicate to students that working is expected to be shown.

Emphasise that all problems on the worksheets and test sheets are designed to be attempted without the aid of a calculator. Students are unlikely to become confident Mathematicians if they do not have a reasonable background of basic skills.

It is important to explain your expectations to the class. Naturally these will be relative to their level of mathematical ability. Some class members may be expected to attempt all questions including the problems at the end whereas others may only be expected to complete the sheets in part (but encouraged to go further when possible).

Also explain that the material covered in each worksheet may not necessarily reflect the work being undertaken in class at the time. The work covered by the Maths Mate Program should, with minor exceptions, be revision of work introduced in previous years of study. The exceptions will depend to some degree on the background of your students.

STARTING EACH TERM:

At the start of every term give each student a new *Worksheet Results* sheet located at the beginning of each term in the Student Workbook. Explain the importance of the upkeep of this document and how it may be used to identify which skills they have acquired and which skills they still need to learn and practise. Providing a new sheet each term gives you a chance to further encourage students to make a fresh start and to set new goals for the term.

A hard copy of this profile sheet is best kept by the class teacher and handed back to the students every week for them to update during the correction process. Extra copies can be made for those students who would like to have a copy of their own to show their parents (see PDF ~ Record Keeping Sheets, pages 1 to 4, or www.mathsmate.co.nz ~ Downloads).

SUGGESTIONS FOR PREPARATION AND ORGANISATION:

Get the students into a routine early. Assign the Maths Mate worksheet at the same time each week and have it returned on the same day the following week.

On the date worksheets are due, the teacher and students correct answers together in class. When marking, have students correct their own work by reading the answers to them or use an overhead screen. Having students correct their own work is less about saving the teacher's time for more important work, but more about building the process of developing in students responsibility for their own learning. It also means that students end up with a much clearer idea of the areas in which they need to concentrate their efforts.

When giving the answers, avoid pausing to discuss the answers at this stage. By using the numbered squares at the base of the worksheets to record correct responses, the time taken to transfer results to the *Worksheet Results* sheet can be minimised (see Fig. 1). The squares at the base of each worksheet can be rotated and aligned with those on the *Worksheet Results* sheet to enable a quick transfer of the correct responses.

MATHS MATE		Name: <i>Madeline Ryan</i>	
SILVER		Class: <i>10B</i>	
Worksheet Results		Teacher: <i>Miss Bourke</i>	
Term 1	Sheet 1	Sheet 2	Sheet 3
1. [Long \times , -]	1	1	1
2. [Decimal +, -]	2	2	2
3. [Decimal \times , -]	3	3	3
4. [Fraction +, -]	4	4	4
5. [Fraction \times , -]	5	5	5
6. [Percentages]	6	6	6
7. [Integer +, -]	7	7	7
8. [Integer \times , -]	8	8	8
9. [Rates / Ratios]	9	9	9
10. [Indices]	10	10	10
11. [Square Roots / Surds]	11	11	11
12. [Order of Operations]	12	12	12
13. [Exploring Number]	13	13	13
14. [Scientific Notation]	14	14	14
15. [Number Patterns]	15	15	15
16. [Expressions]	16	16	16
17. [Substitution]	17	17	17
18. [Expansion]	18	18	18
19. [Factorisation]	19	19	19
20. [Equations]	20	20	20
21. [Graphs & Functions]	21	21	21
22. [Units of Measurement / Time]	22	22	22
23. [Perimeter]	23	23	23
24. [Area]	24	24	24
25. [Volume]	25	25	25
26. [Surface Area]	26	26	26
27. [Pythagoras / Trigonometry]	27	27	27
28. [Shape / Location]	28	28	28
29. [Angles]	29	29	29
30. [Statistics]	30	30	30
31. [Probability]	31	31	31
32. [Problem Solving 1]	32	32	32
33. [Problem Solving 2]	33	33	33
Total Correct	19	23	30

Should there be need for explanation of one or more answers or perhaps how a problem was solved, you can decide on the relative worth to the class and commit appropriate time on that basis. After the correction has been completed, it can be valuable to spend time on a problem that has clearly attracted the class's attention while they are focused on it and their interest is high. On the other hand, care needs to be taken to ensure extended periods of time are not spent catering to individual needs with the bulk of the class waiting.

Remember to check the *Problem Solving Hints & Solutions* (see PDF ~ Problem Solving Hints & Solutions, pages 1 to 16). They supply teachers with ready answers to the more challenging problem solving questions found at the end of each Maths Mate worksheet. They also contain helpful hints for developing students' problem solving skills.

Have the students fill in their *Worksheet Results* sheets.

Fig. 1 - Sample *Worksheet Results* sheet

MATHS MATE		Worksheet Record							
		Term 1							
Class: IOB		Teacher: Ms Bourke							
Worksheet Number	Student Name	Worksheet Results							
		1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8
1	ASHTON Darcy	15 ✓							
2	BAKER Stobhan	28 × L							
3	BOURKE Louise	26 ✓							
4	CROSS Chris	14 ✓							
5	DWYER Jim	31 ×							
6	FIORE Ella	22 ✓							
7	FREEMAN Warren	17 ✓							
8	HAHN Kim	21 ✓							
9	HU Joanna	26 ✓							
10	JILBERT Luke	19 × L							
11	KEUNEMAN John	22 ✓							
12	McKENNA Joseph	18 ✓							
13	MOYLE Brendan	24 ✓							
14	MOYLE Emily	27 ✓							
15	NESBIT Peter	32 ✓							
16	RYAN Jacinta	21 × L							
17	RYAN Madeline	19 ✓							
18	SETON Elizabeth	24 ×							
19	TUTOS Alexander	22 ✓							
20	WINKELS Tim	19 ×							
21	WRIGHT Anthony	28 ✓							
22	WRIGHT Paul	20 ✓							
23	YEO Tania	27 ✓							
24									
25									
26									
27									
28									
29									
30									
31									
32									
33									
34									

✓ - Signed by parent L - Work handed in late × - Not signed by parent

page 3 © Maths Mate Silver - Record Keeping Sheets

Fig. 2 - Sample Worksheet Record sheet

Understand that any question on the Maths Mate worksheets is part of a set of four similar questions in the term. For example, consider sheets 1, 2, 3 and 4 in MM Silver (year 10) term 1. Question 12 on each sheet is similar in design, content and degree of difficulty. This grouping of question style is also true for the next set of four worksheets and so on. Thus the Maths Mate tests (see PDF ~ Test Masters, pages 1 to 32) also reflect this grouping of question style and substance.

Collect the students' Maths Mate worksheets and attached working, the Worksheet Results sheets.

Enter Maths Mate results onto your Worksheet Record, see Fig. 2 (see also PDF ~ Record Keeping Sheets, pages 7 to 10, or www.mathsmate.co.nz ~ Downloads). Firstly, a record of the total number of correct answers for each week can be written. The presence of a parent's signature may also be noted to monitor whether work was attempted by the student at home. Late work can also be noted. This system is explained at the base of the Worksheet Record sheet.

It is important that students are encouraged to complete every Maths Mate worksheet to maintain the effectiveness of the program.

AFTER EVERY FOUR WORKSHEETS:

Tests are given twice a term. These tests take the same format as the worksheets and are based on the previous four worksheets. A and B tests are provided to allow alternate students to have a different test, thereby ensuring scores accurately reflect the student's own work. (The two tests can be distinguished by their label at the base of the second page, e.g. Silver~Test 3A and Silver~Test 3B.) The tests serve a number of purposes. They give the teacher a more accurate indication of the student's abilities in conditions where the child does not have the assistance of a parent or tutor. They also help to motivate students to correct their work accurately and increase their desire to learn the required skills. Without the tests, students may become comfortable with seeking assistance to achieve high scores, unaware of the importance of fully understanding their work.

It is at this point that teachers record accurately how students are performing in each area of skill. A *Test Results* sheet is provided (see PDF ~ Record Keeping Sheets, page 5, or www.mathsmate.co.nz ~ Downloads). It is expected that one of these forms be completed for each student in the class when recording test results. Again, the numbering system at the bottom of each page helps speed up this process. When administering the tests, it is advisable to have an assignment of some form or worksheet available for students to begin as soon as they complete the test, which may only take 30 minutes for an able student.

TOPIC - TO - TOPIC:

A periodic check of the *Test Results* sheets will assist you in evaluating individual or possible class areas of concern. You can then plan appropriate *Skill Builder* work or advise individual students of concerns (perhaps as a guide to tutoring). It will also give you a valuable indication of the background skills students have before beginning a new topic, allowing you to tailor your lessons appropriately. In fact you are saved from having to pre-test students before each topic. This will result in a considerable saving of class time.

END OF SEMESTER:

Combined, the *Worksheet Results* sheet, the *Test Results* sheet and the *Worksheet Record* sheet become invaluable for writing reports and for preparing for parent / teacher interviews. They give a good indication to parents, not only of the child's skills but also of the consistency of their effort and the degree of responsibility they have assumed for their learning. At the end of the year, particularly when moving into a level where streaming occurs or into senior Mathematics classes, these records allow clear comparisons of students to be made across class groups.

MERIT CERTIFICATES:

Merit Certificates can be used to encourage and reward selected students for consistent work, outstanding results or best of all, for significant improvement. A master Merit Certificate can be found on the Teacher Resource PDF and can be printed and presented to students at the teacher's discretion.



We are confident you will find the Maths Mate Program a valuable asset to your teaching. We thank all those teachers who have provided feedback on this program and we value further comments and suggestions. Please direct all correspondence to:

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NEW ZEALAND
Phone: 647 929 4063
Email: info@mathsmate.co.nz
Website: www.mathsmate.co.nz

Dear Parents,

This year, as part of their Mathematics program, all Year 10 students will be given a Maths Mate worksheet on a regular basis. There will be 8 worksheets to be completed each term, generally one per week, the exceptions being short or disrupted weeks.

The Maths Mate worksheets have been designed to allow students to attempt all questions without the aid of a calculator, and this should be encouraged at home.

Don't be too concerned if your child finds the initial worksheet difficult. It is not expected that students will be able to complete every question from week one; in fact Q33 has been included to offer a real challenge to all students. Each worksheet is built around a common framework of questions aimed at covering the current Mathematics Curriculum.

While there is room on the worksheet for the recording of answers, this is only intended as a summary of the student's work. An asterisk ' * ' has been used to indicate those questions where each student has been asked to show his or her working. In these cases the detail normally expected in Mathematics should be included, with all steps in the development of answers clearly shown. This working should be attached to the worksheet and submitted with it.

Corresponding questions on each worksheet cover the same skill area, that is, Q1 always tests long multiplication or division, Q2, addition or subtraction of decimals, and so on, with the questions within each category becoming progressively more difficult from week to week.

Students will be confronted by the same type of question on a regular basis. The diagnostic nature of the worksheets will help students and teachers to identify areas of strength and weakness. This should also help to motivate students to make another attempt at mastering skills that they may have found too difficult in the past. As well, the results sheet, if completed accurately, will allow students to enjoy monitoring their own improvement.

It would be appreciated if you would complete the tear off slip at the bottom of this page so that we can be sure that you are aware of our expectations. We ask also that you sign the completed worksheet each week to acknowledge that your child is working independently and regularly but with your support.

We thank you in anticipation of your involvement and remind you that you are encouraged to call and discuss your child's progress at any time.

Yours sincerely,

Class Teacher

Principal

Maths Mate Program - Return Slip

Student's Name: Class:

As a parent / guardian I have signed this form to indicate that I am aware of the Maths Mate requirements expected of my child.

Parent's Signature: Date:

Dear Parents,

This year, as part of their Mathematics program, all Year 5/6 students will be given a Maths Mate worksheet on a regular basis. There will be 8 worksheets to be completed each term, generally one per week, the exceptions being short or disrupted weeks.

The Maths Mate worksheets have been designed to allow students to attempt all questions without the aid of a calculator, and this should be encouraged at home.

Don't be too concerned if your child finds the initial worksheet difficult. It is not expected that students will be able to complete every question from week one; in fact Q24 has been included to offer a real challenge to all students. Each worksheet is built around a common framework of questions aimed at covering the current Mathematics Curriculum.

While there is room on the worksheet for the recording of answers, this is only intended as a summary of the student's work. An asterisk ' * ' has been used to indicate those questions where each student has been asked to show his or her working. In these cases the detail normally expected in Mathematics should be included, with all steps in the development of answers clearly shown. This working should be attached to the worksheet and submitted with it.

Corresponding questions on each worksheet cover the same skill area; that is, Q1 always tests adding whole numbers to 10, Q2, subtracting whole numbers to 10, and so on with the questions within each category becoming progressively more difficult from week to week.

Students will be confronted by the same type of question on a regular basis. The diagnostic nature of the worksheets will help students and teachers to identify areas of strength and weakness. This should also help to motivate students to make another attempt at mastering skills that they may have found too difficult in the past. As well, the results sheet, if completed accurately, will allow students to enjoy monitoring their own improvement.

If your child is having difficulty with a certain skill, Skill Builders are available to students, teachers and parents from the Maths Mate websites www.mathsmate.net and www.mathsmate.co.nz. The Skill Builders also contain a Glossary of important facts and reference material that will provide students with instant help.

It would be appreciated if you would complete the tear off slip at the bottom of this page so that we can be sure that you are aware of our expectations. We ask also that you sign the completed worksheet each week to acknowledge that your child is working independently and regularly but with your support.

We thank you in anticipation of your involvement and remind you that you are encouraged to call and discuss your child's progress at any time.

Yours sincerely,

Class Teacher

Principal



Maths Mate Program - Return Slip

Student's Name: Class:

As a parent / guardian I have signed this form to indicate that I am aware of the Maths Mate requirements expected of my child.

Parent's Signature: Date:

MATHS MATE



Teacher Resource



Teacher's Guide to the Use of Maths Mate

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Test Masters

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Test Answers

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Record Keeping Sheets

pages 1 - 10

MATHS MATE

Term 1 - Sheet 1



Name:

Due Date: / /

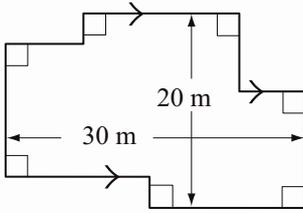
Parent's Signature:

1. [Long \times ,+] *
 $304 \times 14 =$ 4256
2. [Decimal +,-] *
 $4.8 - 0.95 + 0.18 =$ 4.03
3. [Decimal \times ,+] *
 $0.2 \times 0.3 =$ 0.06
4. [Fraction +,-] *
 $\frac{x}{5} + \frac{2x}{5} =$ $\frac{3x}{5}$
5. [Fraction \times ,+] *
 $2 \times 3\frac{1}{3} =$ $6\frac{2}{3}$
6. [Percentages] *
Increase \$6 by 2.5% \$6.15
7. [Integer +,-] *
 $(+6) - (+8) + (-2) =$ -4
8. [Integer \times ,+] *
 $(-5) \times (+12) =$ -60
9. [Rates / Ratios] *
Share 475 pens in the ratio 10 : 7 : 8
190 : 133 : 152
10. [Indices] *
Evaluate $(\frac{2}{3})^{-2}$ $2\frac{1}{4}$
11. [Square Roots / Surds] *
Simplify $4\sqrt{7} \times 3\sqrt{2}$ $12\sqrt{14}$
12. [Order of Operations] *
 $13 - 5 \times 3 =$ -2
13. [Exploring Number] *
You buy 5 CDs at \$28.90 each and pay using the appropriate number of \$20 notes. How much change should you receive?
\$ 15.50
14. [Scientific Notation] *
How many significant figures are there in 205? 3
15. [Number Patterns]
Complete the pattern:
 $\frac{10}{9}, \frac{10}{3}, 10, 30,$ 90, 270
16. [Expressions]
Write the following as an algebraic expression:
The sum of p, q and w $p + q + w$
17. [Substitution] *
The formula of the area of a triangle is $A = \frac{bh}{2}$. Find A when $b = 15$ and $h = 3$
22.5
18. [Expansion]
Expand $2xy(2x - y)$ $4x^2y - 2xy^2$
19. [Factorisation] *
Factorise and simplify
 $\frac{3xy - 6y}{3xy}$ $\frac{x - 2}{x}$
20. [Equations] *
Solve for x :
 $-3(4 - x) = 6$ 6
21. [Graphs & Functions]
Complete the table:

rule	gradient (m)	x-intercept	y-intercept (c)
$y = 3x$	3	(0,0)	(0,0)
$y = 3x - 6$	3	(2,0)	(0,-6)
22. [Units of Measurement / Time]
The Wills family departs Melbourne on March 27th at 1300 hours and arrives in London on March 28th at 0555 hours. How long was their journey, given London time is 10 hours behind Melbourne time?
26 h 55 min

QUOTE OF THE WEEK: I went into McDonalds yesterday and said, "I'd like some fries." The girl at the counter said, "Would you like some fries with that?"

23. [Perimeter] *
Find the perimeter of the shape.

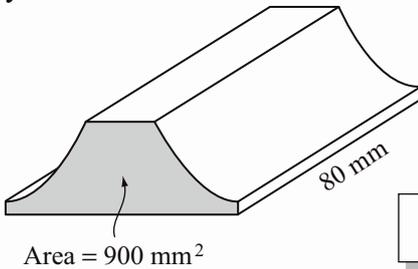


100 m

24. [Area] *
A rectangular field has dimensions 500 metres by 300 metres. How many kilograms of fertiliser are needed for this field if it is to be applied at the rate of 60 kilograms per hectare? [1 ha = 10 000 m²]

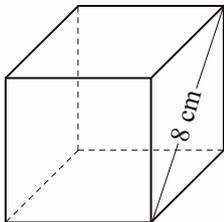
900 kg

25. [Volume] *
Find the volume of the solid and express your answer in cm³.



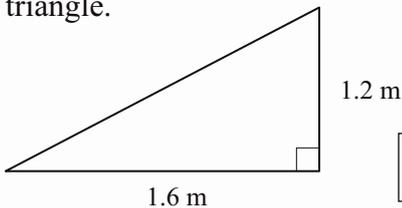
72 cm³

26. [Surface Area] *
Find the total surface area of the cube.



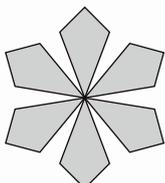
192 cm²

27. [Pythagoras / Trigonometry] *
Find the length of the hypotenuse of this triangle.



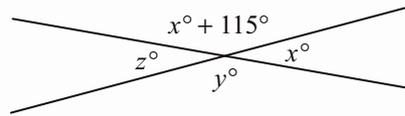
2 m

28. [Shape / Location]
What is the order of rotational symmetry of this shape? That is, in rotating the shape through 360°, how often will it look exactly as it did at the start? [Hint: A square has an order of 4.]



6

29. [Angles] *
Find the values of x° , y° and z° .



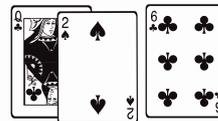
$$x^\circ = 32.5^\circ \quad y^\circ = 147.5^\circ \quad z^\circ = 32.5^\circ$$

30. [Statistics] *
Find the mean of the following distribution.

Score	70	71	72	73	74
Frequency	1	4	10	4	1

72

31. [Probability] *
A 52 card deck of playing cards is shuffled, and three cards are dealt from the top of the deck. The first two cards are both black. Determine the probability of the third card also being black.



$\frac{12}{25}$

32. [Problem Solving 1] *
In your drawer you have 6 white socks, 4 black socks, 8 red socks, 4 yellow socks and 2 green socks. There is a power failure and you reach into the drawer in the dark. How many socks must you take with you to ensure you have a pair of the same colour?

6

33. [Problem Solving 2] *
Solve for x :
 $(x + 1) + (x + 2) + (x + 3) + \dots + (x + 100) = 15\,050$

100

MATHS MATE

Term 1 - Sheet 2



Name:

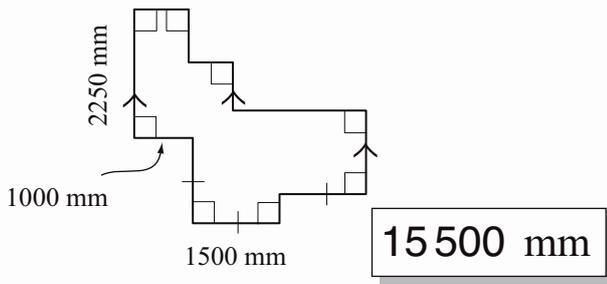
Due Date: / /

Parent's Signature:

1. [Long \times ,+] *
 $134 \times 34 =$ 4556
2. [Decimal +,-] *
 $3.11 - 0.33 + 0.77 =$ 3.55
3. [Decimal \times ,+] *
 $9 \div 0.03 =$ 300
4. [Fraction +,-] *
 $\frac{4y}{7} - \frac{y}{7} =$ $\frac{3y}{7}$
5. [Fraction \times ,+] *
 $2\frac{6}{7} \div 2 =$ $1\frac{3}{7}$
6. [Percentages] *
 Reduce \$400 by 0.75% \$ 397
7. [Integer +,-] *
 $(-1) - (+7) + (-8) =$ -16
8. [Integer \times ,+] *
 $(+2) \times (-25) =$ -50
9. [Rates / Ratios] *
 Arrange 756 people into three groups in the ratio 8 : 6 : 7 288 : 216 : 252
10. [Indices] *
 Evaluate $\left(\frac{1}{4}\right)^{-3}$ 64
11. [Square Roots / Surds] *
 Simplify $\frac{6\sqrt{6}}{2\sqrt{3}}$ $3\sqrt{2}$
12. [Order of Operations] *
 $(2 - 8) \times 8 - 19 =$ -67
13. [Exploring Number] *
 A phone bill of \$241.50 is divided equally between three students. How much does each student pay? \$80.50
14. [Scientific Notation] *
 How many significant figures are there in 0.0120? 3
15. [Number Patterns] *
 Complete the pattern:
 9, 3, 1, $\frac{1}{3}$, $\frac{1}{9}$, $\frac{1}{27}$
16. [Expressions] *
 Write the following as an algebraic expression:
 A number that is k less than the sum of m and n $m + n - k$
17. [Substitution] *
 Interest is calculated using the formula $I = \frac{PRT}{100}$. Find I when $P = 3000$, $R = 6.5$ and $T = 2$ 390
18. [Expansion] *
 Expand $5x(2xy - 3y)$ $10x^2y - 15xy$
19. [Factorisation] *
 Factorise and simplify $\frac{8x^2 - 6x}{12x - 9}$ $\frac{2x}{3}$
20. [Equations] *
 Solve for x :
 $3(x - 1) = 2(x + 4)$ 11
21. [Graphs & Functions] *
 Complete the table:
- | rule | gradient (m) | x-intercept | y-intercept (c) |
|-----------|------------------|-------------|---------------------|
| $y = -5x$ | -5 | (0,0) | (0,0) |
| $y = 5x$ | 5 | (0,0) | (0,0) |
22. [Units of Measurement / Time] *
 The Ming family departs London on April 19th at 2200 hours and arrives in Singapore on April 20th at 1715 hours. How long was their journey, given London time is 8 hours behind Singapore time? 11 h 15 min

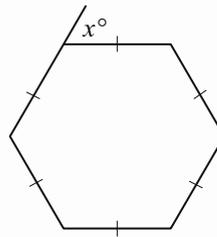
QUOTE OF THE WEEK: Everyone is kneaded out of the same bread but not baked in the same oven. Yiddish proverb

23. [Perimeter] *
Find the perimeter of the shape.



15500 mm

29. [Angles] *
Find the value of x° .



60°

24. [Area] *
A rectangular swimming pool 15 m by 8 m has a 1 m wide concrete path around it. What is the area of the path?

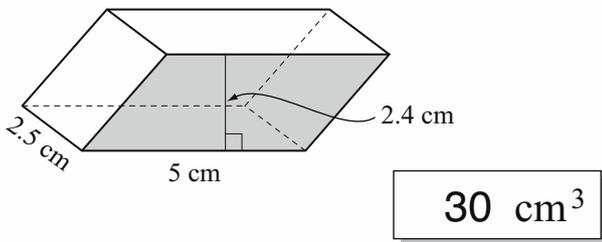
50 m²

30. [Statistics] *
Find the mean of the following distribution.

Score	0	1	2	3	4
Frequency	10	8	6	4	2

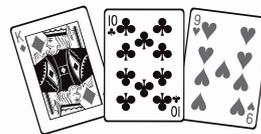
$\frac{4}{3}$

25. [Volume] *
Find the volume of the prism.



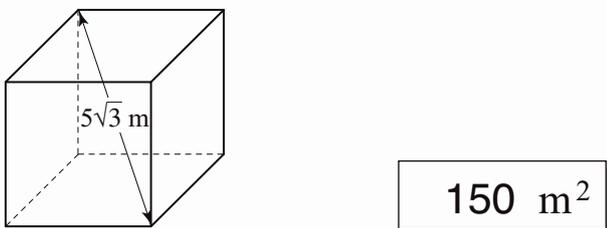
30 cm³

31. [Probability] *
Three cards are drawn at random from a deck of 52. The probability of them all being red is: $\frac{26}{52} \times \frac{25}{51} \times \frac{24}{50} = \frac{2}{17}$
What is the probability that at least one card is black?



$\frac{15}{17}$

26. [Surface Area] *
Find the total surface area of the cube.

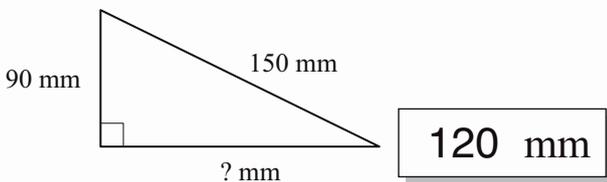


150 m²

32. [Problem Solving 1] *
To the nearest whole second, what is one millionth of a year?

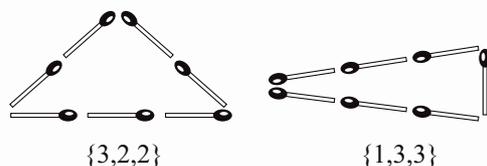
32 s

27. [Pythagoras / Trigonometry] *
Find the missing side length of this triangle.



120 mm

33. [Problem Solving 2] *
Seven matchsticks can be used to form a triangular enclosure in two different ways, {3,2,2} and {1,3,3}, as shown below. How many different triangles can be formed using 11 matchsticks?



4

28. [Shape / Location]
For the shape shown, find the minimum angle of rotation required to regain the original image.



120°

MATHS MATE

Term 1 - Sheet 3



Name:

Due Date: / /

Parent's Signature:

1. [Long \times ,+] *
 $62 \times 26 =$ 1612
2. [Decimal +,-] *
 $2.41 - 0.72 + 1.43 =$ 3.12
3. [Decimal \times ,+] *
 $0.04 \times 0.7 =$ 0.028
4. [Fraction +,-] *
 $\frac{5}{2f} + \frac{1}{2f} =$ $\frac{3}{f}$
5. [Fraction \times ,+] *
 $9\frac{3}{5} \div 3 =$ $3\frac{1}{5}$
6. [Percentages] *
Reduce \$1000 by 0.15% \$ 998.50
7. [Integer +,-]
 $(+9) + (-1) + (-2) =$ 6
8. [Integer \times ,+]
 $(-16) \div (-2) =$ 8
9. [Rates / Ratios] *
Divide \$216 in the ratio 3 : 4 : 5
\$ 54 : \$ 72 : \$ 90
10. [Indices] *
Evaluate $\frac{(-2)^8}{(-2)^6}$ 4
11. [Square Roots / Surds]
Simplify $\frac{8\sqrt{12}}{6\sqrt{4}}$ $\frac{4\sqrt{3}}{3}$
12. [Order of Operations] *
 $12 + 10 - 8 \times 4 =$ -10
13. [Exploring Number]
Six kitchen chairs cost \$592.50. What is the cost per chair?
\$ 98.75
14. [Scientific Notation]
How many significant figures are there in 63 000?
2
15. [Number Patterns]
Complete the pattern:
 $\frac{3}{16}, \frac{3}{4}, 3, 12,$ 48, 192
16. [Expressions]
Write the following as an algebraic expression:
Fifteen lots of g 15g
17. [Substitution] *
The volume of a cube is found by using the formula $V = l^3$. Find V when $l = 0.4$ m.
0.064 m³
18. [Expansion]
Expand $5x(x^2 - 3x + 2)$ $5x^3 - 15x^2 + 10x$
19. [Factorisation] *
Factorise and simplify
 $\frac{6x^2 + 15x}{6x^2}$ $\frac{2x + 5}{2x}$
20. [Equations] *
Solve for x :
 $5(x + 1) = -20$ -5
21. [Graphs & Functions]
Complete the table:

rule	gradient (m)	x -intercept	y -intercept (c)
$y = \frac{1}{2}x + 2$	$\frac{1}{2}$	$(-4,0)$	$(0,2)$
$y = \frac{1}{2}x + 3$	$\frac{1}{2}$	$(-6,0)$	$(0,3)$
22. [Units of Measurement / Time]
What is the arrival date and time in New York for the trip shown, given that New York time is 15 hours behind Melbourne time?

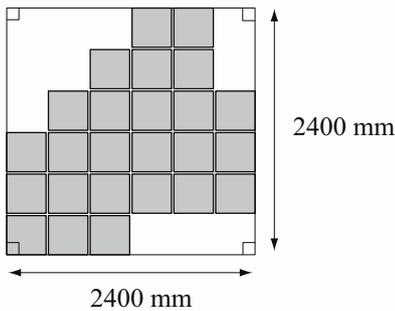
Flights Out: Melbourne to New York - Saturday 06 Feb 2010

From	To	Flight	Duration
15:30 Melbourne	___:___ New York	▸ QF508	21h 40m

2210 hours on 06/02/2010

QUOTE OF THE WEEK: It is better in prayer to have a heart without words than words without a heart. Mahatma Gandhi

23. [Perimeter] *
Find the perimeter of the shaded paved area.

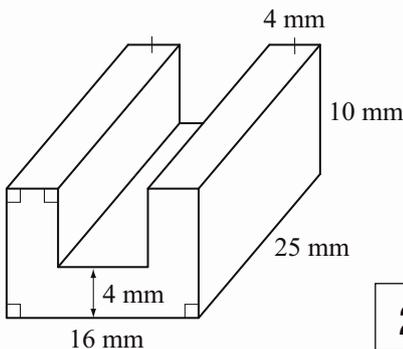


9600 mm

24. [Area] *
A rare type of coloured glass costs \$600 per square metre. How much would a rectangular piece 20 cm by 25 cm cost?

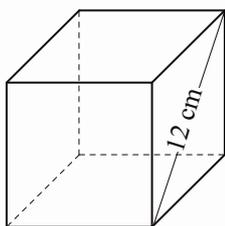
\$ 30

25. [Volume] *
Find the volume of the solid.



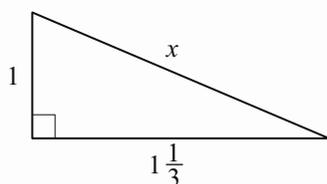
2800 mm³

26. [Surface Area] *
Find the total surface area of the cube.



432 cm²

27. [Pythagoras / Trigonometry] *
Find the value of x .



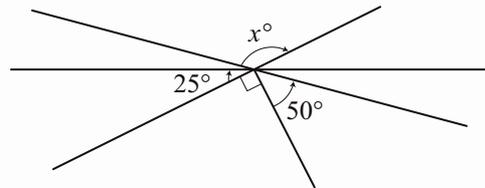
1 2/3

28. [Shape / Location]
What is the order of rotational symmetry of this shape? That is, in rotating the shape through 360°, how often will it look exactly as it did at the start? [Hint: A square has an order of 4.]



2

29. [Angles] *
Find the value of x° .



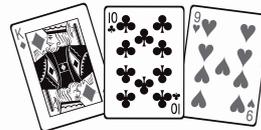
140°

30. [Statistics] *
Find the mean of the following distribution.

Score	5	10	15	20	25	30
Frequency	7	5	4	2	1	1

12

31. [Probability] *
Two cards are drawn at random from a deck of 52. The probability that neither card is a heart is: $\frac{39}{52} \times \frac{38}{51} = \frac{19}{34}$
What is the probability that at least one card is a heart?



15/34

32. [Problem Solving 1] *
What two-digit whole number is twice the product of its digits?

36

33. [Problem Solving 2] *
If a and b are positive integers and $a + b + a \times b = 39$, what are the three possible values of $a + b$?

11, 12, 20

MATHS MATE

Term 1 - Sheet 4



Name:

Due Date: / /

Parent's Signature:

1. [Long \times, \div] *
 $16.5 \div 11 =$ 1.5
2. [Decimal $+, -$] *
 $5.18 - 1.31 + 4.4 =$ 8.27
3. [Decimal \times, \div]
 $60 \div 0.3 =$ 200
4. [Fraction $+, -$] *
 $\frac{3}{5g} + \frac{12}{5g} =$ $\frac{3}{g}$
5. [Fraction \times, \div] *
 $4\frac{4}{5} \div 2 =$ $2\frac{2}{5}$
6. [Percentages]
 Increase \$100 000 by 0.025% \$100 025
7. [Integer $+, -$]
 $(+3) - (-3) - (+3) =$ 3
8. [Integer \times, \div]
 $(+34) \div (-17) =$ -2
9. [Rates / Ratios] *
 Arrange 442 people into three groups in the ratio 8 : 5 : 4
208 : 130 : 104
10. [Indices] *
 Simplify $(x^0)^3$ 1
11. [Square Roots / Surds]
 Simplify $4\sqrt{3} \times 2\sqrt{5}$ $8\sqrt{15}$
12. [Order of Operations] *
 $3 + 6 - 36 \div 2 =$ -9
13. [Exploring Number] *
 You buy tickets for 8 adults and 8 children. The tickets cost \$16.75 each and \$8.25 each respectively. How much change should you receive after handing over the appropriate number of \$50 notes? \$0
14. [Scientific Notation]
 How many significant figures are there in 0.004? 1
15. [Number Patterns]
 Complete the pattern:
 $12, 6, 3, \frac{3}{2},$ $\frac{3}{4}, \frac{3}{8}$
16. [Expressions]
 Write the following as an algebraic expression:
 The average of s and t $\frac{s+t}{2}$
17. [Substitution]
 To calculate the sum of the angles of a polygon, use the formula $T = (n - 2) \times 180^\circ$. Find T for $n = 10$ (a decagon). 1440°
18. [Expansion]
 Expand $4x(3x^2 + 5x)$ $12x^3 + 20x^2$
19. [Factorisation] *
 Factorise and simplify
 $\frac{6ab - 2b^2}{12ab - 4b^2}$ $\frac{1}{2}$
20. [Equations] *
 Solve for x :
 $2(4x + 1) = 3(3x + 2)$ -4
21. [Graphs & Functions]
 Complete the table:

rule	gradient (m)	x -intercept	y -intercept (c)
$y = -2x$	-2	(0,0)	(0,0)
$y = -2x + 2$	-2	(1,0)	(0,2)
22. [Units of Measurement / Time]
 What is the arrival date and time in Singapore for the trip shown, given that Singapore time is 2 hours behind Sydney time?

Flights Out: Sydney to Singapore - Saturday 13 Feb 2010

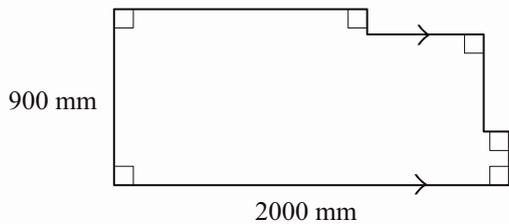
From	To	Flight	Duration
16:00 Sydney	___:___ Singapore	▶ QF509	8h 15m

2215 hours on 13/02/2010

QUOTE OF THE WEEK: The Lord's prayer is 66 words, the Gettysburg Address is 286 words, there are 1322 words in the Declaration of Independence, but government regulations on the sale of cabbage total 26 911 words. U.S. National Review

23. [Perimeter] *

Find the perimeter of the shape.



5800 mm

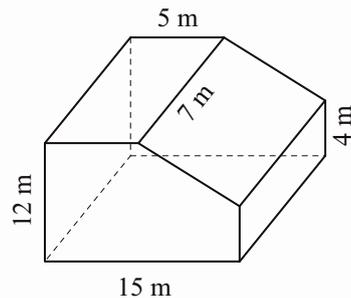
24. [Area] *

A certain type of tile costs \$60 per square metre. If each tile is a square with sides of 25 cm, how much does one tile cost?

\$ 3.75

25. [Volume] *

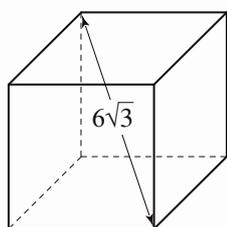
Find the volume of the prism.



980 m³

26. [Surface Area] *

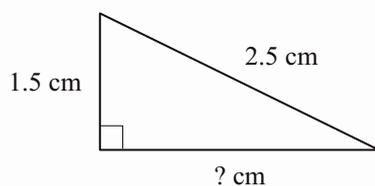
Find the total surface area of the cube.



216

27. [Pythagoras / Trigonometry] *

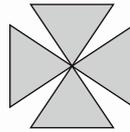
Find the missing side length of this triangle.



2 cm

28. [Shape / Location]

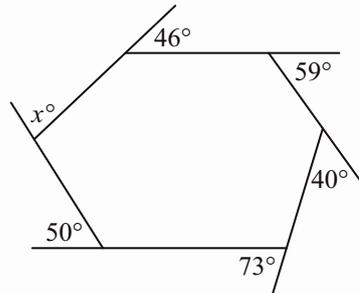
For the shape shown, find the minimum angle of rotation required to regain the original image.



90°

29. [Angles] *

Find the value of x° .



92°

30. [Statistics] *

Find the mean of the following distribution.

Score	0	100	200	300	400
Frequency	5	10	15	20	50

300

31. [Probability] *

A card is drawn at random from a deck of 52. What is the probability of selecting a card numbered 2, 3, 4, 5, 6, 7, 8, 9 or 10?



$\frac{9}{13}$

32. [Problem Solving 1] *

If $x^a = 2$ and $x^b = 3$, find the value of $x^{(2a + 3b)}$

108

33. [Problem Solving 2] *

A polygon has 4850 diagonals. How many sides does the polygon have?

100



Name:

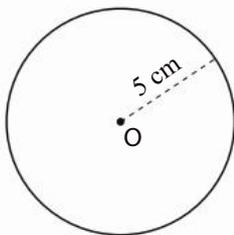
Due Date: / /

Parent's Signature:

1. [Long \times ,+] $88 \times 13 =$ 1144
2. [Decimal +,-] * $10 + 1.6 - 0.75 =$ 10.85
3. [Decimal \times ,+] * $0.3 \div 6 =$ 0.05
4. [Fraction +,-] * $1\frac{2}{7} + \frac{6}{21} =$ $1\frac{4}{7}$
5. [Fraction \times ,+] * $2 \times \frac{m}{6} =$ $\frac{m}{3}$
6. [Percentages] *
Calculate the simple interest Mrs Williams would need to pay if she borrowed \$10 000 for five years at 9% per annum. \$ 4500
7. [Integer +,-] * $8 - (6 - 9) =$ 11
8. [Integer \times ,+] $(+t) \times (-2) =$ -2t
9. [Rates / Ratios] *
A cyclist travels at 30 km/h. How far does she ride in 40 minutes? 20 km
10. [Indices] Simplify $(-b^3)^4$ b^{12}
11. [Square Roots / Surds] * Simplify $\sqrt{45}$ $3\sqrt{5}$
12. [Order of Operations] * $(5 - 14) \div (5 - 2) =$ -3
13. [Exploring Number] Write $\frac{1}{40}$ as a decimal. 0.025
14. [Scientific Notation] Express 9 160 000 km², the approximate area of USA, in scientific notation. 9.16×10^6 km²
15. [Number Patterns] Complete the pattern:
0, 2, 6, 14, 30, 62
16. [Expressions] Write the following as an algebraic expression:
2 more than a half of d $\frac{d}{2} + 2$
17. [Substitution] *
If $a = 4$ and $b = 5$, find the value of $3a - 5b$ -13
18. [Expansion] *
Expand and simplify $2(x + 3) + x(x + 3)$ $x^2 + 5x + 6$
19. [Factorisation] *
Factorise $x^2 + ax + bx + ab$ $(x + a)(x + b)$
20. [Equations] *
Solve for x : $4(3x + 2) = 0$ $-\frac{2}{3}$
21. [Graphs & Functions] *
Find the equation of the line joining the points P(-3,-3) and Q(-2,2), using the formula $y - y_1 = m(x - x_1)$ where $m = \frac{y_2 - y_1}{x_2 - x_1}$ $y = 5x + 12$
22. [Units of Measurement / Time] How many centimetres in 2.4 km? 240 000 cm

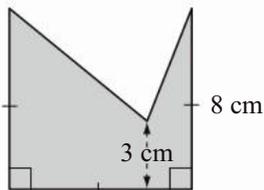
QUOTE OF THE WEEK: The most effective way to cope with change is to help create it. L. W. Lynett

23. [Perimeter] *
Find the circumference of the circle.
(Use $\pi \approx 3.14$)



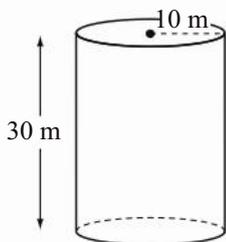
31.4 cm

24. [Area] *
Find the area of the shape.



44 cm²

25. [Volume] *
Find the volume of the cylinder.
(Use $\pi \approx 3.14$)

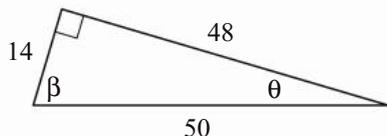


9420 m³

26. [Surface Area] *
Using $TSA = 2\pi r(r + h)$ where $\pi \approx 3.14$, find the total surface area of a cylindrical pellet of radius 1 cm and height 4 cm.

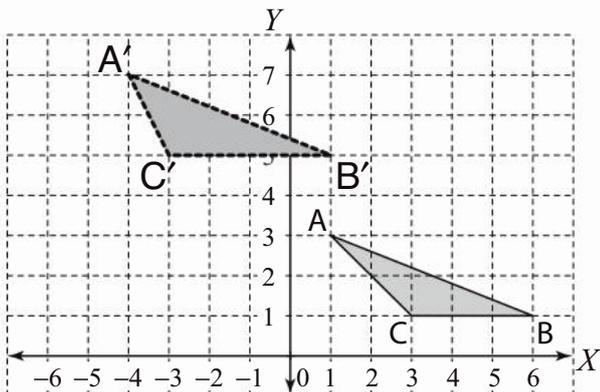
31.4 cm²

27. [Pythagoras / Trigonometry] *
For which angle is the cosine ratio 0.96?

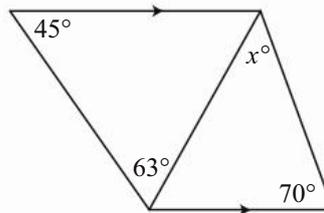


θ

28. [Shape / Location]
Redraw the triangle ABC after translating it -5 units horizontally and 4 units vertically.



29. [Angles] *
Find the value of x° .



38°

30. [Statistics]
During which decade did the U.S. federal minimum wage decrease the most in terms of 2007 dollars?



1980 - 1990

31. [Probability]
What is the probability that a person chosen at random voted for Julius in the school election? [Complete the two-way table.]

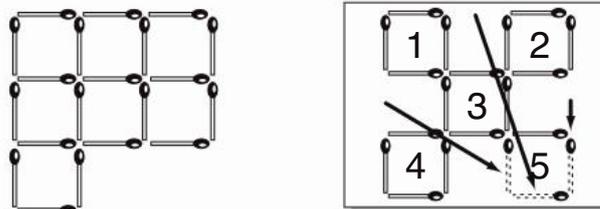
	Mai	Jane	Julius	Total
Yr 10 students	30	6	1	37
Yr 11 students	3	28	7	38
Yr 12 students	5	3	28	36
Total	38	37	36	111

$\frac{12}{37}$

32. [Problem Solving 1] *
The apartment block has 88 apartments and 196 rooms altogether. Each apartment has either 2 or 3 rooms. How many apartments have 2 rooms?

68

33. [Problem Solving 2]
Move three matches to new positions so as to make exactly 5 squares, all the same size.





Name:

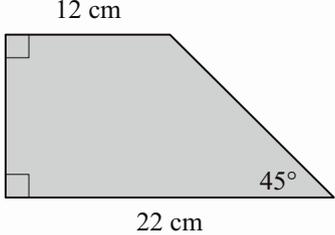
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Parent's Signature:

1. [Long \times ,+] $1230 \div 6 =$ 205
2. [Decimal +,-] * $6.6 + 0.25 - 0.5 =$ 6.35
3. [Decimal \times ,+] $0.7 \times 60 =$ 42
4. [Fraction +,-] * $3\frac{1}{5} - \frac{31}{15} =$ $1\frac{2}{15}$
5. [Fraction \times ,+] * $\frac{x}{5} \div \frac{x}{3} =$ $\frac{3}{5}$
6. [Percentages] * Sara invested \$900 at 5% per annum simple interest for 18 months. How much interest would she earn in this period? \$ 67.50
7. [Integer +,-] * $-2 - (3 - 10) =$ 5
8. [Integer \times ,+] $(-6r) \div (-3) =$ $2r$
9. [Rates / Ratios] * A jet travels at 900 km/h. How far does it go in 10 seconds? 2.5 km
10. [Indices] Simplify $-(e^7)^2$ $-e^{14}$
11. [Square Roots / Surds] * Simplify $\sqrt{200}$ $10\sqrt{2}$
12. [Order of Operations] * $(2 \times 5 + 1)^2 - 3^3 =$ 94
13. [Exploring Number] Write $\frac{26}{9}$ as a recurring decimal. $2.\dot{8}$
14. [Scientific Notation] Express 4 500 000 000 years, the age of the Earth, in scientific notation. 4.5×10^9 years
15. [Number Patterns] Complete the pattern:
2, 2, 4, 6, 10, 16
16. [Expressions] Write the following as an algebraic expression:
A number that is three less than the sum of k and z $k + z - 3$
17. [Substitution] * If $d = 3$ and $e = -8$, find the value of $d(e - d)$ -33
18. [Expansion] * Expand and simplify $x(x + 2) - (x + 2)$ $x^2 + x - 2$
19. [Factorisation] * Factorise $x^3 + x^2y + xy^2 + y^3$ $(x + y)(x^2 + y^2)$
20. [Equations] * Solve for x : $5(4x + 3) = 0$ $-\frac{3}{4}$
21. [Graphs & Functions] * Find the equation of the line joining the points A(4,-1) and B(2,0), using the formula $y - y_1 = m(x - x_1)$ where $m = \frac{y_2 - y_1}{x_2 - x_1}$ $y = -\frac{1}{2}x + 1$
22. [Units of Measurement / Time] A fish tank has a volume of 0.8 m^3 . What is its capacity in litres? 800 L

23. [Perimeter] *
A circle has a circumference of 44 cm.
Using $\pi \approx \frac{22}{7}$ find its diameter. 14 cm

24. [Area] *
Find the area of the shape.



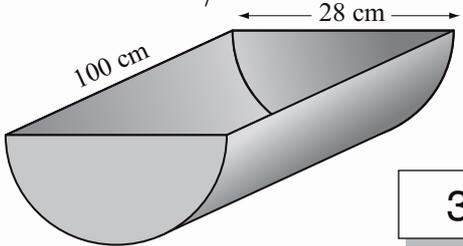
12 cm

22 cm

45°

170 cm²

25. [Volume] *
Find the capacity in litres of the animal feed bin. (Use $\pi \approx \frac{22}{7}$)



100 cm

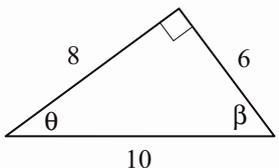
28 cm

30.8 L

26. [Surface Area] *
Find the total surface area of a plank of wood that is in the shape of a rectangular prism and measures 10 cm by 200 cm by 4 cm.

5680 cm²

27. [Pythagoras / Trigonometry] *
For which angle is the sine ratio 0.8?



8

6

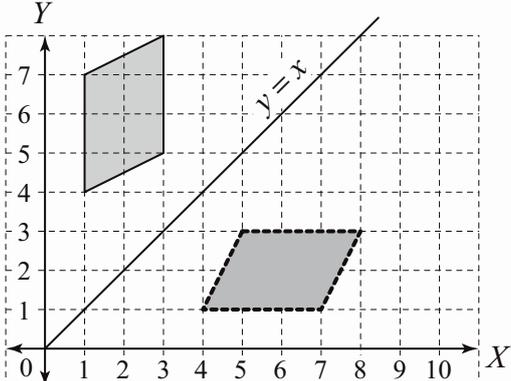
10

θ

β

β

28. [Shape / Location]
Draw the reflection of the parallelogram in the line of equation $y = x$.



Y

7

6

5

4

3

2

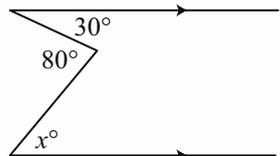
1

0

0 1 2 3 4 5 6 7 8 9 10 X

$y = x$

29. [Angles] *
Find the value of x° .



30°

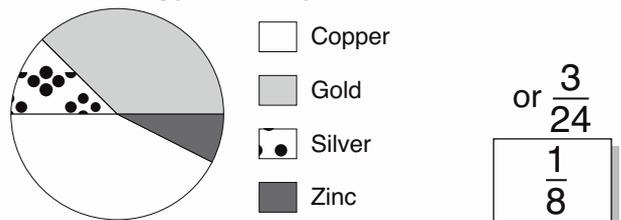
80°

x°

50°

30. [Statistics]
The actual gold content of 9-carat gold must be $\frac{9}{24}$ ths of the alloy. This pie chart gives an example of the proportion of other metals in the alloy. What fraction of the 9-carat gold is silver?

Typical Composition of 9-Carat Gold



31. [Probability]
What is the probability that a musician chosen at random from the orchestra plays a string instrument? [Complete the two-way table.]

	Men	Women	Total
String	10	12	22
Woodwind	6	9	15
Brass	3	3	6
Total	19	24	43

$\frac{22}{43}$

32. [Problem Solving 1] *
A small rectangular paddock is divided into four smaller rectangular yards as shown. The areas of three of the yards are given. What is the area of the fourth yard?

270 m ²	648 m ²		
360 m ²	? m ²	864 m²	

33. [Problem Solving 2] *
A five metre long ladder rests at an angle against a vertical wall. The foot of the ladder is moved one metre further away from the base of the wall and in this movement the top of the ladder slides exactly one metre down the wall! What distance from the ground is the top of the ladder now?

3 m



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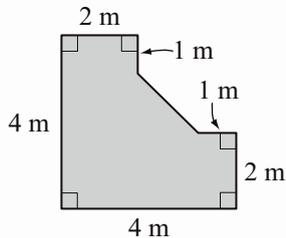
1. [Long \times , \div]
 $405 \div 5 =$ 81
2. [Decimal $+$, $-$] *
 $2 - 0.17 + 0.2 =$ 2.03
3. [Decimal \times , \div]
 $0.08 \div 0.2 =$ 0.4
4. [Fraction $+$, $-$]
 $\frac{2}{3} + \frac{7}{10} =$ $1\frac{11}{30}$
5. [Fraction \times , \div]
 $\frac{t}{5} \times \frac{6}{t} =$ $1\frac{1}{5}$
6. [Percentages] *
 Each year Alan pays back 8% of the total loan of \$12 000. How much does he still owe after 10 years?
\$2400
7. [Integer $+$, $-$] *
 $8 + (4 - 11) =$ 1
8. [Integer \times , \div]
 $(+3m) \times (-3) =$ $-9m$
9. [Rates / Ratios] *
 A motorcyclist travels at a speed of 72 km/h. How long would he take to travel 3.6 kilometres?
3 min
10. [Indices]
 Simplify $(-2x^3)^3$ $-8x^9$
11. [Square Roots / Surds] *
 Simplify $\sqrt{12x^3}$ $2x\sqrt{3x}$
12. [Order of Operations] *
 $(8 + 3 - 11)^5 - 9 =$ -9
13. [Exploring Number]
 Write $\frac{1}{12}$ as a recurring decimal. $0.08\dot{3}$
14. [Scientific Notation]
 Express 12 500 in scientific notation correct to 2 significant figures. 1.3×10^4
15. [Number Patterns]
 Complete the pattern:
 3, 3, 6, 9, 15, 24, 39
16. [Expressions]
 Write the following as an algebraic expression:
 Two more than five lots of b $5b + 2$
17. [Substitution] *
 If $x = 4$ and $y = -1$, find the value of $x^2 + xy$ 12
18. [Expansion] *
 Expand and simplify $x(x - 5) + 5(x - 5)$ $x^2 - 25$
19. [Factorisation] *
 Factorise $2a^2b - 6ab - 3a + 9$ $(a - 3)(2ab - 3)$
20. [Equations] *
 Solve for x :
 $\frac{1}{2}(x - 5) = 0$ 5
21. [Graphs & Functions] *
 Find the equation of the line joining the points M(0, -2) and N(-1, 3), using the formula $y - y_1 = m(x - x_1)$ where $m = \frac{y_2 - y_1}{x_2 - x_1}$
 $y = -5x - 2$
22. [Units of Measurement / Time]
 The capacity of an eye dropper is 5 mL. Find its volume in mm^3 . 5000 mm^3

QUOTE OF THE WEEK: Keep away from people who try to belittle your ambitions. Small people always do that, but the really great make you feel that you, too, can become great. Mark Twain

23. [Perimeter] *
The wheels of a radio-controlled car have a radius of 3.5 cm. If the wheels are rotating 25 times every second, what is the speed of the model car in metres per second?
(Use $\pi \approx \frac{22}{7}$)

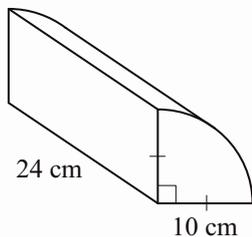
5.5 m/s

24. [Area] *
Find the area of the shape.



12.5 m²

25. [Volume] *
Using $\pi \approx 3.14$ find the volume of the solid.

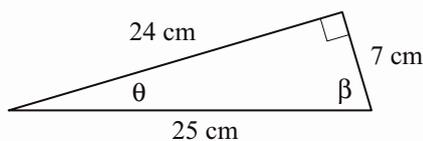


1884 cm³

26. [Surface Area] *
Using $TSA = \pi r(r + s)$ where $\pi \approx 3.14$, find the total surface area of a cone of radius 3.5 cm and slant height 16.5 cm.

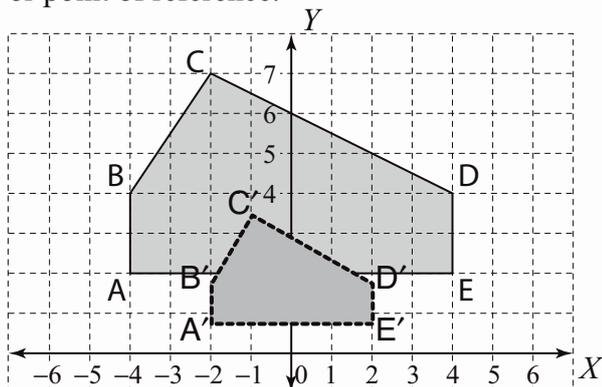
219.8 cm²

27. [Pythagoras / Trigonometry] *
For which angle is the sine ratio 0.28?

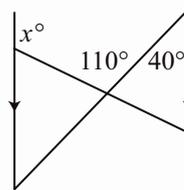


θ

28. [Shape / Location]
Scale the shape ABCDE by a factor of $\frac{1}{2}$ using the origin as the centre of enlargement or point of reference.



29. [Angles] *
Find the value of x° .

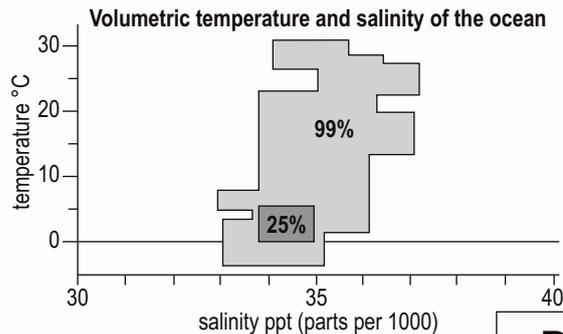


110°

30. [Statistics]

Which best describes the ocean?

- A) 99% is between 33 and 36 salinity ppt
B) 99% is between 0 and 30°C
C) 25% is between 33 and 34 salinity ppt
D) 25% is between 0 and 6°C



D

31. [Probability]
What is the probability that a vehicle chosen at random was a Nissan 4 × 4? [Complete the two-way table.]

	Toyota	Nissan	Ford	Total
Vans	4	3	6	13
4 × 4	5	5	0	10
Sedans	2	9	1	12
Total	11	17	7	35

$\frac{1}{7}$

32. [Problem Solving 1] *
If n is an even number, which of the following
I. $n + n$ II. $n + n + n$ III. $n \times n \times n$
must also be even?

- A) I only
B) II only
C) III only
D) II and III only
E) I, II and III

E

33. [Problem Solving 2] *
Water in the Murray River flows at 6 km/h. The paddlesteamer 'Pevensey' takes 4 hours to complete a 36 km round trip on the river (18 km down stream and 18 km back up stream). What is the boat's speed relative to the water?

12 km/h



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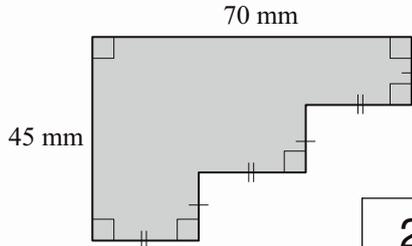
Parent's Signature:

1. [Long \times, \div]
 $693 \div 7 =$ 99
2. [Decimal $+, -$] *
 $3.1 - 0.3 - 0.05 =$ 2.75
3. [Decimal \times, \div] *
 $0.4 \times 0.25 =$ 0.1
4. [Fraction $+, -$] *
 $\frac{7}{8} - \frac{1}{6} =$ $\frac{17}{24}$
5. [Fraction \times, \div] *
 $\frac{1}{f} \div \frac{2}{f} =$ $\frac{1}{2}$
6. [Percentages] *
Each year Trevor pays any interest that has accrued on his loan, plus 5% of the original \$100 000 loan. How much does he still owe after 6 years? \$70 000
7. [Integer $+, -$] *
 $-2 + (2 - 9) =$ -9
8. [Integer \times, \div]
 $(-21y) \div (-7) =$ 3y
9. [Rates / Ratios] *
The African wild dog can run at up to 45 km/h. At this rate how long does it take it to cover 6 km? 8 min
10. [Indices] *
Simplify $3m^2 \times (2m^3)^2$ 12m⁸
11. [Square Roots / Surds] *
Simplify $\sqrt{32t}$ 4 $\sqrt{2t}$
12. [Order of Operations] *
 $(125 \times 38 \div 9)^0 + 15 =$ 16
13. [Exploring Number]
Write $\frac{15}{7}$ as a recurring decimal. 2.142857
14. [Scientific Notation]
Express 0.00407 in scientific notation correct to 2 significant figures. 4.1×10^{-3}
15. [Number Patterns]
Complete the pattern:
47, 48, 50, 53, 57, 62
16. [Expressions]
Write the following as an algebraic expression:
One third of the sum of f and d $\frac{f+d}{3}$
17. [Substitution] *
If $h = -6$ and $k = -2$, find the value of h^2k -72
18. [Expansion] *
Expand and simplify
 $x(x+4) - 4(x+4)$ $x^2 - 16$
19. [Factorisation] *
Factorise
 $5e + e^2 + 5f + ef$ $(e+f)(5+e)$
20. [Equations] *
Solve for x :
 $\frac{2}{3}(4x-1) = 0$ $\frac{1}{4}$
21. [Graphs & Functions] *
Find the equation of the line joining the points F(-4,-2) and G(3,1), using the formula $y - y_1 = m(x - x_1)$ where $m = \frac{y_2 - y_1}{x_2 - x_1}$
 $y = \frac{3}{7}x - \frac{2}{7}$
22. [Units of Measurement / Time]
Change 0.001 tonne into grams. 1000 g

23. [Perimeter] *
 French artist Jean-Auguste-Dominique Ingres painted 'The Turkish Bath' in 1862. The painting has been completed on a circular canvas with a diameter of 1.1 m. Find the circumference of the painting. (Use $\pi \approx 3.14$)

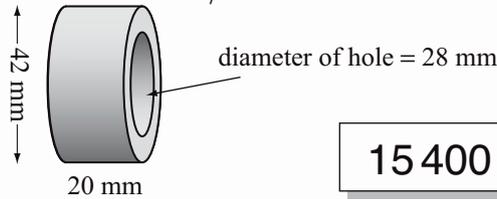
3.454 m

24. [Area] *
 Find the area of the shape.



2100 mm²

25. [Volume] *
 Find the volume of rubber used to make the tyre. (Use $\pi \approx \frac{22}{7}$)

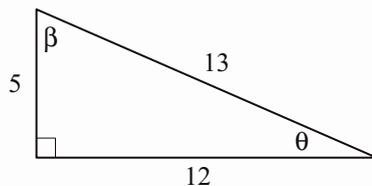


15400 mm³

26. [Surface Area] *
 Given $TSA = 4\pi r^2$ for a sphere, use $\pi \approx 3.14$ to find the total surface area of a solid hemisphere of diameter 20 cm.

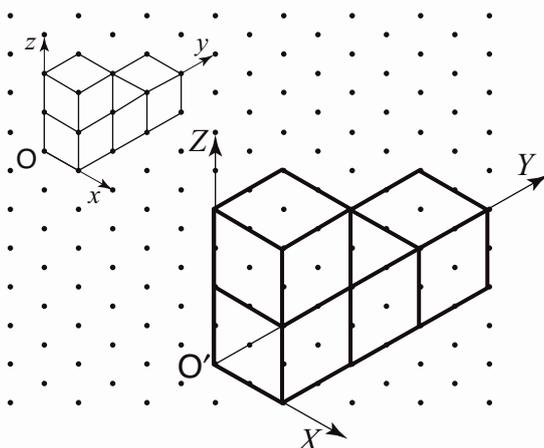
942 cm²

27. [Pythagoras / Trigonometry] *
 For which angle is the tangent ratio 2.4?

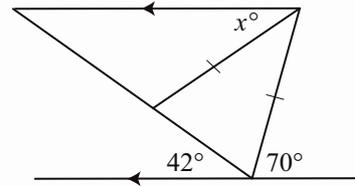


β

28. [Shape / Location]
 Redraw the solid after it has been enlarged by a scale factor of 2.

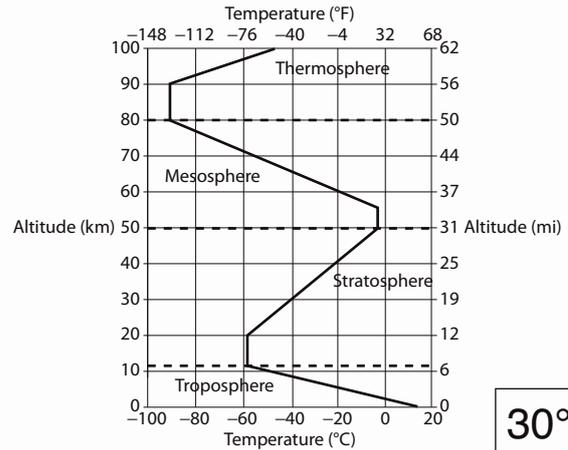


29. [Angles] *
 Find the value of x° .



26°

30. [Statistics]
 What is the difference, to the nearest 10°C, between the minimum temperature reached in the stratosphere and the mesosphere?



30°C

31. [Probability]
 What is the probability that a person chosen at random was aged 56 years or more and voted "No" in the referendum? [Complete the two-way table.]

	18 - 35 years	36 - 55 years	56 + years	Total
Yes	300	900	200	1400
No	100	400	400	900
Total	400	1300	600	2300

$\frac{4}{23}$

32. [Problem Solving 1] *
 If p is the smallest of three consecutive integers p , q and r , what is the sum of q and r expressed in terms of p ?

$2p + 3$

33. [Problem Solving 2] *
 $\sqrt{6 + \sqrt{6 + \sqrt{6 + \sqrt{6 + \sqrt{6 + \dots}}}}} = n$
 Find the value of n given that it is a positive whole number.

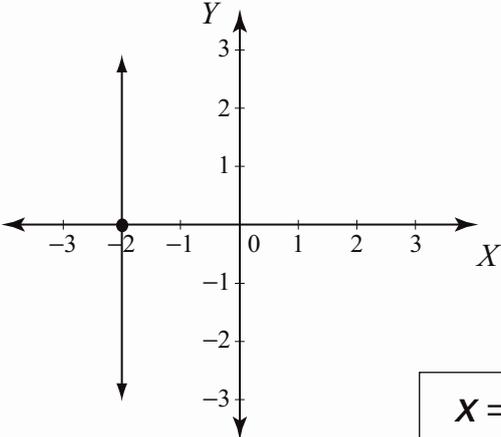
3



Name:

Due Date: / /

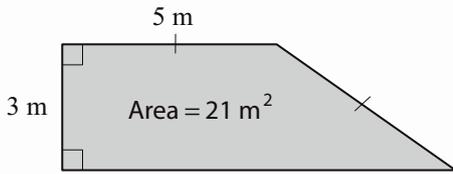
Parent's Signature:

1. [Long \times, \div] *
 $22 \times 66 =$ 1452
2. [Decimal $+, -$]
 $1 - 0.043 =$ 0.957
3. [Decimal \times, \div]
 $2.4 \times 0.8 =$ 1.92
4. [Fraction $+, -$] *
 $\frac{x}{2} + \frac{x}{4} =$ $\frac{3x}{4}$
5. [Fraction \times, \div] *
 $3 \times 5\frac{1}{2} =$ $16\frac{1}{2}$
6. [Percentages] *
Jacob donates 8% of his income to charity.
If he gives \$12 per week to charity, how much does he earn?
\$ 150 /week
7. [Integer $+, -$] *
 $-3 - (6 - 15) =$ 6
8. [Integer \times, \div]
 $(-3) \times (-5) \times (+4) =$ 60
9. [Rates / Ratios] *
On a map the distance between Ballarat and Ararat is 15 cm. What is the scale factor if the actual distance is 90 km?
1 : 600 000
10. [Indices] *
Evaluate $(0.1)^{-3}$ 1000
11. [Square Roots / Surds] *
Between which two consecutive whole numbers does $2\sqrt{3}$ lie?
3 and 4
12. [Order of Operations] *
 $(6 - 3) \times (3 - 6) =$ -9
13. [Exploring Number] *
You need 5 m of cloth to make 2 jackets.
How many jackets can be made from 150 m of cloth?
60
14. [Scientific Notation]
Which is the order of magnitude of 86 000?
[i.e. What power of 10 appears in the scientific notation of the number? OR What power of 10 is the number closest to?]
A) 10^3 B) 10^4
C) 10^5 D) 10^6 C
15. [Number Patterns]
Complete the pattern:
 $1, 1\frac{3}{5}, 2\frac{1}{5}, 2\frac{4}{5},$ $3\frac{2}{5}, 4$
16. [Expressions]
Add the following polynomials:
 $(8x^2 - 6x - 9) + (9x^2 - 6x + 8)$
 $17x^2 - 12x - 1$
17. [Substitution] *
If $a = 5, b = 0$ and $x = 4$, simplify $b(a + x)$ 0
18. [Expansion] *
Expand and simplify $2(x + 1)^2 - 4$ $2x^2 + 4x - 2$
19. [Factorisation]
Factorise $4x^2 + 20x + 25$ $(2x + 5)^2$
20. [Equations] *
Solve the simultaneous equations:
 $y = 2x + 1$
 $y = x - 1$ (-2, -3)
21. [Graphs & Functions]
Find the equation of the line.
 $x = -2$

22. [Units of Measurement / Time]
How many square centimetres are there in 200 square millimetres?

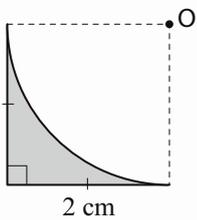
2 cm²

23. [Perimeter] *
Find the perimeter of the trapezium.



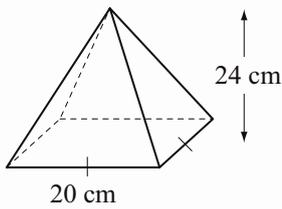
22 m

24. [Area] *
Using $\pi \approx 3.14$ find the area of the shaded region.



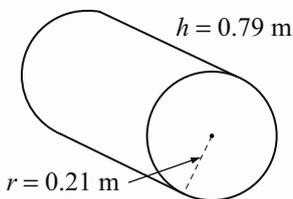
0.86 cm²

25. [Volume] *
Calculate the volume of the square pyramid.



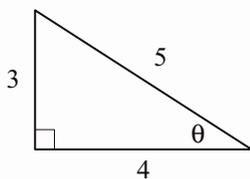
3200 cm³

26. [Surface Area] *
Using $\pi \approx \frac{22}{7}$ find the total surface area of the cylinder.



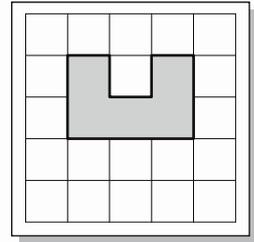
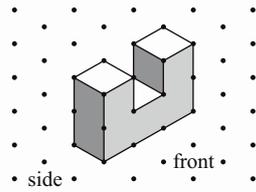
1.32 m²

27. [Pythagoras / Trigonometry] *
Use the triangle to calculate the value of $\sin \theta$.

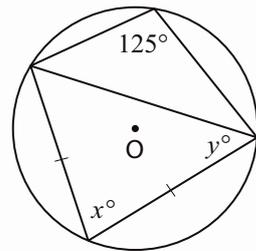


0.6

28. [Shape / Location]
Draw the view from the front of the solid.

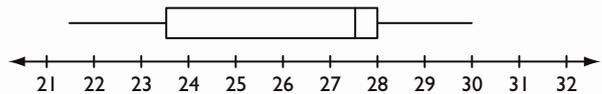


29. [Angles] *
Find the values of x° and y° .



$x^\circ = 55^\circ$ $y^\circ = 62.5^\circ$

30. [Statistics]
For the box-and-whisker plot, find the range and the interquartile range (IQR).



range = 8.5 IQR = 4.5

31. [Probability]
If two dice are tossed, what is the probability of rolling two odd numbers?



or 0.25 $\frac{1}{4}$

32. [Problem Solving 1] *
Simplify $\frac{3}{1 + \frac{1}{1+1}}$

2

33. [Problem Solving 2] *
I think of a two-digit number which I multiply by 2. I then divide the result by 3, multiply this result by 4 and finally divide by 5. Find the original two-digit number given that at every stage of the process, the result remained a two-digit number.

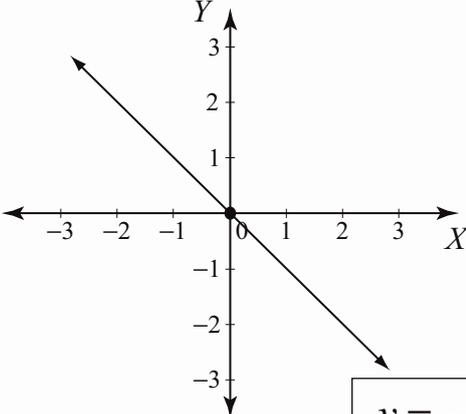
30



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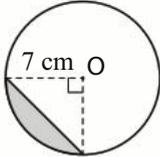
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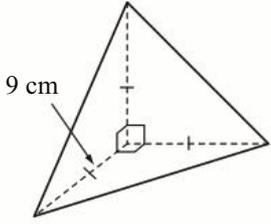
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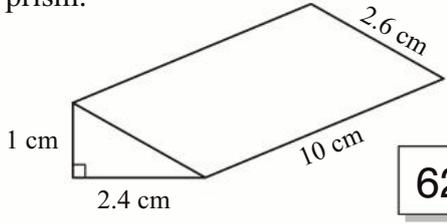
1. [Long \times, \div] *
 $36 \times 15 =$ 540
2. [Decimal $+, -$]
 $1 - 0.611 =$ 0.389
3. [Decimal \times, \div]
 $3.05 \times 0.04 =$ 0.122
4. [Fraction $+, -$] *
 $\frac{d}{5} - \frac{d}{15} =$ $\frac{2d}{15}$
5. [Fraction \times, \div] *
 $4 \times 2\frac{1}{3} =$ $9\frac{1}{3}$
6. [Percentages] *
My pay rise of 3% means I earn an extra \$27 per week. What is my weekly wage after the pay rise?
\$ 927
7. [Integer $+, -$] *
 $2 - (5 + 10) =$ -13
8. [Integer \times, \div]
 $(+6) \times (+3) \div (-9) =$ -2
9. [Rates / Ratios] *
Albury and Wagga Wagga are 130 km apart. How many centimetres apart are they on a map with a scale factor of 1 : 250 000?
52 cm
10. [Indices] *
Simplify $(2x^0)^{-2}$ $\frac{1}{4}$
11. [Square Roots / Surds] *
Between which two consecutive whole numbers does $2\sqrt{6}$ lie?
4 and 5
12. [Order of Operations] *
 $(2 + 8) \times (5 + 18) =$ 230
13. [Exploring Number] *
100 kg of tomatoes were picked from a 100 m² paddock. At this rate how many hectares are required to produce 4 tonnes of tomatoes?
0.4 ha
14. [Scientific Notation]
Which is the order of magnitude of 0.018?
[i.e. What power of 10 appears in the scientific notation of the number? OR What power of 10 is the number closest to?]
A) 10^{-2} B) 10^{-1} C) 10^1 D) 10^2 A
15. [Number Patterns]
Complete the pattern:
 $8, 7\frac{1}{3}, 6\frac{2}{3}, 6,$ $5\frac{1}{3}, 4\frac{2}{3}$
16. [Expressions]
Find the difference between the following polynomials:
 $(x^2 + 2x + 3) - (x^2 - 2x + 1)$
 $4x + 2$
17. [Substitution] *
If $a = 4$ and $b = 5$ simplify $\frac{10}{b} + \frac{ab}{10}$ 4
18. [Expansion] *
Expand and simplify $3(2 - x)^2 + 2x$ $3x^2 - 10x + 12$
19. [Factorisation]
Factorise $x^2 - 6x + 9$ $(x - 3)^2$
20. [Equations] *
Solve the simultaneous equations:
 $2x + y = 7$
 $2x - y = 1$ (2,3)
21. [Graphs & Functions]
Find the equation of the line.

 $y = -x$

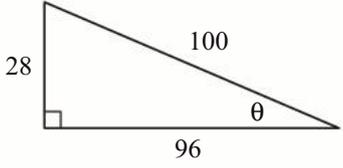
22. [Units of Measurement / Time] *
How many square metres are there in 3000 square centimetres?
0.3 m²

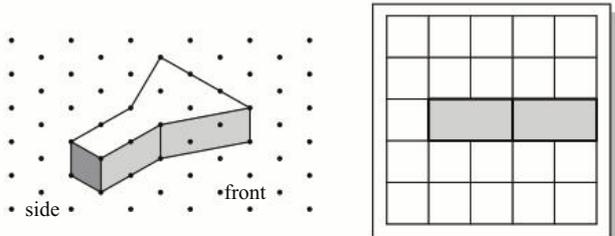
23. [Perimeter] *
The largest pyramid in the world is the Quetzalcóatl pyramid south-east of Mexico City. The temple mound has a height of only 54 metres but its square base covers an area of 16 hectares. Find the perimeter of its base.
1600 m

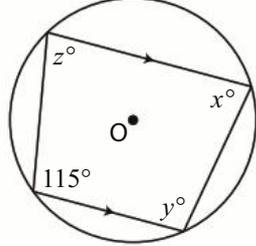
24. [Area] *
Using $\pi \approx \frac{22}{7}$ find the area of the shaded region.

14 cm²

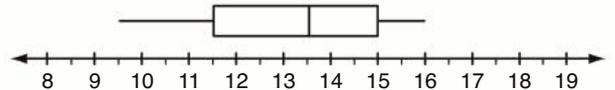
25. [Volume] *
Calculate the volume of the triangular pyramid.

121.5 cm³

26. [Surface Area] *
Find the total surface area of the triangular prism.

62.4 cm²

27. [Pythagoras / Trigonometry] *
Use the triangle to calculate the value of $\sin \theta$.

0.28

28. [Shape / Location]
Draw the view from the front of the solid.


29. [Angles] *
Find the values of x° , y° and z° .

 $x^\circ = 65^\circ$ $y^\circ = 115^\circ$ $z^\circ = 65^\circ$

30. [Statistics]
For the box-and-whisker plot, find the range and the interquartile range (IQR).

range = 6.5 IQR = 3.5

31. [Probability]
If two dice are tossed, what is the probability of rolling a double?

or $0.1\bar{6}$
 $\frac{1}{6}$

32. [Problem Solving 1] *
Which of the following fractions is the largest?
A) $\frac{111}{221}$ B) $\frac{75}{151}$ C) $\frac{333}{998}$ D) $\frac{113}{225}$ E) $\frac{101}{301}$
A

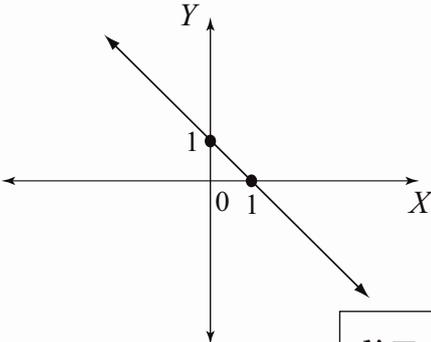
33. [Problem Solving 2] *
The number 105 can be expressed as a sum of two or more consecutive, positive integers in seven different ways. One such sequence begins with 12:
 $12 + 13 + 14 + 15 + 16 + 17 + 18 = 105$
With which numbers do the other 6 sequences begin?
1, 6, 15, 19, 34, 52



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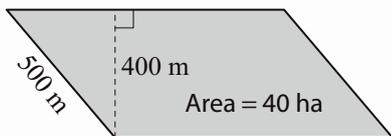
Parent's Signature:

1. [Long \times, \div] *
 $26 \times 18 =$ 468
2. [Decimal $+, -$]
 $1 - 0.45 =$ 0.55
3. [Decimal \times, \div]
 $48 \div 0.6 =$ 80
4. [Fraction $+, -$] *
 $\frac{w}{2} + \frac{w}{3} =$ $\frac{5w}{6}$
5. [Fraction \times, \div] *
 $6 \times 1\frac{3}{5} =$ $9\frac{3}{5}$
6. [Percentages] *
A recent 2% increase in my rent costs me an extra \$5 per week. How much rent do I pay now? \$ 255
7. [Integer $+, -$] *
 $-7 + (4 - 8) =$ -11
8. [Integer \times, \div]
 $(+2) \times (-3) \times (+7) =$ -42
9. [Rates / Ratios] *
On a map the distance between Cairns and Mareeba is 8 cm. What is the scale factor if the actual distance is 64 km? 1 : 800 000
10. [Indices] *
Evaluate $\frac{1}{2^{-3}}$ 8
11. [Square Roots / Surds] *
Between which two consecutive whole numbers does $4\sqrt{5}$ lie? 8 and 9
12. [Order of Operations] *
 $(9 + 3) - 6 \times 4 =$ -12
13. [Exploring Number] *
A cheetah can move 17 m in 2 bounds. At this rate, what distance will it cover in 11 bounds? 93.5 m
14. [Scientific Notation]
Which is the order of magnitude of 3.8×205 ? [i.e. What power of 10 appears in the scientific notation of the number? OR What power of 10 is the number closest to?]
A) 10^0 B) 10^1 C) 10^2 D) 10^3 D
15. [Number Patterns]
Complete the pattern:
6.4, 3.2, 1.6, 0.8, $0.4, 0.2$
16. [Expressions]
Add the following polynomials:
 $(-5y^2 - 9y + 4) + (8y^2 - 4y - 10)$
 $3y^2 - 13y - 6$
17. [Substitution] *
If $e = 3$ and $f = 5$, simplify $\frac{ef^2}{5}$ 15
18. [Expansion] *
Expand and simplify
 $(x + y)^2$ $x^2 + 2xy + y^2$
19. [Factorisation]
Factorise
 $9x^2 - 4y^2$ $(3x + 2y)(3x - 2y)$
20. [Equations] *
Solve the simultaneous equations:
 $4x + 3y = 8$
 $2x + 3y = 10$ (-1, 4)
21. [Graphs & Functions]
Find the equation of the line.

 $y = -x + 1$

22. [Units of Measurement / Time]
Change 2.75 cm^3 into mm^3 .

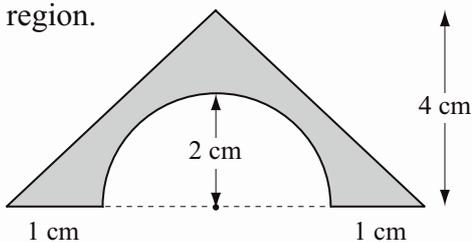
2750 mm^3

23. [Perimeter] *
Find the perimeter of the parallelogram.



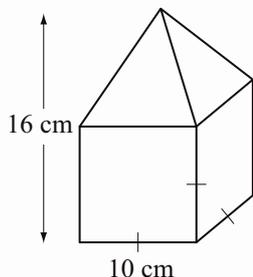
3000 m

24. [Area] *
Using $\pi \approx 3.14$ find the area of the shaded region.



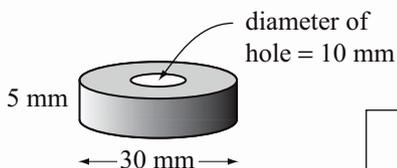
5.72 cm^2

25. [Volume] *
A wooden toy is constructed as shown. It is in the shape of a cube with a square pyramid on top. Find the volume of wood in the toy.



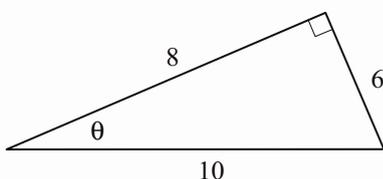
1200 cm^3

26. [Surface Area] *
Using $\pi \approx 3.14$ find the total surface area of the washer.



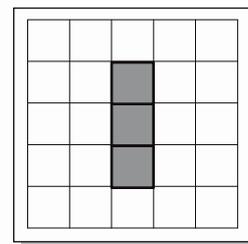
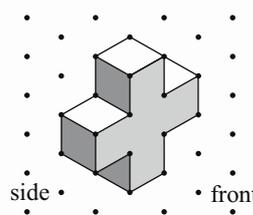
1884 mm^2

27. [Pythagoras / Trigonometry] *
Use the triangle to calculate the value of $\cos \theta$.

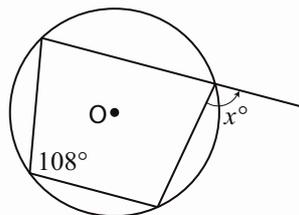


0.8

28. [Shape / Location]
Draw the view from the side of the solid.



29. [Angles] *
Find the value of x° .

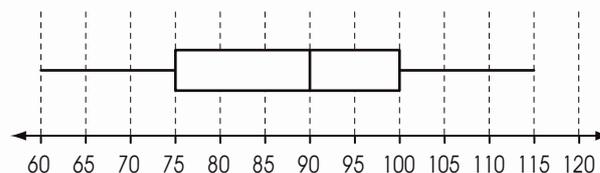


108°

30. [Statistics]
This data shows the number of people boarding each of 20 flights at an airport:

60, 75, 100, 84, 110, 75, 73, 95, 69, 88,
72, 100, 106, 92, 82, 87, 98, 109, 115, 93

Draw a box-and-whisker plot for this data.



31. [Probability]
If two dice are thrown, what is the probability of obtaining an even number on one die and an odd number on the other?



or 0.5 $\frac{1}{2}$

32. [Problem Solving 1] *
 $24^2 - 2 \times 24 \times 19 + 19^2 =$

25

33. [Problem Solving 2] *
Each letter stands for a different digit. What number does ABC represent?

$$\begin{array}{r} \text{A B C} \\ \times \quad \text{B} \\ \hline \text{A A B B} \end{array}$$

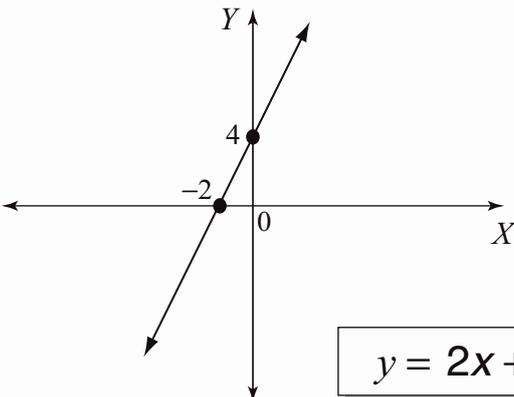
286



Name:

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Parent's Signature:

1. [Long \times, \div]
 $837 \div 9 =$ 93
2. [Decimal $+, -$]
 $1 - 0.028155 =$ 0.971845
3. [Decimal \times, \div]
 $0.072 \div 0.9 =$ 0.08
4. [Fraction $+, -$] *
 $\frac{2r}{5} + \frac{r}{2} =$ $\frac{9r}{10}$
5. [Fraction \times, \div] *
 $5 \times 2\frac{2}{3} =$ $13\frac{1}{3}$
6. [Percentages] *
A library has 1290 books out on loan. If this represents 6% of the library's books, how many books remain in the library?
20210
7. [Integer $+, -$] *
 $-3 + (1 - 7) =$ -9
8. [Integer \times, \div]
 $(-7) \times (-6) \div (-3) =$ -14
9. [Rates / Ratios] *
Sydney and Brisbane are 730 km apart. How many centimetres apart are they on a map with a scale factor of 1 : 100 000?
730 cm
10. [Indices] *
Evaluate $\frac{1}{5^{-3}}$ 125
11. [Square Roots / Surds] *
Between which two consecutive whole numbers does $4\sqrt{2}$ lie?
5 and 6
12. [Order of Operations] *
 $(14 \times 6 - 21) \div 7 =$ 9
13. [Exploring Number] *
A factory produces 3 L of juice from 10 kg of oranges. At this rate how much juice could be produced from 36 kg of oranges?
10.8 L
14. [Scientific Notation]
Which is the order of magnitude of 0.0128?
[i.e. What power of 10 appears in the scientific notation of the number? OR What power of 10 is the number closest to?]
A) 10^{-5} B) 10^{-4}
C) 10^{-3} D) 10^{-2} D
15. [Number Patterns]
Complete the pattern:
4, 2, 1, 0.5, 0.25, 0.125
16. [Expressions]
Find the difference between the following polynomials:
 $(y^3 - 5y^2 + y) - (-y^2 - 3y - 2)$
 $y^3 - 4y^2 + 4y + 2$
17. [Substitution] *
If $x = 2$, $y = 5$ and $z = 10$,
simplify $\frac{xyz}{50}$ 2
18. [Expansion] *
Expand and simplify $(x + 3y)^2$ $x^2 + 6xy + 9y^2$
19. [Factorisation]
Factorise $8c^2 - 2d^2$ $2(2c - d)(2c + d)$
20. [Equations] *
Solve the simultaneous equations:
 $5x + 3y = 6$
 $5x + y = -2$ $(-\frac{6}{5}, 4)$
21. [Graphs & Functions]
Find the equation of the line.

 $y = 2x + 4$

QUOTE OF THE WEEK: The reason some parents want their children to play the piano instead of the violin is that it's harder to lose a piano.

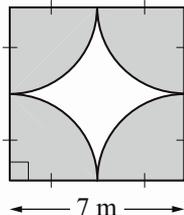
22. [Units of Measurement / Time]
Convert 0.02 m^3 to mm^3 .

20 000 000 mm^3

23. [Perimeter] *
A rectangular block of land is 50 metres wide and has an area of 2 hectares. Find the length of the block of land.

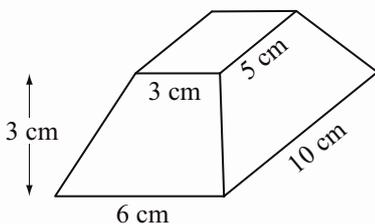
400 m

24. [Area] *
Using $\pi \approx \frac{22}{7}$ find the shaded area.



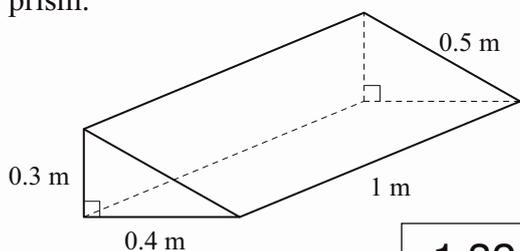
38.5 m^2

25. [Volume] *
A gold ingot is in the shape of a truncated pyramid. What is its volume?
[Hint: Consider the ingot as the solid left after a rectangular pyramid is cut from the top of a larger rectangular pyramid.]



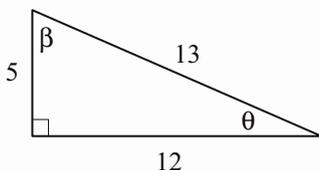
105 cm^3

26. [Surface Area] *
Find the total surface area of the triangular prism.



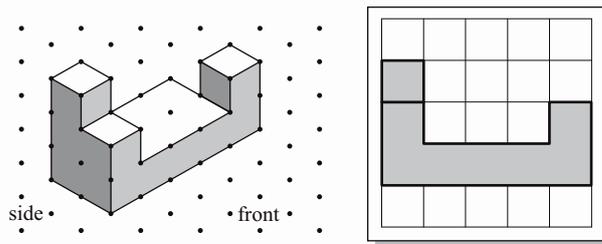
1.32 m^2

27. [Pythagoras / Trigonometry] *
Use the triangle to calculate the value of $\tan \beta$.

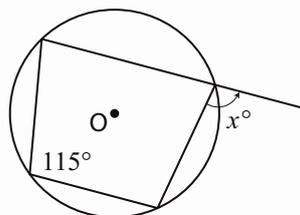


2.4

28. [Shape / Location]
Draw the view from the front of the solid.

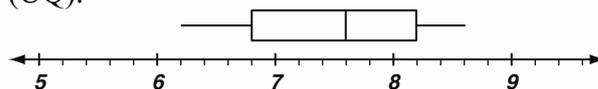


29. [Angles] *
Find the value of x° .



115°

30. [Statistics]
For the box-and-whisker plot, find the median, the lower quartile (LQ) and the upper quartile (UQ).



median = 7.6 LQ = 6.8 UQ = 8.2

31. [Probability]
If two dice are thrown one after the other, what is the probability of getting a 2 on the second die?



or 0.16

$\frac{1}{6}$

32. [Problem Solving 1] *
Find the value of the product:

$$\left(1 + \frac{2}{3}\right) \left(1 + \frac{2}{5}\right) \left(1 + \frac{2}{7}\right) \dots \left(1 + \frac{2}{17}\right) \left(1 + \frac{2}{19}\right)$$

7

33. [Problem Solving 2] *
If a , b and c represent the side lengths of a triangle and

$$\frac{c-b}{a} + \frac{a-c}{b} + \frac{b-a}{c} = 0$$

what type of triangle is it?

isosceles or equilateral

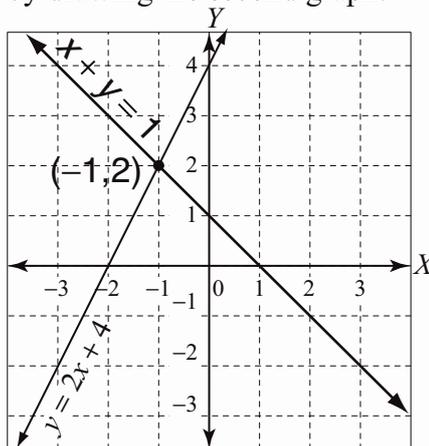


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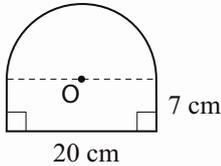
1. [Long \times ,+] $508 \times 6 =$ 3048
2. [Decimal +,-] $5 - 0.641 =$ 4.359
3. [Decimal \times ,+] $1.6 \times 0.09 =$ 0.144
4. [Fraction +,-] * $\frac{5}{6} - \frac{7}{15} =$ $\frac{11}{30}$
5. [Fraction \times ,+] $\frac{1}{4}(8 + 20g) =$ $2 + 5g$
6. [Percentages] *
Sugar is added to 400 g of cream, and the mix is beaten to produce 500 g of whipped cream. What is the percentage of sugar in the whipped cream? 20%
7. [Integer +,-] $(-5q) + (-2q) =$ $-7q$
8. [Integer \times ,+] * $(2 - 5) \times (2 - 5) =$ 9
9. [Rates / Ratios] *
To visit Pluto, a spaceship would have to travel approximately 5 600 000 000 km from Earth. How long would this journey take travelling at 40 000 km/h? 140 000 h
[This is almost 16 years]
10. [Indices] Simplify $\frac{20a^5b^6}{5a^2b^3}$ $4a^3b^3$
11. [Square Roots / Surds] Expand and simplify $\sqrt{2}(3 + \sqrt{2})$ $2 + 3\sqrt{2}$
12. [Order of Operations] * $(12 - 8) \times (8 - 12) =$ -16
13. [Exploring Number] *
Four people can build a hut in 10 days. At this rate how many people are needed to build a similar hut in 8 days? 5
14. [Scientific Notation] Estimate the order of magnitude of 89.5×21.1 10^3
15. [Number Patterns] Write the first four terms of the sequence $t_n = 2^n$ where $n \geq 1$ 2, 4, 8, 16
16. [Expressions] Write algebraic expressions for three consecutive whole numbers starting with n . $n, n + 1, n + 2$
17. [Substitution] *
If $u = -3$ and $v = -2$, find the value of $2u(u - 3v)$ -18
18. [Expansion] *
Expand and simplify $(2a + 3)(2a - 5)$ $4a^2 - 4a - 15$
19. [Factorisation] Factorise $x^2 + 5x + 4$ $(x + 4)(x + 1)$
20. [Equations] *
Solve for x : $\frac{2x}{3} - \frac{x}{2} = 4$ 24
21. [Graphs & Functions]
Solve $y = 2x + 4$ and $x + y = 1$ simultaneously by drawing the second graph. (-1, 2)



22. [Units of Measurement / Time] *
The Earth has a density of 5.5 g/cm^3 . Express the density in kg/m^3 .

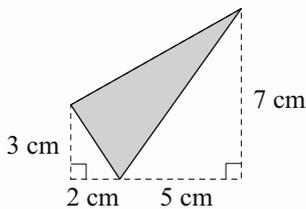
5500 kg/m^3

23. [Perimeter] *
Using $\pi \approx 3.14$ calculate the perimeter of the shape.



65.4 cm

24. [Area] *
Find the area of the shaded triangle.

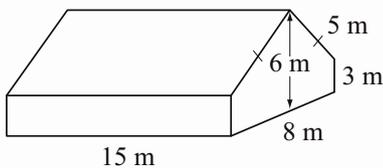


14.5 cm^2

25. [Volume] *
Using $V = \pi r^2 h$ where $\pi \approx 3.14$, find the volume of a cylinder of base radius 2 m and height 25 m.

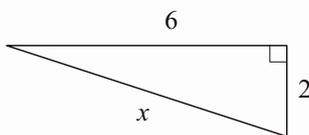
314 m^3

26. [Surface Area] *
Find the total surface area of the solid.



432 m^2

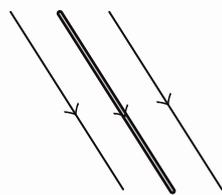
27. [Pythagoras / Trigonometry] *
Find, in surd form, the value of x .



$2\sqrt{10}$

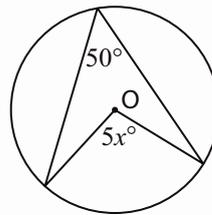
28. [Shape / Location]
The shape formed by all the points equally distanced from these two parallel lines is:

- A) a point
B) a line
C) two parallel lines
D) two intersecting lines



B

29. [Angles] *
Find the value of x° .



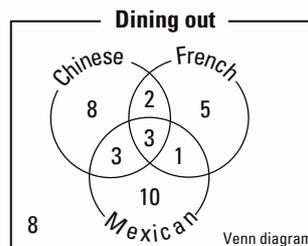
20°

30. [Statistics]
A die was rolled 40 times and the results were recorded. Find the value of the lower quartile.

Score	1	2	3	4	5	6
Frequency	6	7	8	4	8	7

2

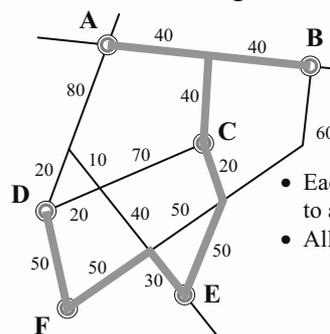
31. [Probability]
Forty people were asked about the types of restaurants they had eaten at in the last 12 months. Find the probability that a surveyed person chosen at random had not eaten at a Chinese restaurant in that time.



or 0.6

$\frac{3}{5}$

32. [Problem Solving 1] *
A pay television station wishes to lay cables along existing roads to connect each town, A to F, to a fibre optic network. Calculate the minimum length of cable required.



- Each town must be connected to at least one other town.
- All distances are in kilometres.

320 km

33. [Problem Solving 2] *
Triangle A is divided into 2 smaller triangles B and C. Triangle B is larger than triangle C. All three triangles A, B and C, are right-angled triangles with sides in the ratio 3 : 4 : 5. Find the ratio Area of A : Area of B : Area of C

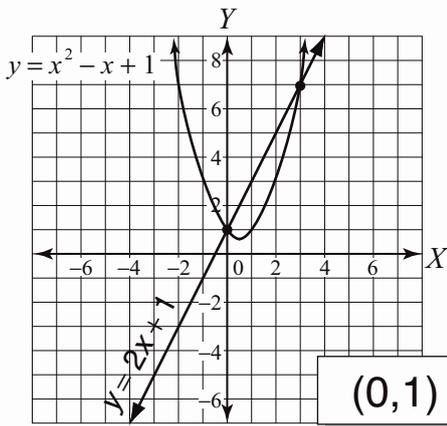
25 : 16 : 9



Name:

Due Date: / /

Parent's Signature:

1. [Long \times , \div] *
 $690 \div 15 =$ 46
2. [Decimal $+$, $-$]
 $2.8 - 0.111 =$ 2.689
3. [Decimal \times , \div]
 $0.308 \div 0.4 =$ 0.77
4. [Fraction $+$, $-$] *
 $\frac{3}{10} + 2\frac{5}{8} =$ $2\frac{37}{40}$
5. [Fraction \times , \div] *
 $\frac{2}{3}(6t + 3) =$ $4t + 2$
6. [Percentages] *
A fuel additive increased the racing car's maximum speed by 5 km/h or 2%. What is the car's new maximum speed? 255 km/h
7. [Integer $+$, $-$]
 $(-z) + (-8z) =$ $-9z$
8. [Integer \times , \div] *
 $(6 - 8) \times (6 + 8) =$ -28
9. [Rates / Ratios] *
Light takes 8 minutes to travel from the Earth to the Sun. Find the distance from the Earth to the Sun given the speed of light is 300 000 km/s. 144 000 000 km
10. [Indices]
Simplify $\frac{4xy^2 \times x^2y}{8x^3y^3}$ $\frac{1}{2}$
11. [Square Roots / Surds]
Expand and simplify $\sqrt{5}(2 - \sqrt{5})$ $2\sqrt{2} - 5$
12. [Order of Operations] *
 $(2 \times 5)^3 + 3^3 =$ 1027
13. [Exploring Number] *
Three machines harvested a field in 12 days. How many days would it have taken for 9 similar machines to do the same job? 4 days
14. [Scientific Notation]
Estimate the order of magnitude of 5.15×28 10^2
15. [Number Patterns]
Write the first four terms of the sequence $t_n = (2n - 1)^2$ where $n \geq 1$ 1, 9, 25, 49
16. [Expressions]
Write a simple expression for the average of two consecutive whole numbers where the smaller of the two numbers is n . $\frac{2n + 1}{2}$
17. [Substitution] *
If $p = -\frac{1}{5}$ and $q = \frac{1}{4}$, find the value of $p - 3q$ $-\frac{19}{20}$
18. [Expansion] *
Expand and simplify $(5x - 2)(2x - 5)$ $10x^2 - 29x + 10$
19. [Factorisation]
Factorise $y^2 + 6y + 5$ $(y + 1)(y + 5)$
20. [Equations] *
Solve for x :
 $\frac{3x}{2} + \frac{x}{5} = 0$ 0
21. [Graphs & Functions]
Solve $y = x^2 - x + 1$ and $y = 2x + 1$ simultaneously by drawing the second graph.
 (0, 1) & (3, 7)

QUOTE OF THE WEEK: Opportunity is missed by most people because it is dressed in overalls and looks like work. Thomas Edison

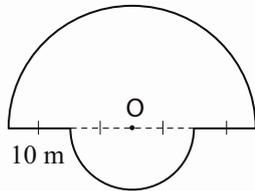
22. [Units of Measurement / Time] *

Gold has a density of 19.29 g/cm^3 . Express the density in kg/m^3 .

19 290 kg/m^3

23. [Perimeter] *

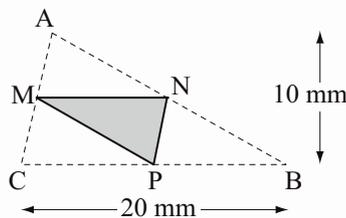
Use $\pi \approx 3.14$ to find the perimeter of the shape.



114.2 m

24. [Area] *

Find the area of the shaded region, given that M, N and P are midpoints of the sides of triangle ABC.



25 mm^2

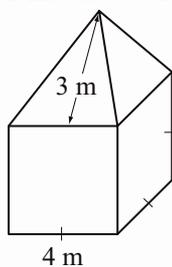
25. [Volume] *

Using $V = \frac{1}{3}\pi r^2 h$ where $\pi \approx 3.14$, find the volume of a cone of base radius 6 mm and height 25 mm.

942 mm^3

26. [Surface Area] *

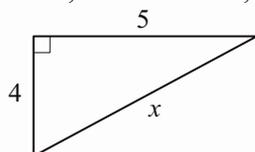
A block of wood has the shape of a square pyramid on top of a cube as shown below. Find its total surface area.



104 m^2

27. [Pythagoras / Trigonometry] *

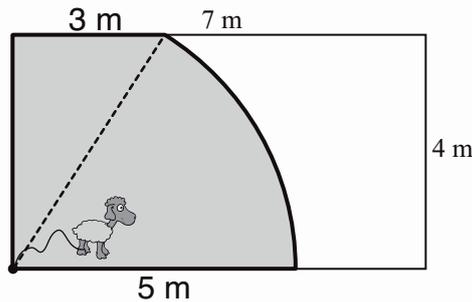
Find, in surd form, the value of x .



$\sqrt{41}$

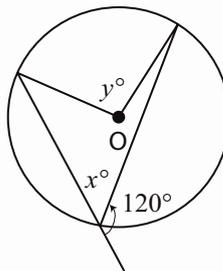
28. [Shape / Location]

A lamb is tethered by a 5 m rope to the corner of a rectangular yard. Show the dimensions and the shape of the region inside the yard over which the lamb can graze.



29. [Angles] *

Find the values of x° and y° .



$x^\circ = 60^\circ$ $y^\circ = 120^\circ$

30. [Statistics]

Two dice are rolled 20 times and their total score recorded. Find the upper quartile for the results.

Score	2	3	4	5	6	7	8	9	10	11	12
Frequency	1	0	3	2	4	3	3	1	3	0	0

8

31. [Probability]

Find the probability that a girl selected at random from the surveyed group, is wearing a necklace but neither a ring nor a bracelet.



$\frac{1}{7}$

32. [Problem Solving 1] *

Find the sum:
 $(-1)^n + (-1)^{n+1} + (-1)^{n+2} + (-1)^{n+3}$
 given that n is a natural number.

0

33. [Problem Solving 2] *

What are the last two digits in the expansion of 6^{666} ?

56

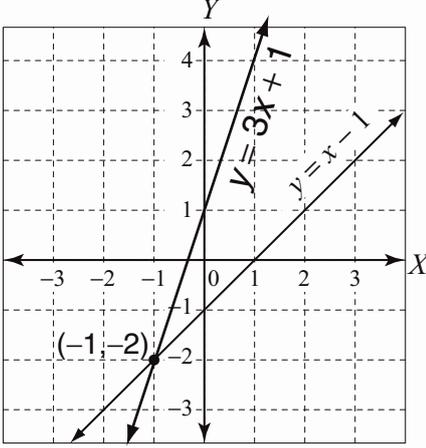


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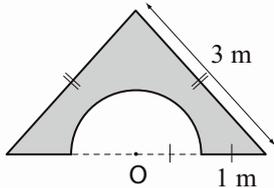
1. [Long \times , \div]
 $49.8 \div 6 =$ 8.3
2. [Decimal $+$, $-$]
 $10 - 0.059 =$ 9.941
3. [Decimal \times , \div]
 $32.4 \div 90 =$ 0.36
4. [Fraction $+$, $-$] *
 $1\frac{3}{8} + \frac{11}{12} =$ $2\frac{7}{24}$
5. [Fraction \times , \div] *
 $\frac{1}{3}(9 + 3k) =$ $3 + k$
6. [Percentages] *
 A 20% discount on my shirt saved me \$12.
 How much did I pay? \$ 48
7. [Integer $+$, $-$]
 $(+6w) - (-2w) =$ 8w
8. [Integer \times , \div] *
 $(1 - 7) \times (2 - 8) =$ 36
9. [Rates / Ratios] *
 Mars is approximately 54 600 000 km from Earth. How long does it take the light to travel from Mars to Earth? [The speed of light is approximately 300 000 km/s.] 3 min 12 s
10. [Indices]
 Simplify $\frac{12s^5t^3 \times 2s}{4s^2t}$ $6s^4t^2$
11. [Square Roots / Surds] *
 Expand and simplify $2\sqrt{3}(3 + \sqrt{3})$ $6\sqrt{3} + 6$
12. [Order of Operations] *
 $1 + 3 \times 5^2 - 7 =$ 69
13. [Exploring Number] *
 Six workers can harvest a hectare of vines in 5 hours. At this rate how many workers would be needed to complete the same job in 3 hours? 10
14. [Scientific Notation]
 Estimate the order of magnitude of 399×21 10^4
15. [Number Patterns]
 Write the first four terms of the sequence $t_n = n^2 - n + 1$ where $n \geq 1$ 1, 3, 7, 13
16. [Expressions] *
 Write a simple algebraic expression for the sum of three consecutive whole numbers where the smallest of the three numbers is $n - 1$ $3n$
17. [Substitution] *
 If $a = 1.2$, $b = -0.5$ and $c = 0.8$, evaluate the expression $a + 2b - 3c$ -2.2
18. [Expansion] *
 Expand and simplify $(x^2 + 2)(x^2 + 5)$ $x^4 + 7x^2 + 10$
19. [Factorisation]
 Factorise $x^2 - 3x + 2$ $(x - 1)(x - 2)$
20. [Equations] *
 Solve for x :
 $\frac{3x}{4} - x = 10$ -40
21. [Graphs & Functions]
 Solve $y = x - 1$ and $y = 3x + 1$ simultaneously by drawing the second graph.


(-1, -2)

22. [Units of Measurement / Time] *
Aluminium has a density of 2.699 g/cm^3 .
Express the density in kg/m^3 .

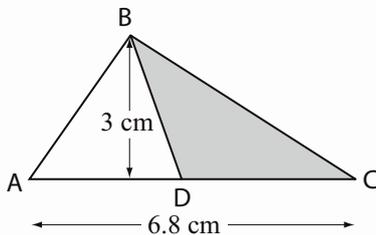
2699 kg/m^3

23. [Perimeter] *
Use $\pi \approx 3.14$ to find the perimeter of the shaded region.



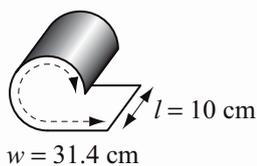
11.14 m

24. [Area] *
Find the length AD such that triangle ABD has the same area as triangle BCD.



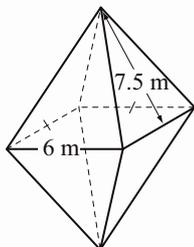
3.4 cm

25. [Volume] *
A rectangle of dimensions 31.4 cm by 10 cm is rolled to form a cylinder as shown below. Find the volume of the cylinder. (Use $\pi \approx 3.14$)



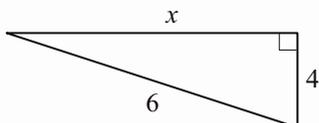
785 cm^3

26. [Surface Area] *
Find the total surface area of the solid.



180 m^2

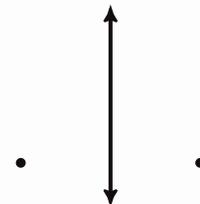
27. [Pythagoras / Trigonometry] *
Find, in surd form, the value of x.



$2\sqrt{5}$

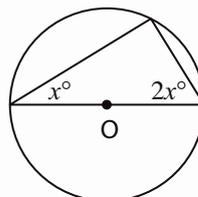
28. [Shape / Location]
The shape formed by all the points equally distanced from these two points is:

- A) a point
- B) a line
- C) two parallel lines
- D) two intersecting lines



B

29. [Angles] *
Find the value of x° .



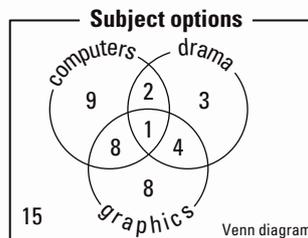
30°

30. [Statistics]
Find the interquartile range for the distribution.

Number of pets	0	1	2	3	4	5
Frequency	6	10	7	4	3	0

1

31. [Probability]
If a surveyed student is chosen at random, what is the probability that the student is not studying Drama?



or 0.8
 $\frac{4}{5}$

32. [Problem Solving 1] *
Some men want to cross a lake. If there are 4 men in each boat, 7 men will remain on the shore. If there are 7 men in each boat, 2 boats will be empty. How many men and boats are there?

men = 35 boats = 7

33. [Problem Solving 2] *
Lee sent this phone message home.

SEND
+ MORE
\$ MONEY

How much \$MONEY does Lee require?

[Every letter represents a different digit.]

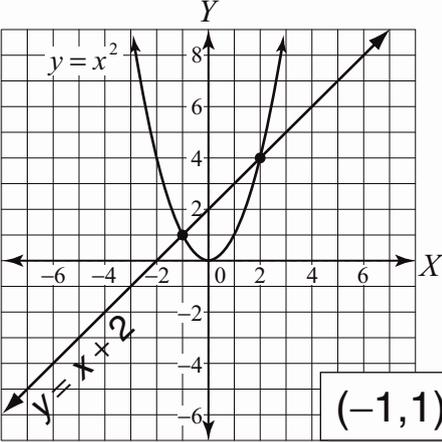
\$ 10 652



Name:

Due Date: / /

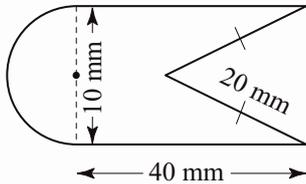
Parent's Signature:

1. [Long \times , \div]
 $366.8 \div 7 =$ 52.4
2. [Decimal $+$, $-$]
 $4.2 - 0.0035 =$ 4.1965
3. [Decimal \times , \div]
 $6.48 \div 0.08 =$ 81
4. [Fraction $+$, $-$] *
 $2\frac{5}{12} + 1\frac{3}{4} =$ $4\frac{1}{6}$
5. [Fraction \times , \div] *
 $\frac{2}{5}(10m - 5) =$ $4m - 2$
6. [Percentages] *
 A 10% discount on my air fare saved me \$140. How much did I pay?
\$ 1260
7. [Integer $+$, $-$]
 $(+2z) + (-6z) =$ $-4z$
8. [Integer \times , \div] *
 $(6 - 3) \times (3 - 6) =$ -9
9. [Rates / Ratios] *
 Mercury Messenger probe, launched in 2004, will arrive on Mercury in 2011. If Mercury is approximately 77 million km away from Earth, what is the average speed of the probe in km/h during the seven year journey?
 [Consider 1 year = 8760 h. Round to the nearest whole number.]
1256 km/h
10. [Indices] *
 Simplify $(a^2)^4 \div a^5$ a^3
11. [Square Roots / Surds] *
 Expand and simplify
 $2\sqrt{5}(3 + 2\sqrt{5})$ $6\sqrt{5} + 20$
12. [Order of Operations] *
 $3 \times 8 + 35 \div 7 =$ 29
13. [Exploring Number] *
 The pool can be filled in 2 hours using 3 garden hoses. How much time would be required if a fourth hose were used?
1.5 h
14. [Scientific Notation]
 Estimate the order of magnitude of
 105×210 10^4
15. [Number Patterns]
 Write the first four terms of the sequence
 $t_n = \frac{n}{n+1}$ where $n \geq 1$ $\frac{1}{2}, \frac{2}{3}, \frac{3}{4}, \frac{4}{5}$
16. [Expressions] *
 Write a simple algebraic expression for the sum of three consecutive even numbers where the smallest of the three numbers is n .
 $3n + 6$
17. [Substitution] *
 If $x = \frac{1}{6}$, $y = \frac{2}{9}$ and $z = \frac{5}{18}$, evaluate the expression $2x - y + 2z$
 $\frac{2}{3}$
18. [Expansion] *
 Expand and simplify
 $(y^2 + 6)(y^2 - 6)$ $y^4 - 36$
19. [Factorisation]
 Factorise
 $a^2 - 6a + 8$ $(a - 2)(a - 4)$
20. [Equations] *
 Solve for x :
 $\frac{4x}{2} + \frac{x}{3} = 14$ 6
21. [Graphs & Functions]
 Solve $y = x^2$ and $y = x + 2$ simultaneously by drawing the second graph.

 $(-1, 1) \text{ \& } (2, 4)$

22. [Units of Measurement / Time] *
Water has a density of 1 g/cm^3 . Express the density in kilograms per litres.

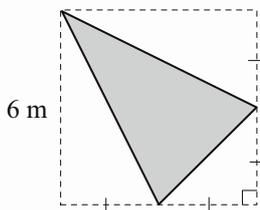
1 kg/L

23. [Perimeter] *
Use $\pi \approx 3.14$ to find the perimeter of the shape.



135.7 mm

24. [Area] *
Find the area of the shaded region.

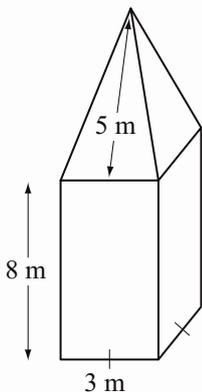


13.5 m²

25. [Volume] *
Using $\pi \approx \frac{22}{7}$ find the volume of a cylindrical grain silo of base diameter 14 m and height 15 m.

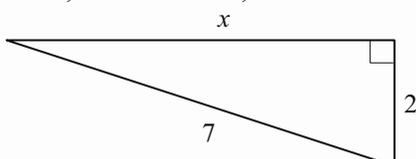
2310 m³

26. [Surface Area] *
An obelisk type monument has the shape of a pyramid on top of a square prism. Find its total surface area.



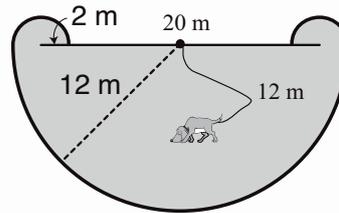
135 m²

27. [Pythagoras / Trigonometry] *
Find, in surd form, the value of x .

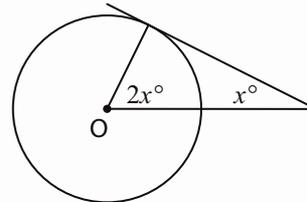


$3\sqrt{5}$

28. [Shape / Location]
A dog is tethered by a 12 m chain to a post at the midpoint of a straight 20 m long dog proof fence. Show the dimensions and the shape of the region over which the dog can wander.



29. [Angles] *
Find the value of x° .



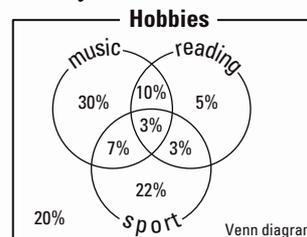
30°

30. [Statistics]
Find the interquartile range for the distribution.

Number of goals per game	0	1	2	3	4	5
Frequency	3	12	9	4	3	1

1.5

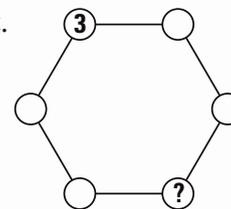
31. [Probability]
Find the probability that a surveyed person selected at random did not list music as a hobby.



or 50%

$\frac{1}{2}$

32. [Problem Solving 1] *
At each vertex of a hexagon, an integer is written. No two integers are the same, and each is the sum of the numbers at the two vertices next to it. What number is directly opposite the number 3?



-3

33. [Problem Solving 2] *
Three friends need to travel into town, a distance of 30 km. They have a motorbike that is able to carry one or two of them at a speed of 60 km/h and they can jog at a speed of 12 km/h. What is the least time required for all three to reach town?

1 h



Name:

Due Date: / /

Parent's Signature:

1. [Long \times ,+] *
 $29 \times 15 =$ 435
2. [Decimal +,-] *
 $x - 7.5 = 9.75$ $x = 17.25$
3. [Decimal \times ,+] *
 $17.5 \div x = 175$ $x = 0.1$
4. [Fraction +,-] *
 $\frac{1}{3} + \frac{1}{4} - \frac{2}{6} =$ $\frac{1}{4}$
5. [Fraction \times ,+] *
 $2\frac{1}{4} \times 1\frac{3}{5} =$ $3\frac{3}{5}$
6. [Percentages] *
What is the selling price of a TV set if it was originally worth \$860 and it is discounted by 15%?
\$ 731
7. [Integer +,-] *
 $(6 - 7) - (8 - 9) =$ 0
8. [Integer \times ,+] *
 $\frac{6mn}{-2m} =$ $-3n$
9. [Rates / Ratios] *
A farmer pumps 288 000 L of water from the river daily to irrigate his land. How much water is being pumped every minute if the pump runs 24 hours a day?
200 L
10. [Indices] *
Simplify and express using positive indices
 $\frac{m^3}{m^{-2}}$ m^5
11. [Square Roots / Surds] *
Evaluate $\frac{\sqrt{3} \times 3\sqrt{2}}{\sqrt{24}}$ $1\frac{1}{2}$
12. [Order of Operations] *
 $4 \times 9 \div 4 =$ 9
13. [Exploring Number]
Write 250% as an improper fraction in simplest form. $\frac{5}{2}$
14. [Scientific Notation]
Express 3.14×10^3 as a basic numeral. 3140
15. [Number Patterns]
Write the first four terms of the sequence $t_n = \frac{4n+1}{n}$ where $n \geq 1$ $5, 4\frac{1}{2}, 4\frac{1}{3}, 4\frac{1}{4}$
16. [Expressions]
Filtered water costs 8 cents per litre. How much would n litres cost?
8n cents
17. [Substitution] *
For what value of x is $\frac{1}{x+4}$ undefined?
-4
18. [Expansion] *
Expand and simplify $x(2x+1)(1-3x)$ $-6x^3 - x^2 + x$
19. [Factorisation]
Factorise $4x^2 + 12x + 5$ $(2x+1)(2x+5)$
20. [Equations] *
Solve for x :
 $x(x+12) = 0$ 0, -12
21. [Graphs & Functions]
Complete the table of values for the parabola of equation $y = 3x^2 - 1$

x	-2	-1	0	1	2	3
y	11	2	-1	2	11	26

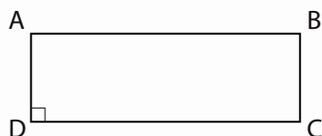
22. [Units of Measurement / Time]

How many millilitres in r litres?

$$1000r \text{ mL}$$

23. [Perimeter] *

Find the perimeter of the rectangle ABCD if it has an area of 108 cm^2 , and the ratio AB : BC is 3 : 1.



$$48 \text{ cm}$$

24. [Area] *

Write a formula for the area A of the right-angled triangle.



$$A = \frac{d^2}{2}$$

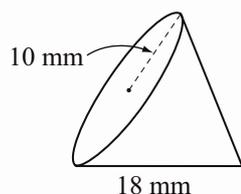
25. [Volume] *

A concrete path 1 m wide is to be constructed around a rectangular pool 3 m wide and 5 m long. What volume of concrete is required if the path is to have a thickness of 50 mm?

$$1 \text{ m}^3$$

26. [Surface Area] *

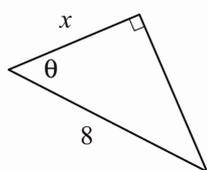
Use $TSA = \pi r(r + s)$ and $\pi \approx \frac{22}{7}$ to find the total surface area of the cone.



$$880 \text{ mm}^2$$

27. [Pythagoras / Trigonometry] *

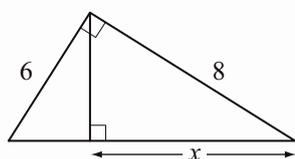
Find the value of x , given $\cos \theta = 0.75$



$$6$$

28. [Shape / Location] *

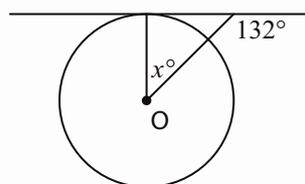
Using similarity, find the value of x .



$$6.4$$

29. [Angles] *

Find the value of x° .



$$42^\circ$$

30. [Statistics]

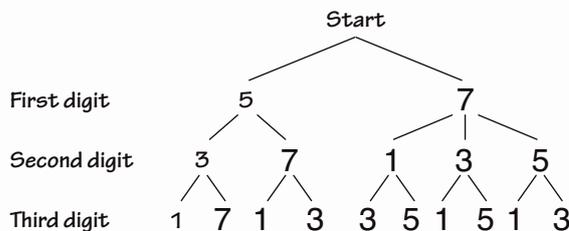
Complete the back-to-back stemplot for the following heights, measured in metres, of the students in a Year 10 class.

Height (m)							
Boys:	1.50	1.64	1.75	1.67	1.49	1.70	1.63
	1.81	1.56	1.59	1.76	1.68	1.82	1.48
Girls:	1.53	1.62	1.48	1.65	1.71	1.56	1.48
	1.64	1.71	1.56	1.59	1.68	1.57	1.56

GIRLS		stem	BOYS	
leaf			leaf	
	8 8	1.4	8 9	
9 7 6 6 6 3		1.5	0 6 9	
	8 5 4 2	1.6	3 4 7 8	
	1 1	1.7	0 5 6	
		1.8	1 2	

31. [Probability]

How many different three-digit numbers greater than 520 can be made using the digits 1, 3, 5 and 7 if the digits can not be repeated? [Complete the tree diagram to help solve the problem.]



$$10$$

32. [Problem Solving 1] *

Which is larger, 2^{18} or 3^{12} ?

[Hint: Neither logarithms nor calculator should be necessary.]

$$3^{12}$$

33. [Problem Solving 2] *

Using the digits of the year 1996 in the order in which they appear, insert any of the operations or signs $+$, $-$, \times , \div , $\sqrt{\quad}$, (\quad) , $!$, to make an expression equal to 10.

$$1 + \sqrt{9} \times \sqrt{(\sqrt{9} + 6)} = 10$$



Name:

Due Date: / /

Parent's Signature:

1. [Long \times ,+] *
 $38 \times 2.1 =$ 79.8
2. [Decimal +,-] *
 $x - 2.44 = 3.29$ $x = 5.73$
3. [Decimal \times ,+] *
 $4 \times x = 0.04$ $x = 0.01$
4. [Fraction +,-] *
 $\frac{1}{2} + \frac{2}{5} - \frac{1}{6} =$ $\frac{11}{15}$
5. [Fraction \times ,+] *
 $1\frac{6}{7} \div 1\frac{1}{14} =$ $1\frac{11}{15}$
6. [Percentages] *
A car costing \$4000 is sold for \$5000. What is the profit as a percentage of cost? 25%
7. [Integer +,-] *
 $(1 + 8) + (9 - 14) =$ 4
8. [Integer \times ,+] *
 $\frac{-10qr}{-2q} =$ 5r
9. [Rates / Ratios] *
As of 2005 Barbara Blackburn was the fastest English language typist in the world. She had maintained 150 words per minute for 50 minutes. At this rate how many words did she type in half an hour? 4500 words
10. [Indices] *
Simplify and express using positive indices
 $\frac{a^4 b^{-3}}{b^{-3}} =$ a^4
11. [Square Roots / Surds] *
Evaluate $\frac{\sqrt{1\frac{1}{8}}}{\sqrt{8}}$ $\frac{3}{8}$
12. [Order of Operations] *
 $6 \times (9 + 5) =$ 84
13. [Exploring Number] *
Write the recurring decimal $0.\dot{1}$ as a fraction in simplest form. $\frac{1}{9}$
14. [Scientific Notation] *
Express 0.2×10^2 as a basic numeral. 20
15. [Number Patterns] *
Write the first four terms of the sequence $t_n = \sqrt{n+2}$ where $n \geq 1$ $\sqrt{3}, 2, \sqrt{5}, \sqrt{6}$
16. [Expressions] *
If x books fill four shelves, how many books do we need to fill six shelves? $\frac{3x}{2}$ books
17. [Substitution] *
For what value of x is $\frac{-1}{2x-6}$ undefined? 3
18. [Expansion] *
Expand and simplify $-3x(x-1)(x+1)$ $-3x^3 + 3x$
19. [Factorisation] *
Factorise $10y^2 + 17y + 3$ $(2y+3)(5y+1)$
20. [Equations] *
Solve for x :
 $x(x-9) = 0$ 0, 9
21. [Graphs & Functions] *
Complete the table of values for the parabola of equation $y = 2x^2 - 3$

x	-3	-2	-1	0	1	2	3
y	15	5	-1	-3	-1	5	15

QUOTE OF THE WEEK: A good time to keep your mouth shut is when you're in deep water. Sidney Goff

22. [Units of Measurement / Time]

How many kilograms in n grams?

$$\frac{n}{1000} \text{ kg}$$

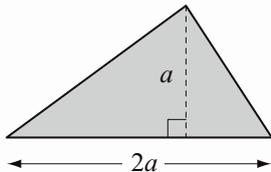
23. [Perimeter] *

How many kilometres of fence are required to enclose a rectangular paddock with an area of 60 km^2 if its width is 6 km ?

$$32 \text{ km}$$

24. [Area] *

Write a formula for the area A of the triangle.



$$A = a^2$$

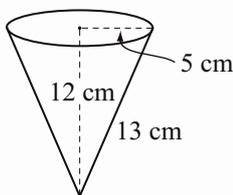
25. [Volume] *

Plastic is used to make a hollow cube which has an outer edge length of 5 cm . Find the volume of plastic used if each wall has a thickness of 5 mm .

$$61 \text{ cm}^3$$

26. [Surface Area] *

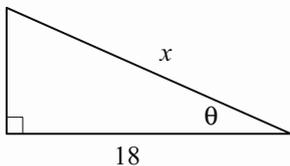
Using $\pi \approx 3.14$ find the total surface area of the cone.



$$282.6 \text{ cm}^2$$

27. [Pythagoras / Trigonometry] *

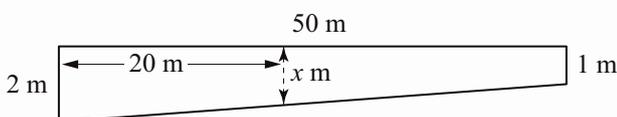
Find the value of x , given $\cos \theta = 0.3$



$$60$$

28. [Shape / Location] *

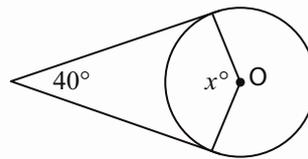
A side view from a plan of a swimming pool is shown below. What is the depth of the pool 20 m from the deep end?



$$1.6 \text{ m}$$

29. [Angles] *

Find the value of x° .



$$140^\circ$$

30. [Statistics]

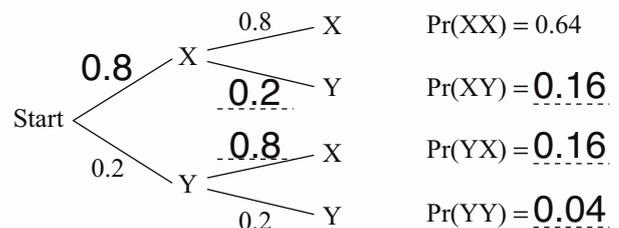
The back-to-back stem-and-leaf plot shows a comparison between the heights in centimetres of thirty students in a Year 10 class. Find the median height of all students in the class.

GIRLS		stem	BOYS	
leaf				leaf
		18	0	1 1
3	0	17	0	2
	5	16	4	6 8 8 9
7	4 1	15	2	9
9	6 2 2 0	14	3	6 7
	8 5 0	13		5

$$155.5 \text{ cm}$$

31. [Probability]

Complete the probability tree diagram.



32. [Problem Solving 1] *

The houses along our side of the street are numbered in consecutive odd numbers, the even numbers being on the other side of the street. Our house is number 69 , but, had the numbering commenced at the other end of the street, our house would have been number 43 . How many houses are there on our side of the street?

$$56$$

33. [Problem Solving 2] *

Charles Sturt wishes to cross the desert, an eight day trip. Charles and each of his helpers are able to carry supplies for a maximum of five days. How many helpers must start out with Charles if he is to cross the desert and all his helpers are to either cross with him or return safely to the starting point?

$$3$$



Name:

Due Date: / /

Parent's Signature:

1. [Long \times ,+] *
 $1.7 \times 43 =$ 73.1
2. [Decimal +,-] *
 $x - 0.814 = 0.077$ $x = 0.891$
3. [Decimal \times ,+] *
 $x \times 2.5 = 0.025$ $x = 0.01$
4. [Fraction +,-] *
 $\frac{1}{3} - \frac{1}{4} + \frac{1}{5} =$ $\frac{17}{60}$
5. [Fraction \times ,+] *
 $1\frac{3}{5} \times 2\frac{1}{2} =$ 4
6. [Percentages] *
Oscar earns 0.5% commission on his real estate sales. How much did he earn in July if his total sales for the month were \$2 080 000? \$ 10 400
7. [Integer +,-] *
 $(3 - 5) + (7 - 9) =$ -4
8. [Integer \times ,+] *
 $\frac{-12x}{3} =$ -4x
9. [Rates / Ratios] *
Around 66 million tonnes of bananas are eaten in the world each year. How many tonnes are eaten in the world per month? 5 500 000 tonnes
10. [Indices]
Simplify and express using positive indices
 $\frac{p^{-3}q^{-3}}{p^2q^{-3}}$ $\frac{1}{p^5}$
11. [Square Roots / Surds] *
Evaluate $\sqrt{\frac{3}{5}} \times \sqrt{2\frac{2}{5}}$ $1\frac{1}{5}$
12. [Order of Operations] *
 $(7 + 11) \times (5 - 2) =$ 54
13. [Exploring Number] *
Change the recurring decimal $1.\dot{8}$ to an improper fraction in simplest form. $\frac{17}{9}$
14. [Scientific Notation]
Express 14.6×10^{-2} as a basic numeral. 0.146
15. [Number Patterns]
Write the first four terms of the sequence $t_n = (2n + 1)^2$ where $n \geq 1$ 9, 25, 49, 81
16. [Expressions] *
Express x km/h in m/s. $\frac{5x}{18}$ m/s
17. [Substitution] *
For what values of x is $\frac{13}{x(x-3)}$ undefined? 0, 3
18. [Expansion] *
Expand and simplify $y(y+2)(2y-1)$ $2y^3 + 3y^2 - 2y$
19. [Factorisation]
Factorise $6y^2 + y - 1$ $(3y - 1)(2y + 1)$
20. [Equations] *
Solve for x :
 $2x^2 + 4x = 0$ 0, -2
21. [Graphs & Functions]
Complete the table of values for the parabola of equation $y = x^2 - 4$

x	1	2	3	4	5	6
y	-3	0	5	12	21	32

QUOTE OF THE WEEK: The Lord gets his best soldiers out of the highlands of affliction. Charles Spurgeon

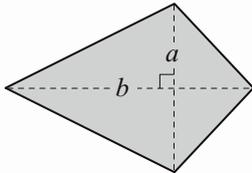
22. [Units of Measurement / Time]
How many days in h hours?

$$\frac{h}{24} \text{ days}$$

23. [Perimeter] *
A rectangle has an area of 72 cm^2 . If its length is twice its width, find its perimeter.

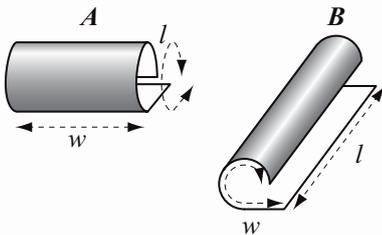
$$36 \text{ cm}$$

24. [Area] *
Write a formula for the area A of the shape.



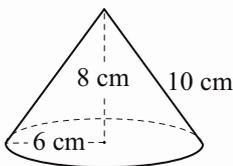
$$A = \frac{ab}{2}$$

25. [Volume] *
A rectangular sheet of paper ($l > w$) can be rolled in two ways to form different cylinders (see A and B below). Write an expression for the volume of the cylinder with the greater capacity.



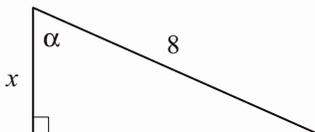
$$V = \frac{l^2 w}{4\pi}$$

26. [Surface Area] *
Find the total surface area of the cone.
[Leave your answer as a multiple of π .]



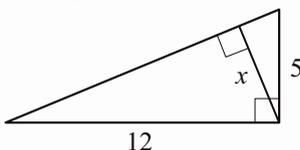
$$96\pi \text{ cm}^2$$

27. [Pythagoras / Trigonometry] *
Find the value of x , given $\cos \alpha = 0.45$



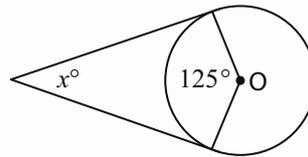
$$3.6$$

28. [Shape / Location] *
Using similarity, find the value of x .



$$4\frac{8}{13}$$

29. [Angles] *
Find the value of x° .



$$55^\circ$$

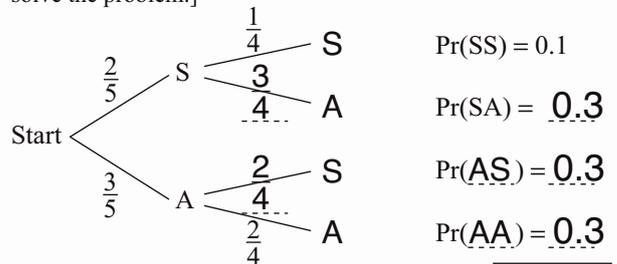
30. [Statistics]
The maximum temperatures for Perth and Brisbane for the first 10 days in November are shown in the table. Complete the back-to-back stem-and-leaf plot to compare the data.

Maximum temperature ($^\circ\text{C}$)

PERTH	20°	25°	18°	21°	19°	24°	30°	31°	32°	29°
BRISBANE	24°	22°	19°	18°	23°	26°	30°	32°	33°	30°

	PERTH		BRISBANE
	9 8	1	8 9
9 5 4 1 0		2	2 3 4 6
2 1 0		3	0 0 2 3

31. [Probability]
A box contains 2 science books and 3 atlases. Two books are to be taken from the box. If each book is equally likely to be selected, what is the probability that the selected books are both atlases? [Complete the tree diagram to help solve the problem.]



$$\Pr(SS) = 0.1$$

$$\Pr(SA) = 0.3$$

$$\Pr(AS) = 0.3$$

$$\Pr(AA) = 0.3$$

or 0.3

$$\frac{3}{10}$$

32. [Problem Solving 1] *
A long strip of paper was folded in half then in half again. It then had three crease lines in the strip. If the paper was folded in half eight more times (ten altogether), how many creases would there be when it was unfolded?
[Note: When unfolded all the crease lines should be parallel to each other.]

$$1023$$

33. [Problem Solving 2] *
If a , b and c represent the side lengths of a triangle and $\sqrt{2(a+b)} = \sqrt{a+c} + \sqrt{a-c}$, what type of triangle is it?

right-angled



Name:

Due Date: / /

Parent's Signature:

1. [Long \times, \div]
 $33.05 \div 5 =$ 6.61
2. [Decimal $+, -$] *
 $x - 0.014 = 0.028$ $x = 0.042$
3. [Decimal \times, \div]
 $40 \div x = 0.4$ $x = 100$
4. [Fraction $+, -$] *
 $\frac{3}{4} + \frac{1}{6} - \frac{5}{12} =$ $\frac{1}{2}$
5. [Fraction \times, \div] *
 $2 \div 2\frac{1}{8} =$ $\frac{16}{17}$
6. [Percentages] *
A seller decides to mark-up prices by 8%.
What is the new price of an item that had been \$45? \$48.60
7. [Integer $+, -$] *
 $(6 - 13) - (5 - 14) =$ 2
8. [Integer \times, \div]
 $\frac{-4m^2}{-2m} =$ $2m$
9. [Rates / Ratios] *
The price of 1 kg of ivory increased by about US\$90 per year for the eight years to 2008 when it reached US\$1000. If it were to continue at this rate, what price did the ivory reach in 2020? US\$ 2080/kg
10. [Indices] *
Simplify and express using positive indices
 $\frac{(2m^2)^{-1}}{6m^{-2}}$ $\frac{1}{12}$
11. [Square Roots / Surds] *
Evaluate $\frac{2\sqrt{6} \times 3\sqrt{3}}{\sqrt{50}}$ $3\frac{3}{5}$
12. [Order of Operations] *
 $8 \times 8 - (8 \div 8) =$ 63
13. [Exploring Number] *
Write 0.035% as a fraction in simplest form. $\frac{7}{20000}$
14. [Scientific Notation]
Express 7.5×10^2 as a basic numeral. 750
15. [Number Patterns]
Write the first four terms of the sequence $t_n = n(n - 1)$ where $n \geq 1$ 0, 2, 6, 12
16. [Expressions]
Squashing 20 kilograms of oranges gives you 3 litres of juice. At this rate how much juice would you obtain from y kilograms of oranges? $\frac{3y}{20}$ L
17. [Substitution] *
For what values of x is $\frac{4}{(x - 2)(x - 3)}$ undefined? 2, 3
18. [Expansion] *
Expand and simplify $y(y + 3)(y - 3)$ $y^3 - 9y$
19. [Factorisation]
Factorise $6x^2 + 25x + 14$ $(3x + 2)(2x + 7)$
20. [Equations] *
Solve for x :
 $x^2 - 6x = 0$ 0, 6
21. [Graphs & Functions]
Complete the table of values for the parabola of equation $y = -2x^2 - 3$

x	-3	-2	-1	0	1	2	3
y	-21	-11	-5	-3	-5	-11	-21

QUOTE OF THE WEEK: A crisis event often explodes the illusions that anchor our lives. Robert Veninga

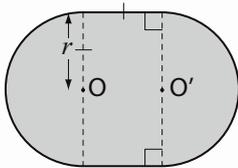
22. [Units of Measurement / Time]
How many kilometres in d metres?

$$\frac{d}{1000} \text{ km}$$

23. [Perimeter] *
Soccer fields must be between 45 and 90 metres wide and between 90 and 120 metres long. What is the value of the ratio $\frac{\text{maximum allowable perimeter}}{\text{minimum allowable perimeter}}$?

$$\frac{14}{9}$$

24. [Area] *
Write a formula for the area A of the shape.
[Leave your answer as a multiple of π .]

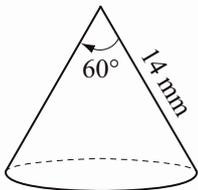


$$A = \pi r^2 + 2r^2$$

25. [Volume] *
Rain water from the flat roof of a building 11 m by 10 m flows into a cylindrical tank of diameter 2 m. Find the increase in the depth of water in the tank after 20 mm of rain.
(Use $\pi \approx \frac{22}{7}$)

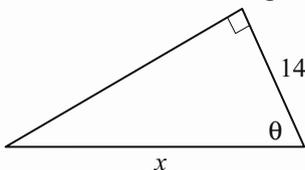
$$700 \text{ mm}$$

26. [Surface Area] *
Using $\pi \approx \frac{22}{7}$ find the total surface area of the cone.



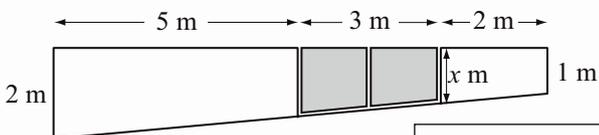
$$462 \text{ mm}^2$$

27. [Pythagoras / Trigonometry] *
Find the value of x , given $\cos \theta = 0.7$



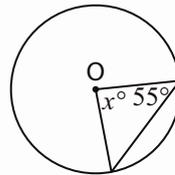
$$20$$

28. [Shape / Location] *
A fence is constructed on sloping ground as shown below. What is the height x of the fence to the right of the driveway?



$$1.2 \text{ m}$$

29. [Angles] *
Find the value of x° .



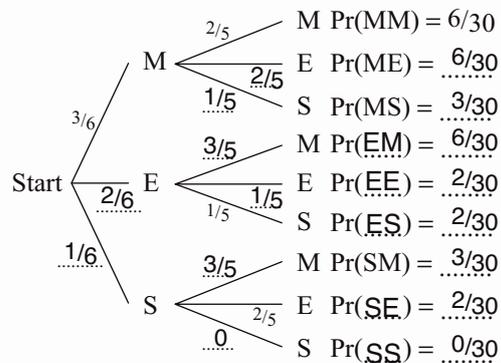
$$70^\circ$$

30. [Statistics]
The stemplot shows the home and away results of Collingwood and Fremantle over the 2010 AFL season. Find the difference between the medians of the two sets of data.

Collingwood	Fremantle
	3
	4
4 0	5
	6
	7 9
	6
	7
6 0	8
6 5	1 2 2 7
7 5 5 0	3 3 6 7
	9
9 7 3 0	10
	11
5 3	1 2 3 4 5 8
	12
	5
	13
	9
	14
7 5	15
	16
2	0

$$9.5$$

31. [Probability]
Two people are to represent the university at an international seminar. They are to be selected at random from a group made up of 3 medical students, 2 engineering students and 1 science student. What is the probability that two engineering students will be selected?
[Complete the tree diagram to help solve the problem.]



$$\frac{1}{15}$$

32. [Problem Solving 1] *
From 1986 to 1990 Coober Pedy's population fell 10%. From 1990 to 1994 it grew 10%, but the population was still 16 fewer than in 1986. What was the population of Coober Pedy in 1994?

$$1584$$

33. [Problem Solving 2] *
Each letter stands for a different digit. What number does STATES represent?

ALASKA
KANSAS
+ NEVADA
STATES

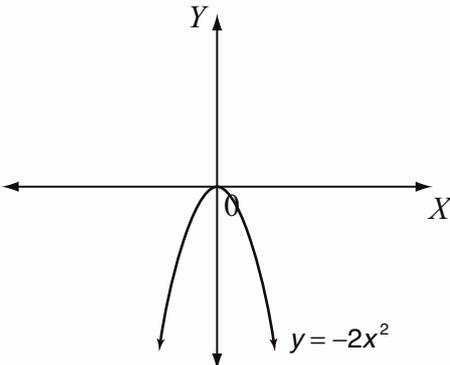
$$945409$$



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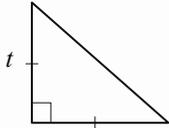
1. [Long \times, \div] *
 $19 \times 1.8 =$ 34.2
2. [Decimal $+, -$] *
 $1 - x = 0.125$ $x = 0.875$
3. [Decimal \times, \div] *
 $0.07 \div x = 7$ $x = 0.01$
4. [Fraction $+, -$] *
 $\frac{x+1}{4} + \frac{x+3}{2} =$ $\frac{3x+7}{4}$
5. [Fraction \times, \div] *
 $\frac{xy}{2y} \times \frac{10}{5x} =$ 1
6. [Percentages] *
Nicola does 40% of her homework before dinner. Of the rest, she does 60% after dinner. What percentage does she leave until morning? 24%
7. [Integer $+, -$] *
 $(+14) - (+4) + (-12) =$ -2
8. [Integer \times, \div] *
 $(-3) \times (-8) \div (-2) =$ -12
9. [Rates / Ratios] *
The Sun is 73% hydrogen, 25% helium and 2% other elements. How much helium would there be in 1 kilogram of matter from the Sun? 250 g
10. [Indices] *
Given $2^x = 64$, find the value of x . 6
11. [Square Roots / Surds] *
Rationalise and simplify $\frac{14}{\sqrt{2}}$ $7\sqrt{2}$
12. [Order of Operations] *
 $12 \div 4 \times (12 - 6) =$ 18
13. [Exploring Number] *
Place in descending order:
 $3, 2^2, \sqrt{23}$ $\sqrt{23}, 2^2, 3$
14. [Scientific Notation] *
Evaluate and express as a basic numeral
 $(5.4 \times 10^{-2}) \times (2 \times 10^3)$ 108
15. [Number Patterns] *
Find the rule of the sequence t_n where $n \geq 1$
2, 4, 6, 8, 10, $t_n = 2n$
16. [Expressions] *
If n is an integer, which of the following must be an odd number?
 $n + 1, 3(n + 1), 2n + 1, 2n$ $2n + 1$
17. [Substitution] *
Does the ordered pair (3.5, 6) satisfy the relation $x^2 > 2y$? yes
18. [Expansion] *
Expand and simplify
 $(x + 2)(x - 5) + 2x(x - 3)$ $3x^2 - 9x - 10$
19. [Factorisation] *
Factorise and simplify
 $\frac{x^2 + 2x + 1}{x^2 - 1}$ $\frac{x+1}{x-1}$
20. [Equations] *
Solve for x :
 $x^2 - 49 = 0$ 7, -7
21. [Graphs & Functions] *
Sketch the parabola of equation $y = -2x^2$ without plotting points.


QUOTE OF THE WEEK: People who think they know everything are a great annoyance to those of us who do.

22. [Units of Measurement / Time] *
The earth is travelling around the sun at an average speed of 30 km/s. Express this speed in km/h.

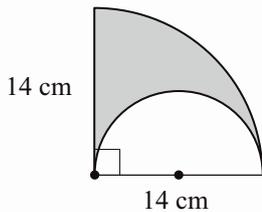
$$108\,000 \text{ km/h}$$

23. [Perimeter] *
Write a formula for the perimeter P of the triangle.



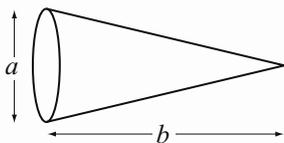
$$P = 2t + t\sqrt{2}$$

24. [Area] *
Using $\pi \approx \frac{22}{7}$ find the shaded area.



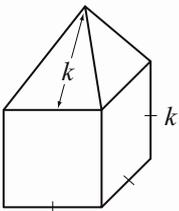
$$77 \text{ cm}^2$$

25. [Volume] *
Write a simple formula for the volume V of the cone in terms of a , b and π .



$$V = \frac{\pi a^2 b}{12}$$

26. [Surface Area] *
Write a formula for the total surface area (TSA) of the solid which has the shape of a square pyramid on top of a cube.

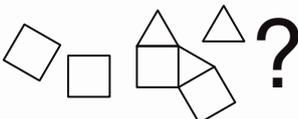


$$TSA = 7k^2$$

27. [Pythagoras / Trigonometry] *
Find the distance between the points $A(-2, -2)$ and $B(3, -1)$. [Express your answer in surd form.]

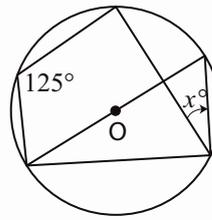
$$\sqrt{26}$$

28. [Shape / Location]
I have four squares and three triangles all of which have side lengths of 5 cm. I attempt to form a net for a polyhedron by taping the shapes together along their edges. If this can be done, into what shape will the net fold?



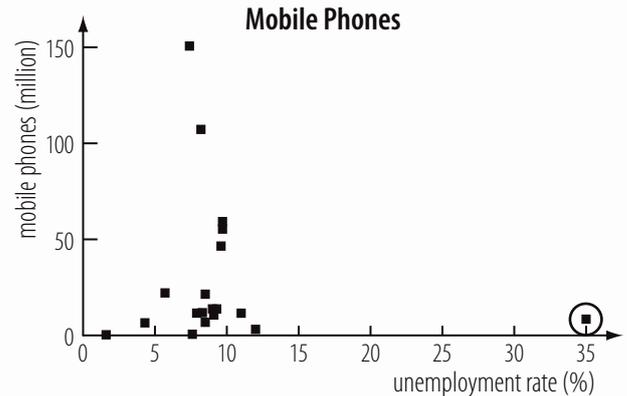
can't be done

29. [Angles] *
Find the value of x° .



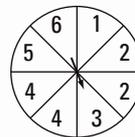
$$35^\circ$$

30. [Statistics]
How many of the selected countries have less than 10 million mobile phones and more than a 30% unemployment rate?



1

31. [Probability]
How many times would you expect to spin an odd number if the spinner is spun 40 times?



15

32. [Problem Solving 1] *
Leonardo Fibonacci posed the following problem in the 13th century:
“A peasant bought 30 birds with 30 coins. For every 5 partridges he paid 3 coins, for every pigeon he paid 2 coins and for every pair of sparrows 1 coin. How many pigeons did he buy?”

9

33. [Problem Solving 2] *
Radius Plus tyres last 60 000 kilometres when used on the back of my car, but only 40 000 kilometres when used on the front of my car. What is the greatest distance I can travel on one set of tyres if they are interchanged at the appropriate time?

48 000 km



Name:

Due Date: / /

Parent's Signature:

1. [Long \times , \div]
 $19.62 \div 6 =$ 3.27
2. [Decimal $+$, $-$] *
 $1 - x = 0.0465$ $x = 0.9535$
3. [Decimal \times , \div]
 $x \times 0.8 = 8$ $x = 10$
4. [Fraction $+$, $-$] *
 $\frac{y-1}{3} + \frac{y+2}{6} =$ $\frac{y}{2}$
5. [Fraction \times , \div] *
 $\frac{4}{3x} \div \frac{xy}{9x} =$ $\frac{12}{xy}$
6. [Percentages] *

A group of hikers are on a 40 km trip. On the first day they completed 40% of the trip. On the second day 25% of the remaining distance was covered. How many kilometres were left to walk?

18 km
7. [Integer $+$, $-$]
 $(-2x) - (+5x) + (-4x) =$ $-11x$
8. [Integer \times , \div]
 $(+5) \times (-7) \times (-2) =$ 70
9. [Rates / Ratios] *

Water is a combination of hydrogen and oxygen in the ratio 1 : 8 by weight. How much oxygen is there in 162 grams of water?

144 g
10. [Indices] *

Given $2^x = \frac{1}{4}$, find the value of x .

-2
11. [Square Roots / Surds] *

Rationalise and simplify $\frac{12}{\sqrt{3}}$

 $4\sqrt{3}$
12. [Order of Operations]
 $(4^{100} \div 23)^0 =$ 1
13. [Exploring Number] *

Place in ascending order:
 $3^2, \sqrt{71}, 2^3$

 $2^3, \sqrt{71}, 3^2$
14. [Scientific Notation] *

Evaluate and express as a basic numeral
 $(6 \times 10^2) \times (1.5 \times 10^{-4})$

0.09
15. [Number Patterns]

Find the rule of the sequence t_n where $n \geq 1$
 $3, 4, 5, 6, 7, \dots$

 $t_n = 2 + n$
16. [Expressions]

If n is a negative integer, which of the following must be positive?
 $n + 1, 2n, n^2, n^5$

 n^2
17. [Substitution] *

Does the ordered pair $(-7, -4)$ satisfy the relation $4x = 7y$?

yes
18. [Expansion] *

Expand and simplify
 $3x(5x - 2) - (x + 1)^2$

 $14x^2 - 8x - 1$
19. [Factorisation] *

Factorise and simplify
 $\frac{x^2 - 9}{x^2 + 4x + 3}$

 $\frac{x - 3}{x + 1}$
20. [Equations] *

Solve for x :
 $4(x^2 - 4) = 0$

2, -2
21. [Graphs & Functions]

Sketch the parabola of equation $y = 4x^2$ without plotting points.

QUOTE OF THE WEEK: Before enlightenment: chopping wood, carrying water. After enlightenment: chopping wood, carrying water.

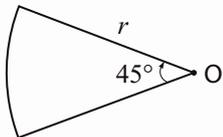
22. [Units of Measurement / Time] *

A zebra can run at up to 18 m/s, while a red deer can reach 78 km/h. Which animal is faster?

red deer

23. [Perimeter] *

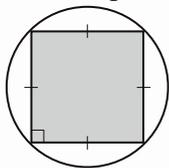
Write a formula for the perimeter P of the shape.



$$P = \frac{\pi r}{4} + 2r$$

24. [Area] *

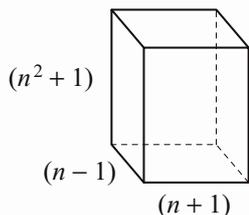
The area of the circle is $16\pi \text{ m}^2$. Find the area of the square inside the circle.



$$32 \text{ m}^2$$

25. [Volume] *

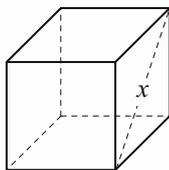
Write a simple formula for the volume V of the rectangular prism.



$$V = n^4 - 1$$

26. [Surface Area] *

Write a formula for the total surface area TSA of the cube.



$$TSA = 3x^2$$

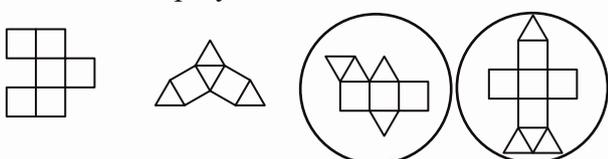
27. [Pythagoras / Trigonometry] *

A triangle has sides of lengths 3 cm, 5 cm and $\sqrt{35}$ cm. Is it a right-angled triangle?

no

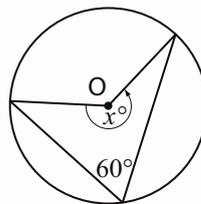
28. [Shape / Location] *

Circle the two nets that **can** be folded to form a model of a polyhedron.



29. [Angles] *

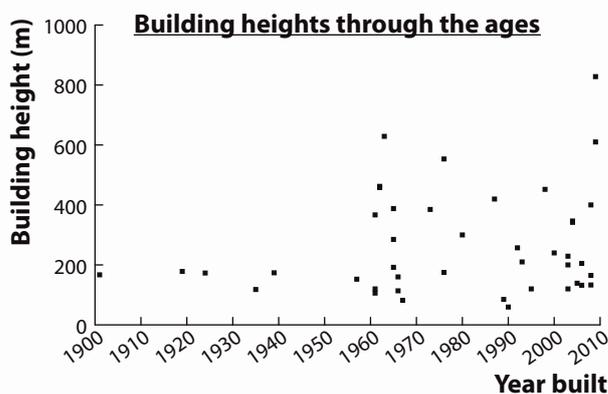
Find the value of x° .



$$240^\circ$$

30. [Statistics]

In which decade did the first building exceed 500 metres high?



1960 - 1970

31. [Probability]

The probability that a match box contains exactly 50 matches is $\frac{2}{5}$. If 15 boxes of matches are investigated, how many would you expect to find with exactly 50 matches inside?

6

32. [Problem Solving 1] *

Two groups of young people each contains 10 men. In one group the ratio of women to men is 1 : 2 but in the other it is 2 : 1. If the two groups combine, what will the new ratio be?

5 : 4

33. [Problem Solving 2] *

Use the digits 1, 2, 3, 4, 5, 6 and 7 (once each) to complete this multiplication so that the answer is as large as possible.

$$\begin{array}{r}
 \begin{array}{cccccc}
 \boxed{6} & \boxed{5} & \boxed{3} & \boxed{1} & & \\
 \times & \boxed{7} & \boxed{4} & \boxed{2} & & \\
 \hline
 & 1 & 3 & 0 & 6 & 2 \\
 & 2 & 6 & 1 & 2 & 4 & 0 \\
 4 & 5 & 7 & 1 & 7 & 0 & 0 \\
 \hline
 \boxed{4} & \boxed{8} & \boxed{4} & \boxed{6} & \boxed{0} & \boxed{0} & \boxed{2}
 \end{array}
 \end{array}$$



Name:

Due Date: / /

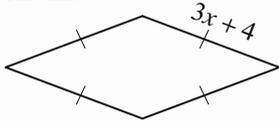
Parent's Signature:

1. [Long \times, \div]
 $29.7 \div 3 =$ 9.9
2. [Decimal $+, -$] *
 $1 - x = 0.006$ $x = 0.994$
3. [Decimal \times, \div]
 $2.4 \div x = 240$ $x = 0.01$
4. [Fraction $+, -$] *
 $\frac{2w+1}{8} - \frac{w}{4} =$ $\frac{1}{8}$
5. [Fraction \times, \div] *
 $\frac{2xy}{5} \times \frac{10}{4y} =$ x
6. [Percentages] *
 Girls make up 56% of a class. How many students are there in the class if there are 3 more girls than boys? 25
7. [Integer $+, -$]
 $(+2) + (-5) + (-20) =$ -23
8. [Integer \times, \div]
 $(-6) \times (-5) \times (+5) =$ 150
9. [Rates / Ratios] *
 Silicone rubber contains carbon, hydrogen, oxygen and silicone atoms in the ratio 2 : 6 : 1 : 1. What percentage of the atoms in silicone rubber are actually silicone atoms? 10%
10. [Indices] *
 If $2^x = 0.25$, what is the value of x ? -2
11. [Square Roots / Surds] *
 Rationalise and simplify $\frac{3}{2\sqrt{6}}$ $\frac{\sqrt{6}}{4}$
12. [Order of Operations]
 $(4 + 3 \times 2)^6 =$ 1 000 000
13. [Exploring Number] *
 Place in descending order:
 $1.45, \sqrt{2.25}, \left(\frac{6}{5}\right)^2$ $\sqrt{2.25}, 1.45, \left(\frac{6}{5}\right)^2$
14. [Scientific Notation] *
 Evaluate and express in scientific notation $(0.04 \times 10^{-2}) \times (0.5 \times 10^{-2})$ 2×10^{-6}
15. [Number Patterns]
 Find the rule of the sequence t_n where $n \geq 1$
 5, 10, 15, 20, 25, $t_n = 5n$
16. [Expressions]
 If $3n$ is an even number, which of the following must be an odd number?
 $n, n^2, n + 1, n + 2$ $n + 1$
17. [Substitution] *
 Does the ordered pair (7,5) satisfy the relation $2x > 3y$? no
18. [Expansion] *
 Expand and simplify $(x - 2)(x + 3) - (x - 5)(x - 1)$ $7x - 11$
19. [Factorisation] *
 Factorise and simplify $\frac{x^2 - x - 2}{x^2 + x - 6}$ $\frac{x + 1}{x + 3}$
20. [Equations] *
 Solve for x :
 $x(x^2 - 1) = 0$ 0, 1, -1
21. [Graphs & Functions]
 Sketch the parabola of equation $y = -x^2 + 1$ without plotting points.

22. [Units of Measurement / Time] *
The strongest wind gust recorded on the Australian mainland is 267 km/h, during cyclone Vance, in 1999 in Western Australia. Express this speed in m/s.
[Round to the nearest whole number.]

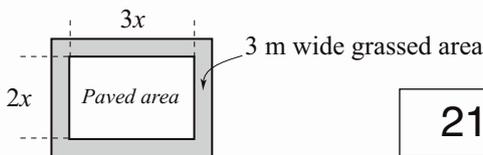
74 m/s

23. [Perimeter] *
Find the formula for the perimeter P of the rhombus.



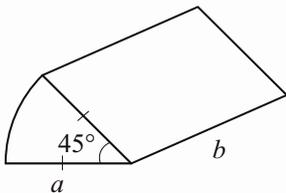
$$P = 12x + 16$$

24. [Area] *
A rectangular paved area has side lengths in the ratio 3 : 2. If the paving is surrounded by a 3 metre wide strip of lawn, find the paved area given that it is exactly equal to the grassed area around it.



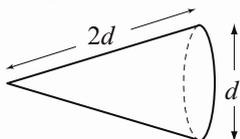
$$216 \text{ m}^2$$

25. [Volume] *
Write a simple formula for the volume V of the solid in terms of a , b and π .



$$V = \frac{\pi a^2 b}{8}$$

26. [Surface Area] *
Write a formula for the total surface area TSA of the cone. [Leave your answer as a multiple of π .]



$$TSA = \frac{5\pi d^2}{4}$$

27. [Pythagoras / Trigonometry] *
A ship sails 12 km due east then 16 km due north. How far is it now from where it started?

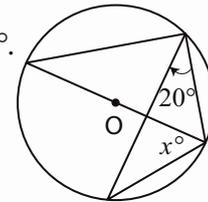
20 km

28. [Shape / Location]
I have three squares and four triangles all of which have side lengths of 2 cm. I attempt to form a net for a polyhedron by taping the shapes together along their edges. If this can be done, into what shape will the net fold?



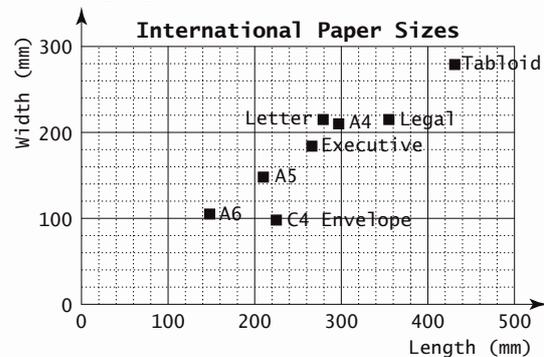
a triangular pyramid
on top of a triangular prism

29. [Angles] *
Find the value of x° .



70°

30. [Statistics]
Which of the paper sizes shown is the closest to being square?



letter

31. [Probability]
The probability that a person is unemployed is 6%. If 300 people were surveyed, how many would you expect to be unemployed?

18

32. [Problem Solving 1] *
Ocean water is 5% salt. How many litres of pure water have to be added to 4 L of ocean water to reduce the concentration of salt to 2%?

6 L

33. [Problem Solving 2] *
Traditionally, billiard tables are measured in imperial measurements called feet. A manufacturer made a rectangular table that measured 6 feet by 8 feet from cushion to cushion. A ball was struck on this table so that it rebounded off all four sides and returned exactly to its original position. Find the total distance travelled by the ball.

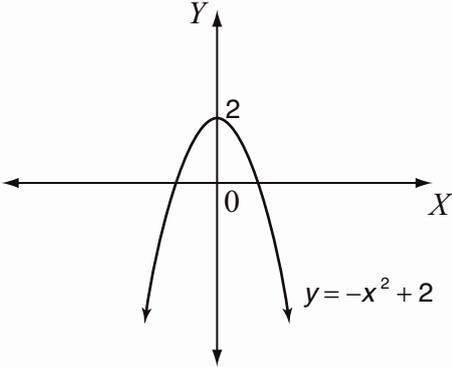
20 feet



Name:

Due Date: / /

Parent's Signature:

1. [Long \times, \div]
 $21.05 \div 5 =$ 4.21
2. [Decimal $+, -$] *
 $1 - x = 0.021$ $x = 0.979$
3. [Decimal \times, \div]
 $0.2 \div x = 0.02$ $x = 10$
4. [Fraction $+, -$] *
 $\frac{z}{5} + \frac{3z+5}{10} =$ $\frac{z+1}{2}$
5. [Fraction \times, \div] *
 $\frac{5xy}{2} \div \frac{y}{4x} =$ $10x^2$
6. [Percentages] *
For a science test Joseph received two more marks, which gave him a 4% higher grade than Dylan. What were the possible marks attainable in the test? 50
7. [Integer $+, -$]
 $(-2y) - (-7y) - (+5y) =$ 0
8. [Integer \times, \div]
 $(-10) \times (-6) \div (-5) =$ -12
9. [Rates / Ratios] *
The longest bone in the body is the femur which is likely to be 50 cm long in a person 1.8 m tall. If a person has a femur 40 cm long, how tall would you expect that person to be? 1.44 m
10. [Indices] *
If $10^x = 0.1$, what is the value of x ? -1
11. [Square Roots / Surds] *
Rationalise and simplify $\frac{6}{5\sqrt{3}}$ $\frac{2\sqrt{3}}{5}$
12. [Orders of Operations] *
 $3 \times 48 \div 12 =$ 12
13. [Exploring Number] *
Place in ascending order:
 $1.42, \sqrt{2}, \left(1\frac{1}{5}\right)^2$ $\sqrt{2}, 1.42, \left(1\frac{1}{5}\right)^2$
14. [Scientific Notation] *
Evaluate and express in scientific notation
 $(2.4 \times 10^{-2}) \times (4 \times 10^{-4})$ 9.6×10^{-6}
15. [Number Patterns]
Find the rule of the sequence t_n where $n \geq 1$
14, 11, 8, 5, $t_n = 17 - 3n$
16. [Expressions]
If n is any integer, which of the following is always odd?
 $n - 1, n + 1, n + 2, 2n + 1$ $2n + 1$
17. [Substitution] *
Does the ordered pair $\left(\frac{3}{4}, \frac{1}{5}\right)$ satisfy the relation $x + y > 1$? no
18. [Expansion] *
Expand and simplify
 $3(x + 4)(x - 2) - (x^2 - 1)$ $2x^2 + 6x - 23$
19. [Factorisation] *
Factorise and simplify
 $\frac{x^2 - 8x + 12}{3x^3 - 12x}$ $\frac{x - 6}{3x(x + 2)}$
20. [Equations] *
Solve for x :
 $x(9 - x^2) = 0$ 0, 3, -3
21. [Graphs & Functions] *
Sketch the parabola of equation $y = -x^2 + 2$ without plotting points.


QUOTE OF THE WEEK: Man cannot discover new oceans until he has courage to lose sight of the shore.

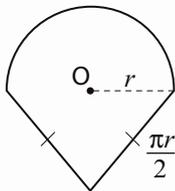
22. [Units of Measurement / Time] *

The strongest wind recorded in Antarctica reached a speed of 327 km/h. Express this speed in m/s. [Round to the nearest whole number.]

91 m/s

23. [Perimeter] *

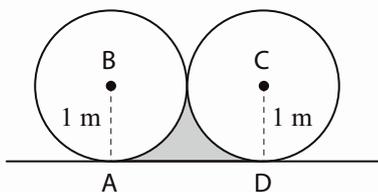
Write a formula for the perimeter P of the shape.



$$P = 2\pi r$$

24. [Area] *

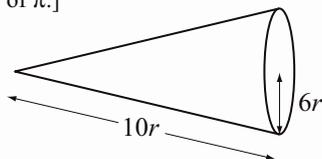
Using $\pi \approx 3.14$ find the shaded area.



$$0.43 \text{ m}^2$$

25. [Volume] *

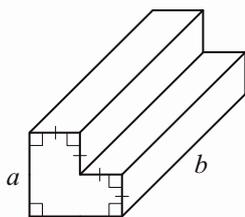
Write a simple formula for the volume V of the cone in terms of r . [Express your answer as a multiple of π .]



$$V = 96\pi r^3$$

26. [Surface Area] *

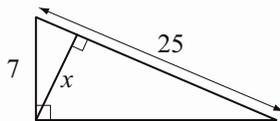
Write a formula for the total surface area TSA of the solid.



$$TSA = 4ab + \frac{3a^2}{2}$$

27. [Pythagoras / Trigonometry] *

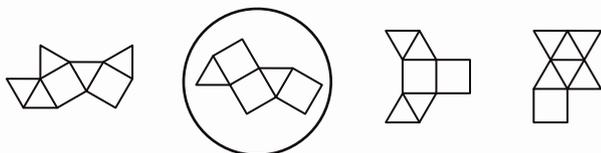
Calculate the unknown marked length.



6.72

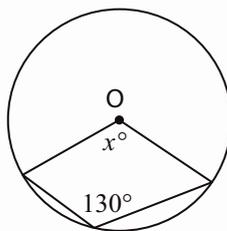
28. [Shape / Location]

Circle the net that **can** be folded to form a model of a polyhedron.



29. [Angles] *

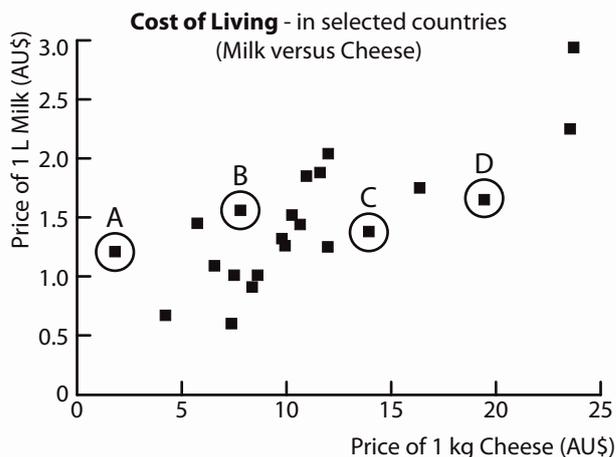
Find the value of x° .



100°

30. [Statistics]

Which circled country has a ratio of the price of cheese to milk closest to 5 : 1?



B

31. [Probability]

How many times would you expect heads to come up when a fair coin is tossed 50 times?

25

32. [Problem Solving 1] *

A small Middle Eastern town has a population of 10 000 people. Some of these people are one-legged and wear only one sandal. Of the rest of the population, exactly half go barefoot. How many sandals are worn in the town?

10 000

33. [Problem Solving 2] *

The lines of a multiplication table are shown below all jumbled. Which times table is it?

$A \times C = EC$
 $A \times E = IE$
 $A \times A = FA$
 $A \times F = JC$
 $A \times I = JI$
 $A \times J = A$
 $A \times B = EI$
 $A \times G = DE$
 $A \times D = FH$

6



Name:

Due Date: / /

Parent's Signature:

1. [Long \times ,+] *
 $23.5 \times 17 =$ 399.5
2. [Decimal +,-] *
 $12.2 - x = 6.5$ $x = 5.7$
3. [Decimal \times ,+] *
 $x^2 = 0.01$ $x = \pm 0.1$
4. [Fraction +,-] *
 $\frac{x+2}{3} + \frac{x+5}{4} =$ $\frac{7x+23}{12}$
5. [Fraction \times ,+] *
 $\frac{2}{x+3} \times \frac{x+3}{5} =$ $\frac{2}{5}$
6. [Percentages] *

\$1000 has been invested for 2 years at 6% per annum compound interest. Find the interest which has accrued.

\$ 123.60
7. [Integer +,-] *
 $-6x - (2x - 10x) =$ 2x
8. [Integer \times ,+] *
 $\frac{4-3}{3-4} =$ -1
9. [Rates / Ratios] *

Human kidneys filter the blood about 300 times a day. At this rate how many times is the blood filtered each hour?

12.5 times/h
10. [Indices] *

Simplify $\frac{3m^2r \times (2r)^{-3}}{m^3r^{-2}}$

 $\frac{3}{8m}$
11. [Square Roots / Surds] *

Expand and simplify $(3 + 2\sqrt{7})(3 - 2\sqrt{7})$

-19
12. [Order of Operations] *
 $(10 - 9)^{2010} \times (6 - 6)^{2014} =$ 0
13. [Exploring Number] *
 $\sqrt{12} < 3\frac{1}{2}$ True or false? true
14. [Scientific Notation] *

Evaluate and express in scientific notation $(4 \times 10^{-2})^2$

 1.6×10^{-3}
15. [Number Patterns]

Find the rule of the sequence t_n where $n \geq 1$
 3, 5, 7, 9, 11,

 $t_n = 2n + 1$
16. [Expressions] *

Simplify the polynomial subtraction:
 $(8x^3 + 4x^2 - x + 3) - (6x^3 + 2x)$

 $2x^3 + 4x^2 - 3x + 3$
17. [Substitution] *

If $v = u + at$, find the speed v (in m/s) if $u = 2$ m/s, $a = 3$ m/s² and $t = 5$ s.

17 m/s
18. [Expansion] *

Expand and simplify $(a + b + c)^2$

 $a^2 + b^2 + c^2 + 2ab + 2ac + 2bc$
19. [Factorisation] *

Factorise $9x^3 - x$

 $x(3x - 1)(3x + 1)$
20. [Equations] *

Solve the inequality:
 $x^2 + 6x + 5 < 0$

 $-5 < x < -1$
21. [Graphs & Functions] *

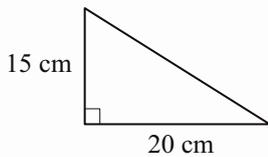
Sketch the graph of equation $y = x^2 + 1$ labelling the intercepts, axis of symmetry and turning point.

QUOTE OF THE WEEK: I figured that if I said it enough, I would convince the world that I really was the greatest. Muhammad Ali

22. [Units of Measurement / Time]
How many hectares in a square kilometre?

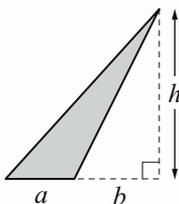
100 ha

23. [Perimeter] *
Find the perimeter of the triangle.
[Hint: Pythagoras' theorem will help.]



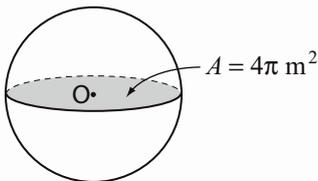
60 cm

24. [Area] *
Write a simple formula for the area A of the shaded triangle.



$$A = \frac{ah}{2}$$

25. [Volume] *
Find the volume of the sphere. [Express your answer as a multiple of π .]

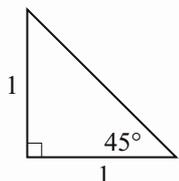


$$V = \frac{32\pi}{3}$$

26. [Surface Area] *
In which cube is the ratio $\frac{\text{surface area}}{\text{volume}}$ greater?
A) a smaller cube
B) a larger cube

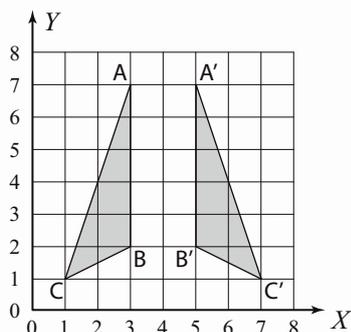
A

27. [Pythagoras / Trigonometry] *
Use the triangle to find the value of $\sin 45^\circ$.
[Leave your answer in surd form.]



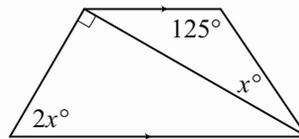
$$\frac{\sqrt{2}}{2}$$

28. [Shape / Location]
Name and describe the transformation which moved the triangle ABC to its new position A'B'C'.



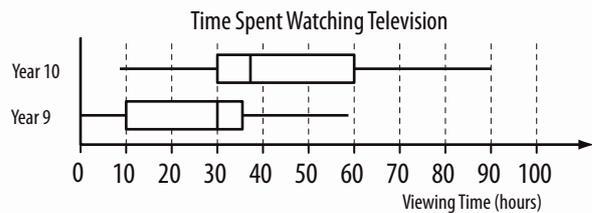
reflection in the line $x = 4$

29. [Angles] *
Find the value of x° .



35°

30. [Statistics]
The box-and-whisker plots show a comparison of the time spent watching television by students in a Year 9 and a Year 10 class over a month. Estimate the ranges for both sets of data, by rounding off to the nearest ten.



Yr 9 range = 60 Yr 10 range = 80

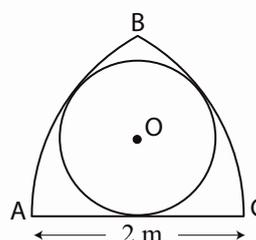
31. [Probability] *
In how many different ways can four books, A, B, C and D, be placed side by side on a bookshelf? [Note: ABCD and ABDC are 2 examples.]

24

32. [Problem Solving 1] *
The number 85 can be expressed as a sum of two or more consecutive, positive integers in three different ways. One such sequence begins with 15.
i.e. $15 + 16 + 17 + 18 + 19 = 85$
With which numbers do the other two sequences begin?

4, 42

33. [Problem Solving 2] *
In the diagram, the arc AB is centred at C and the arc BC is centred at A. What is the radius of the circle centred at O?



0.75 m



Name:

Due Date: / /

Parent's Signature:

1. [Long \times ,+] *
 $15.9 \times 13 =$ 206.7
2. [Decimal +,-] *
 $6.117 - x = 4$ $x = 2.117$
3. [Decimal \times ,+] *
 $\sqrt{x} = 0.01$ $x = 0.0001$
4. [Fraction +,-] *
 $\frac{y+1}{2} + \frac{y-2}{5} =$ $\frac{7y+1}{10}$
5. [Fraction \times ,+] *
 $\frac{7}{h+7} \div \frac{h}{h+7} =$ $\frac{7}{h}$
6. [Percentages] *

The population of a country is 8 000 000.
 If the population is forecast to grow at a rate of 5% per annum, what will the population be in 3 years time?

9 261 000
7. [Integer +,-] *
 $7w - (2w - 9w) =$ 14w
8. [Integer \times ,+] *
 $\frac{5-9}{5-9} =$ 1
9. [Rates / Ratios] *

How much petrol is required for a trip from Brisbane to Toowoomba, a distance of 128 km, if your car's fuel consumption is 8 L/100 km?

10.24 L
10. [Indices] *

Simplify $\frac{4bc \times c^3}{(2c^{-2})^{-3}}$

 $\frac{32b}{c^2}$
11. [Square Roots / Surds] *

Expand and simplify $(\sqrt{3} + 3\sqrt{5})(\sqrt{3} + \sqrt{5})$

 $18 + 4\sqrt{15}$
12. [Order of Operations] *
 $24 \times 51 \times (7 - 7) + 19 =$ 19
13. [Exploring Number] *
 $\sqrt{43} > 6\frac{1}{2}$ True or false? true
14. [Scientific Notation] *

Evaluate and express in scientific notation $(9 \times 10^{-5})^2$

 8.1×10^{-9}
15. [Number Patterns] *

Find the rule of the sequence t_n where $n \geq 1$
 1, 4, 9, 16,

 $t_n = n^2$
16. [Expressions] *

Add the following polynomials:
 $(3x^3 - x^2 + 2x + 5) + (2x^2 - 3)$

 $3x^3 + x^2 + 2x + 2$
17. [Substitution] *

If $x = ut + \frac{1}{2}at^2$, find the distance x when $u = 15$ m/s, $a = 2$ m/s² and $t = 15$ s.

450 m
18. [Expansion] *

Expand and simplify $(2a + b + c)^2$

 $4a^2 + b^2 + c^2 + 4ab + 4ac + 2bc$
19. [Factorisation] *

Factorise $2x^2 - 18y^2$

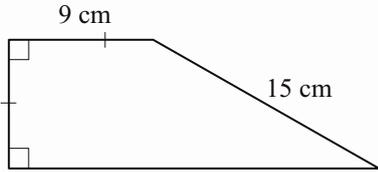
 $2(x - 3y)(x + 3y)$
20. [Equations] *

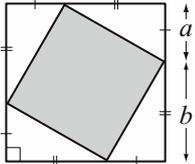
Solve the inequality:
 $x^2 - 6x - 7 < 0$

 $-1 < x < 7$
21. [Graphs & Functions] *

Sketch the graph of equation $y = x^2 - 1$ labelling the intercepts, axis of symmetry and turning point.

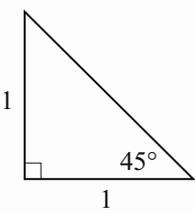
22. [Units of Measurement / Time] *
How many metres per second are equivalent to s km/h?
 $\frac{5s}{18}$ m/s

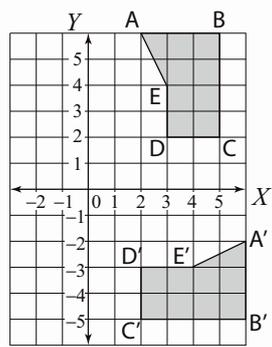
23. [Perimeter] *
Find the perimeter of the trapezium.
[Hint: Pythagoras' theorem will help.]

54 cm

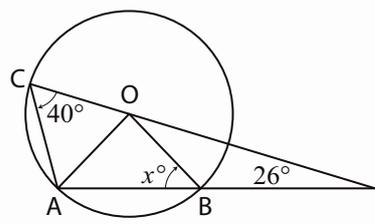
24. [Area] *
Write a simple formula for the area A of the shaded square.

 $A = a^2 + b^2$

25. [Volume] *
The radii of three spheres are 3 m, 4 m and 5 m respectively. Find the radius of a fourth sphere which has a volume equal to the sum of the volumes of the three smaller spheres.
6 m

26. [Surface Area] *
The volume of cube A is 8 times that of cube B. Find the value of the ratio:
 $\frac{\text{surface area of A}}{\text{surface area of B}}$ or 4 : 1 **$\frac{4}{1}$**

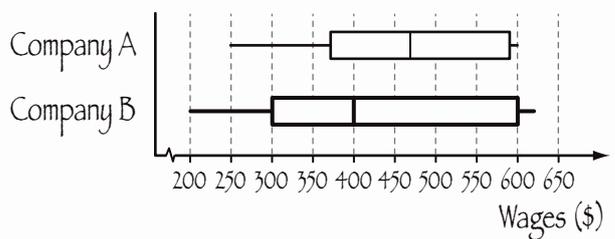
27. [Pythagoras / Trigonometry] *
Use the triangle to find the value of $\tan 45^\circ$.

1

28. [Shape / Location] *
The rotation of the pentagon ABCDE about the origin to a new position A'B'C'D'E' is shown. How is the rotation best described?
A) 45° anticlockwise
B) 90° clockwise
C) 45° clockwise
D) 90° anticlockwise

B

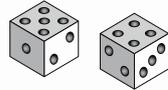
29. [Angles] *
Find the value of x° .

 74°

30. [Statistics] *
A boxplot of the weekly wages of the employees of company A is shown. Draw a boxplot for the weekly wages of company B.

Company A	\$250	\$300	\$370	\$400	\$460	\$480	\$520	\$590	\$590	\$600
Company B	\$200	\$230	\$300	\$330	\$350	\$450	\$470	\$600	\$620	\$620



31. [Probability] *
How many different 3-letter number plates can be formed using A, B, and C, if each letter can be used repeatedly?
[Note: ABA is one example.]
27

32. [Problem Solving 1] *
Two different views are shown of a pair of identical dice, each numbered 1 to 6. Which number is opposite the number 1?
[Note: Though identical, the dice are not necessarily standard in that opposite sides may not add to 7.]

4

33. [Problem Solving 2] *
Grandma had to cook her biscuits for exactly 10 minutes. However, the only timers she had were a 4 minute egg timer and a 7 minute egg timer. How did she use the two egg timers to measure exactly 10 minutes?


Start both, when 4 runs out, reverse 4. When 7 runs out, reverse 4 again. When 4 runs out, the biscuits are ready.



Name:

Due Date: / /

Parent's Signature:

1. [Long \times, \div]
 $12.84 \div 4 =$

3.21

2. [Decimal $+, -$] *
 $30.6 - x = 14.55$

$x = 16.05$

3. [Decimal \times, \div]
 $x^2 = 0.0009$

$x = \pm 0.03$

4. [Fraction $+, -$] *
 $\frac{z-2}{3} - \frac{z}{5} =$

$\frac{2z-10}{15}$

5. [Fraction \times, \div] *
 $\frac{5t}{t+1} \div \frac{1}{t+1} =$

5t

6. [Percentages] *
Amos invests \$20 000 at 10% per annum compound interest. What will Amos' investment be worth after 3 years?

\$ 26 620

7. [Integer $+, -$] *
 $5y - (3y - 7y) =$

9y

8. [Integer \times, \div] *
 $\frac{-3}{-6} \times \frac{-12}{-4} =$

$\frac{3}{2}$

9. [Rates / Ratios] *
The annual average flow over Niagara Falls is $5640 \text{ m}^3/\text{s}$. Express this flow in megalitres per minute.

338.4 ML/min

10. [Indices] *
Simplify $\frac{(2a^2b)^{-3}}{3ab \times 2a^{-3}}$

$\frac{1}{48a^4b^4}$

11. [Square Roots / Surds] *
Expand and simplify
 $(2 + \sqrt{5})(2 + 3\sqrt{5})$

$19 + 8\sqrt{5}$

12. [Order of Operations] *
 $(5 - 5)^9 - (1999 \times 8)^0 =$

-1

13. [Exploring Number]
 $\frac{58}{60} > \frac{59}{61}$ True or false?

false

14. [Scientific Notation] *
Evaluate and express in scientific notation
 $(3 \times 10^4)^3$

2.7×10^{13}

15. [Number Patterns]
Find the rule of the sequence t_n where $n \geq 1$
6, 10, 14, 18, 22,

$t_n = 4n + 2$

16. [Expressions]
Add the following polynomials:
 $(2x^3 + x^2 - 3x - 6) + (3x^3 - 4x^2 + 2x)$

$5x^3 - 3x^2 - x - 6$

17. [Substitution] *
If $x = ut + \frac{1}{2}at^2$, find the distance x when $u = 300 \text{ m/s}$, $a = 5 \text{ m/s}^2$ and $t = 60 \text{ s}$.

27 000 m

18. [Expansion] *
Expand and simplify $(x + 2y + 3z)^2$

$x^2 + 4y^2 + 9z^2 + 4xy + 6xz + 12yz$

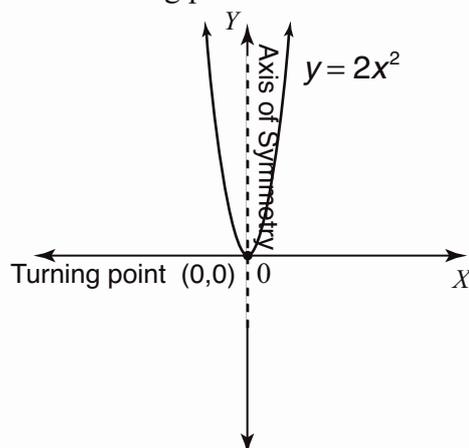
19. [Factorisation] *
Factorise $2a^2bc - 4ab + 6ac$

$2a(abc - 2b + 3c)$

20. [Equations] *
Solve the inequality:
 $x^2 - 2x - 8 \geq 0$

$x \leq -2$ or $x \geq 4$

21. [Graphs & Functions] *
Sketch the graph of equation $y = 2x^2$ labelling the intercepts, axis of symmetry and turning point.



22. [Units of Measurement / Time] *
How many grams/cm³ are equivalent to d tonnes/m³?

$d \text{ g/cm}^3$

23. [Perimeter] *
Find the perimeter of the trapezium.
[Hint: Pythagoras' theorem will help.]

38 cm

24. [Area] *
Write a simple expression for the area A of the shaded region.

$A = 8c + 16$

25. [Volume] *
This solid has the shape of a hemisphere on a cylinder. Find its volume expressed as a multiple of π .

$63\pi \text{ m}^3$

26. [Surface Area] *
Find the value of the ratio:
$$\frac{\text{total surface area of cylinder}}{\text{surface area of sphere}}$$

where the cylinder is just able to contain the sphere.

or $3 : 2$ **$\frac{3}{2}$**

27. [Pythagoras / Trigonometry] *
Use the triangle shown to find the value of $\cos 30^\circ$. [Leave your answer in surd form.]

$\frac{\sqrt{3}}{2}$

28. [Shape / Location]
Name and describe the transformation which moved the triangle ABC to its new position A'B'C'.

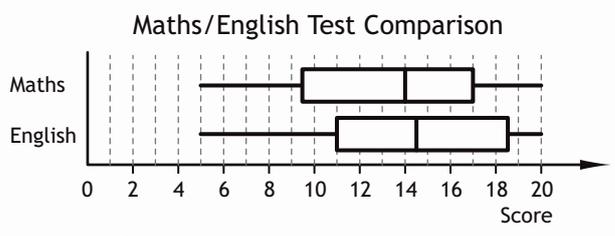
rotation of 180° clockwise about (4,4)

29. [Angles] *
Find the value of x° .

95°

30. [Statistics]
Maths and English test results for a class of 20 students are shown below. Draw two comparative boxplots to illustrate the data.

Maths	5	7	8	8	9	10	10	12	13	14
English	5	6	6	7	11	11	12	13	13	14



31. [Probability] *
In how many different ways can four blocks, A, B, C and D, be stacked directly on top of each other if block A has to be on the bottom?

6

32. [Problem Solving 1] *
When asked about the ability of her cats to catch rats, Miss Kitty replied, "On average, we find a cat-and-a-quarter can catch a rat-and-a-quarter in a minute-and-a-quarter."
How many rats could ten of these cats catch in ten minutes?

80

33. [Problem Solving 2] *
A pattern of triangles is made from toothpicks, as shown below. Write an expression for the number of toothpicks required to make a pattern n triangles long.

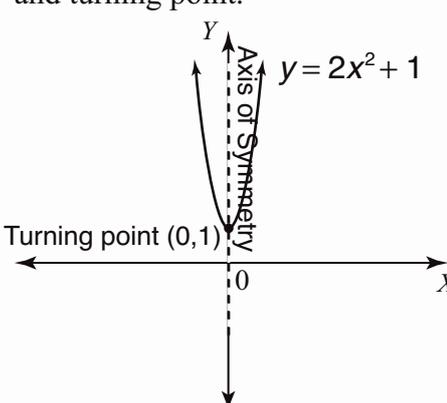
$2n + 1$



Name:

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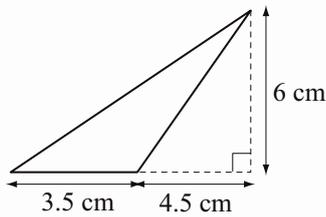
1. [Long $\times, +$] *
 $25.5 \times 18 =$ 459
2. [Decimal $+, -$] *
 $12.5 - x = 2.451$ $x = 10.049$
3. [Decimal $\times, +$] *
 $\sqrt{x} = 0.4$ $x = 0.16$
4. [Fraction $+, -$] *
 $\frac{w+1}{3} + \frac{w+3}{2} =$ $\frac{5w+11}{6}$
5. [Fraction $\times, +$] *
 $\frac{f+1}{3} \times \frac{2}{f+1} =$ $\frac{2}{3}$
6. [Percentages] *
 Lisa invests \$1000 at 10% per annum compound interest. What will Lisa's investment be worth after 4 years? \$1464.10
7. [Integer $+, -$] *
 $-p + (9p - 20p) =$ $-12p$
8. [Integer $\times, +$] *
 $\frac{8-6}{6-8} =$ -1
9. [Rates / Ratios] *
 How much petrol is required to drive from Brisbane to Gympie, a distance of 170 km, if your car's fuel consumption is 9 L/100 km? 15.3 L
10. [Indices] *
 Simplify $\frac{5mn^{-2} \times 6m^2 \times 2}{4m^{-3} \times 15m^6 n^{-2}}$ 1
11. [Square Roots / Surds] *
 Expand and simplify $(\sqrt{2} - 2\sqrt{5})(\sqrt{2} + 2\sqrt{5})$ -18
12. [Order of Operations] *
 $(5 - 5)^9 \div 2012 =$ 0
13. [Exploring Number]
 $\frac{19}{18} > \frac{20}{19}$ True or false? true
14. [Scientific Notation] *
 Evaluate and express in scientific notation $(2 \times 10^{-3})^3$ 8×10^{-9}
15. [Number Patterns]
 Find the rule of the sequence t_n where $n \geq 1$
 13, 10, 7, 4, 1, $t_n = 16 - 3n$
16. [Expressions]
 Find the difference between the polynomials:
 $(3x^3 - 2x^2 + x - 2) - (2x^3 - x^2 + 2x - 5)$
 $x^3 - x^2 - x + 3$
17. [Substitution] *
 If $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$, find the solutions x_1 and x_2 , when $a = 4$, $b = 5$ and $c = 1$
 $-\frac{1}{4}, -1$
18. [Expansion] *
 Expand and simplify $(x + 2y - z)^2$
 $x^2 + 4y^2 + z^2 + 4xy - 2xz - 4yz$
19. [Factorisation] *
 Factorise $3y^3 - 12y^2 + 12y$ $3y(y - 2)^2$
20. [Equations] *
 Solve the inequality:
 $x^2 + 4x + 4 \leq 0$ $x = -2$
21. [Graphs & Functions] *
 Sketch the graph of equation $y = 2x^2 + 1$ labelling the intercepts, axis of symmetry and turning point.


QUOTE OF THE WEEK: The noblest motive is the public good. Sir Richard Steele

22. [Units of Measurement / Time]
How many litres in v cubic metres?

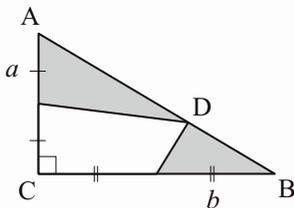
$$1000v \text{ L}$$

23. [Perimeter] *
Find the perimeter of the triangle.
[Hint: Pythagoras' theorem will help.]



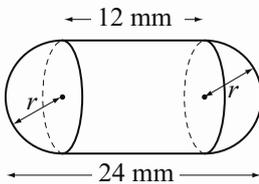
$$21 \text{ cm}$$

24. [Area] *
Write a simple formula for the area A of the shaded region. [Note: D is a point anywhere along the side AB .]



$$A = ab$$

25. [Volume] *
Find the volume of the penicillin capsule.
[Express your answer as a multiple of π .]

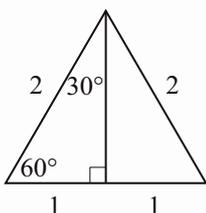


$$720\pi \text{ mm}^3$$

26. [Surface Area] *
A cone with a height equal to its diameter, a cube and a sphere all have exactly the same surface area. Which of the three solids will have the greatest volume?

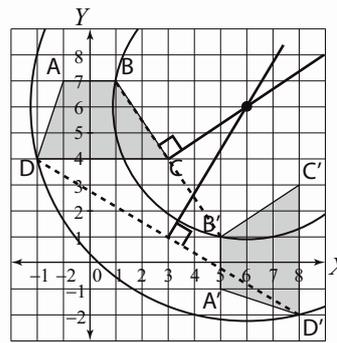
sphere

27. [Pythagoras / Trigonometry] *
Use the triangle to find the value of $\tan 30^\circ$.
[Leave your answer in surd form.]



$$\frac{\sqrt{3}}{3}$$

28. [Shape / Location]
What are the coordinates of the centre of rotation used to rotate the quadrilateral $ABCD$ to its new position $A'B'C'D'$?



(6,6)

29. [Angles] *
Through how many degrees does the big hand of a clock move in 10 minutes?

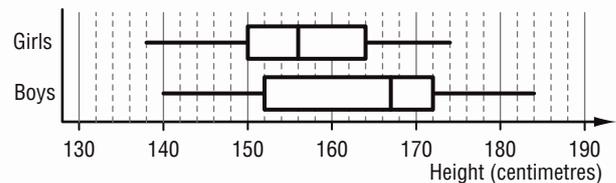
60°

30. [Statistics]
Draw two comparative boxplots to illustrate the heights in centimetres of the boys and girls in a high school class.

Height Comparison

Girls:	138	145	148	150	154	155	155
	157	161	164	164	165	170	174

Boys:	140	143	146	150	154	159	164	166
	168	168	170	172	172	180	181	184



31. [Probability] *
There are 90 different two-digit numbers. How many of these do not contain any of the digits 1, 2, 3 or 4?

30

32. [Problem Solving 1] *
If it takes 8 builders 6 days to build a barn, how long would it take 12 builders to do the same job?

4 days

33. [Problem Solving 2] *
Two cyclists ride towards each other at 20 km/h from opposite ends of a straight stretch of road 40 km long. At the same time, a blowfly flies away from one cyclist towards the other at 30 km/h. When it meets the other cyclist, it is so scared that it turns around and heads back. It continues moving from one cyclist to the other until the cyclists meet. At this point the fly drops dead with fright. What was the total distance travelled by the blowfly?

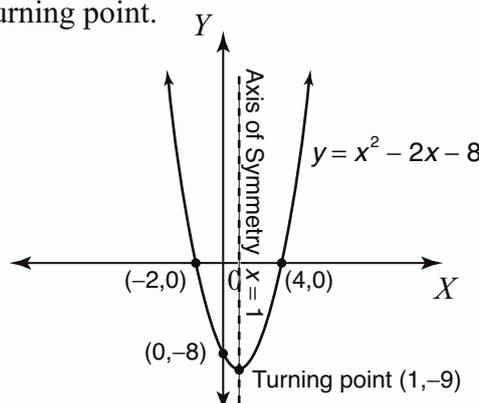
30 km



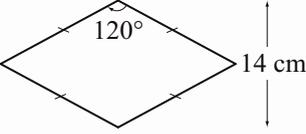
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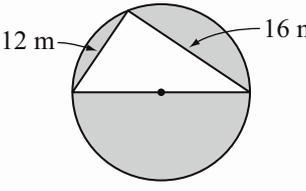
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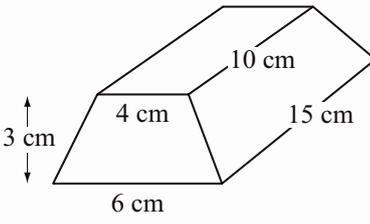
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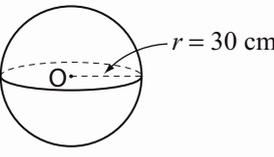
1. [Long \times, \div] *
 $1872 \div 48 =$ 39
2. [Decimal $+, -$] *
 $6.21 + x = 9.5$ $x = 3.29$
3. [Decimal \times, \div] *
 $x^3 = 0.008$ $x = 0.2$
4. [Fraction $+, -$] *
 $\frac{1}{x} + \frac{1}{2x} =$ $\frac{3}{2x}$
5. [Fraction \times, \div] *
 $\frac{6n+3}{2n+1} =$ 3
6. [Percentages] *
After 1 year, a boat has lost 15% of its value and it is now worth only \$17000. What did the boat cost when new?
\$ 20 000
7. [Integer $+, -$] *
 $(2x - 5x) - (3x - 4x) =$ $-2x$
8. [Integer \times, \div] *
 $\frac{-2}{3} \times \frac{24}{-4} =$ 4
9. [Rates / Ratios] *
Jenny has \$30, Lou has 50% more than Jenny, and Alex has twice as much as Lou. Express the amount of money owned by Jenny, Lou and Alex as a ratio in simplest form.
2 : 3 : 6
10. [Indices] *
Evaluate $(-1)^{2n+2} + (-1)^{2n+1} + (-1)^{2n}$, given n is a whole number.
1
11. [Square Roots / Surds] *
Rationalise $\frac{2}{\sqrt{3}+2}$ $2(2 - \sqrt{3})$
12. [Order of Operations] *
 $(36 - 6^2) \div 2011 + 2012 =$ 2012
13. [Exploring Number] *
If A is 40% of B , express B as a percentage of A .
250%
14. [Scientific Notation] *
Evaluate and express in scientific notation $\sqrt{2.5 \times 10^7}$ 5×10^3
15. [Number Patterns] *
If $t_1 = 625$ and $t_{n+1} = \frac{t_n}{5}$, find the first four terms of the pattern.
625, 125, 25, 5
16. [Expressions]
An antique was bought for d dollars and then resold at 10% profit. In terms of d , what was the selling price?
\$ $\frac{11d}{10}$
17. [Substitution] *
If $t = x + 1$ and $y = 2t + 3$, express y in terms of x .
 $y = 2x + 5$
18. [Expansion] *
Expand and simplify $(x + 1)(x + 1)(x + 1)$
 $x^3 + 3x^2 + 3x + 1$
19. [Factorisation]
Factorise $6a^2 + 13a - 5$ $(3a - 1)(2a + 5)$
20. [Equations] *
Solve for x :
 $4x^2 + 5x + 1 = 0$ $-\frac{1}{4}, -1$
21. [Graphs & Functions] *
Sketch the graph of equation $y = x^2 - 2x - 8$ labelling intercepts, axis of symmetry and turning point.


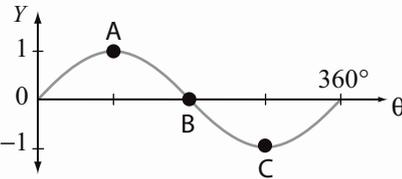
22. [Units of Measurement / Time]
 What does the prefix 'kilo' represent?
 A) 10^{-6} B) 10^{-3} C) 10^3 D) 10^6 **C**

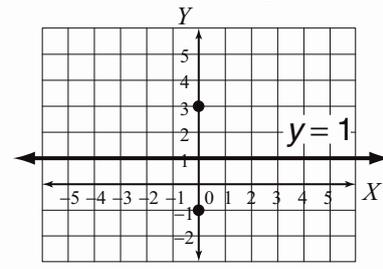
23. [Perimeter] *
 Find the perimeter of the rhombus.
- 
- 56 cm**

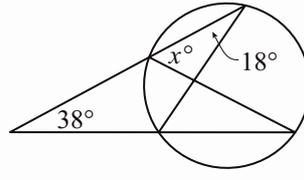
24. [Area] *
 Using $\pi \approx 3.14$ find the shaded area.
- 
- 218 m²**

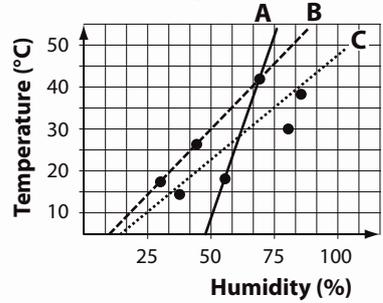
25. [Volume] *
 What is the volume of a gold ingot in the shape of a truncated pyramid? [Hint: Consider the ingot as the solid left after a rectangular pyramid is cut from the top of a larger rectangular pyramid.]
- 
- 190 cm³**

26. [Surface Area] *
 A record for the largest gum bubble ever blown was set in 1994. The almost spherical bubble had a radius of 30 cm. Use $\pi \approx 3.14$ to find the surface area of the bubble.
- 
- 11 304 cm²**

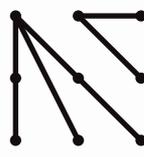
27. [Pythagoras / Trigonometry]
 Complete the missing coordinates using the graph of $y = \sin \theta$
- A(90° , 1) B(180° , 0) C(270 $^\circ$, -1)
- 

28. [Shape / Location]
 Draw the shape formed by all the points that are equally distanced from the points (0,3) and (0,-1).
- 

29. [Angles] *
 Find the value of x° .
- 
- 56°**

30. [Statistics]
 Select the most appropriate 'line of best fit' for the scatter plot.
- 
- C**

31. [Probability] *
 You select a letter at random from the word MUMMY, and then choose another letter without replacing the first one. If the first letter was a 'U', what is the probability that the second letter will be an 'M'?
- or 0.75 **$\frac{3}{4}$**

32. [Problem Solving 1]
 Using the points below as the end points of lines, how many segments can be drawn if each segment is to have a different length?
- 
- 5**

33. [Problem Solving 2] *
 Alex and young Brad can pick a bin full of apples in 90 minutes. Brad and Celia take 60 minutes to do the same job, but when Alex and Celia work together, it takes only 45 minutes to fill a bin. How long would each person take to pick a bin full of apples by themselves?
- A = 120 min, B = 360 min, C = 72 min**



Name:

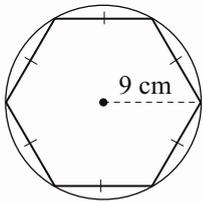
Due Date: / /

Parent's Signature:

1. [Long \times, \div] *
 $64.6 \div 19 =$ 3.4
2. [Decimal $+, -$] *
 $1.4 + x = 3.01$ $x = 1.61$
3. [Decimal \times, \div] *
 $x^2 = 0.25$ $x = \pm 0.5$
4. [Fraction $+, -$] *
 $\frac{1}{3y} + \frac{1}{y} =$ $\frac{4}{3y}$
5. [Fraction \times, \div] *
 $\frac{k^2 - k}{k - 1} =$ k
6. [Percentages] *
 A new computer is bought for \$2200. The value depreciates 20% in the first year. What is the calculated value of the computer after 1 year?
\$1760
7. [Integer $+, -$] *
 $(4y - y) + (2y - 7y) =$ $-2y$
8. [Integer \times, \div] *
 $\frac{5 - 15}{2 - 7} =$ 2
9. [Rates / Ratios] *
 Tom, George and Mary share a pizza. Tom eats half of it and George eats two thirds of the rest. Write the amount eaten by Tom, George and Mary as a ratio in simplest form.
3 : 2 : 1
10. [Indices] *
 $2^{333} < 3^{222}$ True or false? true
11. [Square Roots / Surds] *
 Rationalise $\frac{\sqrt{2} + \sqrt{5}}{\sqrt{2} - \sqrt{5}}$ $\frac{-7 - 2\sqrt{10}}{3}$
12. [Order of Operations] *
 $(7 \times 8 - 55)^9 - 2^3 =$ -7
13. [Exploring Number] *
 If C is 80% of D , express D as a percentage of C .
125%
14. [Scientific Notation] *
 Evaluate and express in scientific notation
 $\sqrt{4.9 \times 10^{-3}}$ 7×10^{-2}
15. [Number Patterns] *
 If $t_1 = 3$ and $t_{n+1} = \frac{1}{t_n}$, find the first four terms of the pattern.
 $3, \frac{1}{3}, 3, \frac{1}{3}$
16. [Expressions]
 Robert bought b books. How many pens could he have bought with the same amount of money if two books cost as much as five pens?
 $\frac{5b}{2}$ pens
17. [Substitution] *
 If $t = 2x + 1$ and $y = 2t$, express y in terms of x .
 $y = 4x + 2$
18. [Expansion] *
 Expand and simplify
 $(a + 3)(a - 3)(a + 2)$
 $a^3 + 2a^2 - 9a - 18$
19. [Factorisation] *
 Factorise $x^4 - 16y^4$
 $(x - 2y)(x + 2y)(x^2 + 4y^2)$
20. [Equations] *
 Solve for x :
 $4x^2 - 8x + 3 = 0$ $\frac{1}{2}, \frac{3}{2}$
21. [Graphs & Functions] *
 Sketch the graph of equation $y = x^2 + 2x + 1$ labelling intercepts, axis of symmetry and turning point.

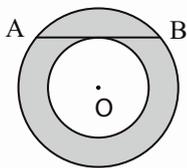
22. [Units of Measurement / Time]
 What does the prefix 'giga' represent?
 A) 10^3 B) 10^6 C) 10^9 D) 10^{12} **C**

23. [Perimeter] *
 Find the perimeter of the regular hexagon that just fits inside a circle of radius 9 cm.



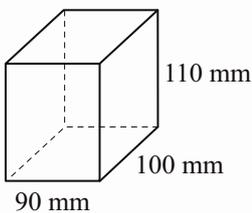
54 cm

24. [Area] *
 AB is tangent to the smaller circle and its length is 20 cm. Using $\pi \approx 3.14$ find the area of the shaded region. [Hint: Pythagoras' theorem will help!]



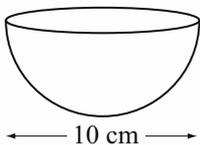
314 cm²

25. [Volume] *
 A woodturner wishes to create a cylinder from a rectangular block of wood. Using $\pi \approx 3.14$ what is the greatest volume, in cm³, the cylinder can have?



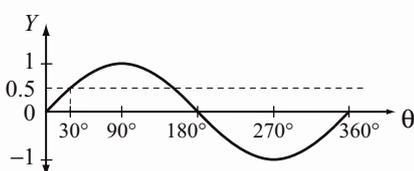
706.5 cm³

26. [Surface Area] *
 Using $\pi \approx 3.14$ find the total surface area of the solid hemisphere.



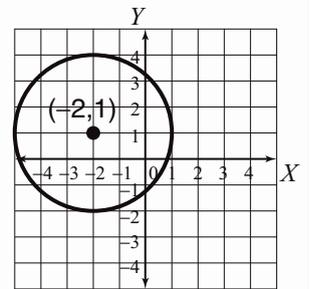
235.5 cm²

27. [Pythagoras / Trigonometry]
 The graph shows that $\sin 30^\circ = 0.5$
 What is the other angle between 0° and 360° that has the same sine value?

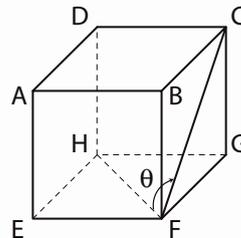


150°

28. [Shape / Location]
 Draw the shape formed by all the points that are at a distance of 3 units from the point $(-2, 1)$.

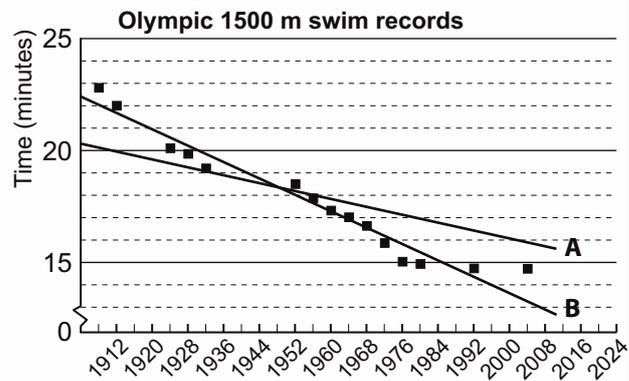


29. [Angles] *
 Find the value of $\angle HFC$, marked θ , in the cube.



60°

30. [Statistics]
 Select the most appropriate 'line of best fit' for the scatter plot.

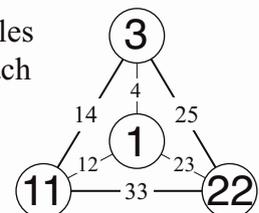


B

31. [Probability] *
 There are 5 novels, 3 dictionaries and 2 video tapes on a shelf. An item is picked at random and not replaced. What is the probability that a second item selected will be a novel, given that the first was a video?

$\frac{5}{9}$

32. [Problem Solving 1]
 Enter numbers in the circles so that the numbers on each line equal the sum of the numbers at each end.



33. [Problem Solving 2] *
 $100! = 100 \times 99 \times 98 \times 97 \dots \times 2 \times 1$
 If you were to evaluate 100 factorial by multiplying all these terms together, how many zeros would there be on the end of your answer?

24



Name:

Due Date: / /

Parent's Signature:

1. [Long \times, \div] *
 $36.8 \div 23 =$

1.6

2. [Decimal $+, -$] *
 $2.5 + x = 2.51$

$x = 0.01$

3. [Decimal \times, \div] *
 $x^2 = 0.0144$

$x = \pm 0.12$

4. [Fraction $+, -$] *
 $\frac{1}{x} + \frac{1}{y} =$

$\frac{y+x}{xy}$

5. [Fraction \times, \div] *
 $\frac{k^2 - 1}{k - 1} =$

$k + 1$

6. [Percentages] *
After 1 year, a computer has lost 30% of its value and is now worth only \$4900. What did it cost when new?

\$7000

7. [Integer $+, -$] *
 $(6s - 7s) - (8s - 9s) =$

0

8. [Integer \times, \div] *
 $\frac{-3}{-4} \times \frac{72}{2} =$

27

9. [Rates / Ratios] *
This table is printed on the side of a box of muffin mix. What is the ratio in simplest form of mix to water, in each case?

muffins	amount of mix	amount of water
12	1 cup	$\frac{3}{4}$ cups
24	2 cups	$1\frac{1}{2}$ cups
36	3 cups	$2\frac{1}{4}$ cups

4 : 3

10. [Indices] *
Evaluate $5 \times (-1)^{2n} - 3 \times (-1)^{2n+1}$, given n is a whole number.

8

11. [Square Roots / Surds] *
Rationalise $\frac{2\sqrt{3}}{\sqrt{3}+1}$

$3 - \sqrt{3}$

12. [Order of Operations] *
 $(6 - 8) \times 3^2 + 25 =$

7

13. [Exploring Number] *
If A is $166\frac{2}{3}\%$ of B , express B as a percentage of A .

60%

14. [Scientific Notation]
Evaluate and express in scientific notation

$$\sqrt{4 \times 10^{-8}}$$

2×10^{-4}

15. [Number Patterns] *
If $t_1 = 3$, $t_2 = 4$ and $t_{n+1} = t_n + t_{n-1}$, find the first four terms of the pattern.

3, 4, 7, 11

16. [Expressions]
If the cost of p mangoes is d cents, what is the cost of z mangoes?

$\$ \frac{zd}{p}$

17. [Substitution] *
If $t = 3x$ and $y = t^2 - 1$, express y in terms of x .

$y = 9x^2 - 1$

18. [Expansion] *
Expand and simplify
 $(x + 3)(x + 2)(x + 5)$

$x^3 + 10x^2 + 31x + 30$

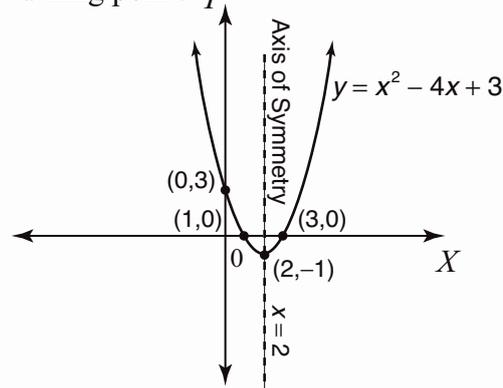
19. [Factorisation]
Factorise
 $x^4 + 2x^2y + y^2$

$(x^2 + y)^2$

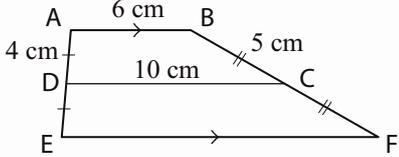
20. [Equations] *
Solve for x :
 $2x^2 + 3x + 1 = 0$

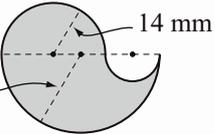
$-\frac{1}{2}, -1$

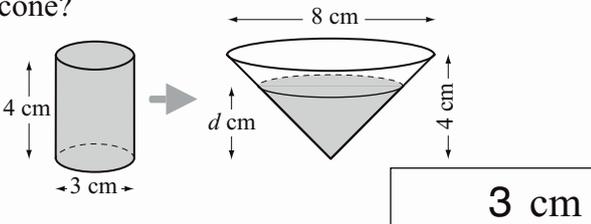
21. [Graphs & Functions] *
Sketch the graph of equation $y = x^2 - 4x + 3$ labelling intercepts, axis of symmetry and turning point.

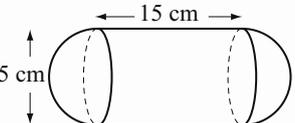


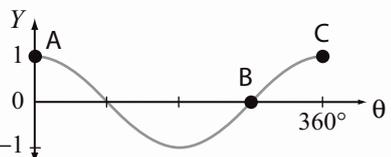
22. [Units of Measurement / Time]
What does the prefix 'micro' represent?
A) 10^{-9} B) 10^{-6} C) 10^{-3} D) 10^{-1} **B**

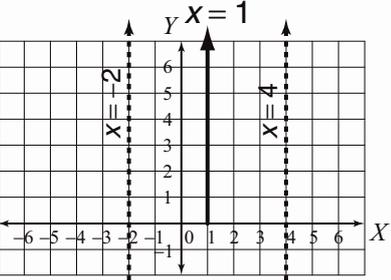
23. [Perimeter] *
Find the perimeter of the trapezium ABFE.
 **38 cm**

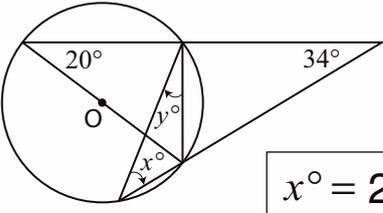
24. [Area] *
Using $\pi \approx \frac{22}{7}$ find the area of the shape.
 **924 mm²**

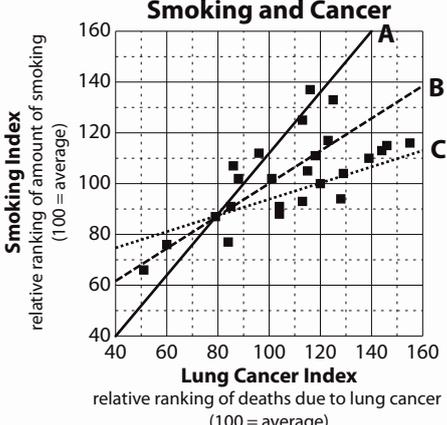
25. [Volume] *
A cylinder full of water has been poured into a cone. What is the depth 'd' of the water in the cone?
 **3 cm**

26. [Surface Area] *
A gas tank has the shape of a cylinder with a hemisphere each end as shown. Using $\pi \approx 3.14$ find the tank's total surface area.
 **314 cm²**

27. [Pythagoras / Trigonometry]
Complete the missing coordinates using the graph of $y = \cos \theta$.
A(0° , 1) B(270° , 0) C(360° , 1)


28. [Shape / Location]
Draw the shape formed by all the points that are in the first quadrant, equally distanced from the lines $x = -2$ and $x = 4$.


29. [Angles] *
Find the values of x° and y° .
 **$x^\circ = 20^\circ$ $y^\circ = 36^\circ$**

30. [Statistics]
Select the most appropriate 'line of best fit' for the scatter plot.
 **B**

31. [Probability] *
A bag contains 4 red and 2 green marbles. Two marbles are randomly selected. Given that the first is red, find the probability that the second is also red.
 $\frac{3}{5}$

32. [Problem Solving 1] *
A snail was trying to climb out of a well that was 8 metres deep. Each day he climbed 3 metres, and each night he slipped back 2 metres. This pattern of climbing 3 metres by day and falling 2 metre by night, was continued. How many days did the snail take to reach the top of the well?
6 days

33. [Problem Solving 2] *
"How old are your three children?" the mathematics teacher asks a former student. He is told their ages add to 13 and multiply to give the number on his classroom door (which they both can see). "I will need to know more," the teacher says, after a few moments reflection. He is told that the eldest child is learning to play the violin. After this the teacher knew the 3 ages. What are their ages?
2, 2, 9



Name:

Due Date: / /

Parent's Signature:

1. [Long \times, \div] *
 $910 \div 26 =$ 35
2. [Decimal $+, -$] *
 $0.053 + x = 1$ $x = 0.947$
3. [Decimal \times, \div] *
 $\sqrt{x} = 0.3$ $x = 0.09$
4. [Fraction $+, -$] *
 $\frac{1}{x} + \frac{1}{(x+1)} =$ $\frac{2x+1}{x(x+1)}$
5. [Fraction \times, \div] *
 $\frac{4y+12}{4y} =$ $\frac{y+3}{y}$
6. [Percentages] *
 A new car is bought for \$23 900. The value depreciates 20% per year. Find the value of the car at the end of the second year. \$ 15 296
7. [Integer $+, -$] *
 $(w - 2w) + (3w - 4w) =$ -2w
8. [Integer \times, \div] *
 $\frac{-50}{3} \times \frac{-18}{2} =$ 150
9. [Rates / Ratios] *
 This table is printed on the side of a box of muffin mix. How many cups of mix should be used to make 50 muffins? [Leave your answer as a mixed number.]

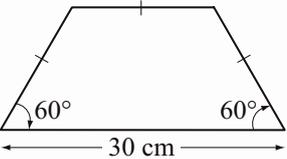
muffins	amount of mix	amount of water
12	1 cup	$\frac{3}{4}$ cups
24	2 cups	$1\frac{1}{2}$ cups
36	3 cups	$2\frac{1}{4}$ cups

 $4\frac{1}{6}$
10. [Indices] *
 Given $2^{23} = 8\,388\,608$ evaluate 8^8 . 16 777 216
11. [Square Roots / Surds] *
 Rationalise $\frac{2\sqrt{3}-1}{\sqrt{3}-1}$ $\frac{5+\sqrt{3}}{2}$
12. [Order of Operations] *
 $(10001 - 10^4) \times 1999 =$ 1999
13. [Exploring Number] *
 If A is $133\frac{1}{3}\%$ of B , express B as a percentage of A . 75%
14. [Scientific Notation]
 Evaluate and express in scientific notation $\sqrt{1.21 \times 10^{-4}}$ 1.1×10^{-2}
15. [Number Patterns] *
 If $t_1 = 3, t_2 = 1$ and $t_{n+1} = t_{n-1} - t_n$, find the first four terms of the pattern. 3, 1, 2, -1
16. [Expressions]
 To produce a single bottle of grape juice g kilograms of grapes are required. How many kilograms of grapes are needed to make b bottles of grape juice? gb kg
17. [Substitution] *
 If $x = t - 1$ and $y = t - 2$, express y in terms of x . $y = x - 1$
18. [Expansion] *
 Expand and simplify $(x + 1)^2(x - 1)$ $x^3 + x^2 - x - 1$
19. [Factorisation] *
 Factorise $3y^3 - 12y^2 + 12y$ $3y(y - 2)^2$
20. [Equations] *
 Solve for x :
 $x^2 - 6x - 7 = 0$ 7, -1
21. [Graphs & Functions] *
 Sketch the graph of equation $y = x^2 + 2x - 3$ labelling intercepts, axis of symmetry and turning point.

22. [Units of Measurement / Time]
 What does the prefix 'mega' represent?
 A) 10^9 B) 10^6 C) 10^3 D) 10^1

B

23. [Perimeter] *
 Find the perimeter of the trapezium.

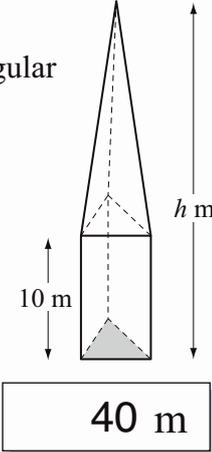


75 cm

24. [Area] *
 If you double the circumference of a circle what will happen to its area?

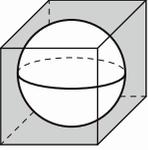
it increases four times

25. [Volume] *
 An obelisk type monument is constructed by placing a triangular pyramid on top of a triangular prism as shown. The same volume of concrete was used to form both the 10 m high prism which forms the base and the pyramid on top. What is the full height 'h' of the monument?



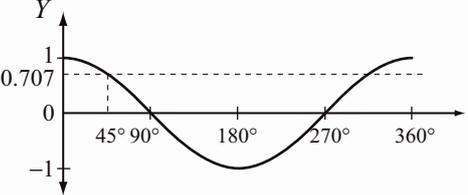
40 m

26. [Surface Area] *
 Using $\pi \approx 3.14$ find the surface area of a sphere which just fits inside a cube with a volume of 1000 cm^3 .



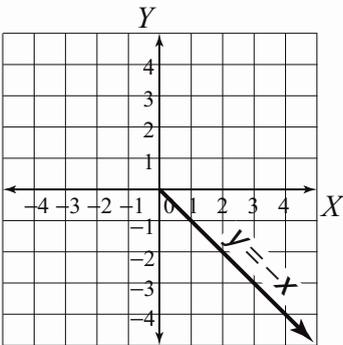
314 cm^2

27. [Pythagoras / Trigonometry]
 The graph shows that $\cos 45^\circ \approx 0.707$
 What is the other angle between 0° and 360° that has the same cosine value?

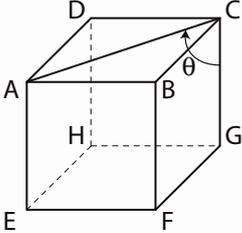


315°

28. [Shape / Location]
 Draw the shape formed by all the points that are in the fourth quadrant, equally distanced from the X and Y axes.

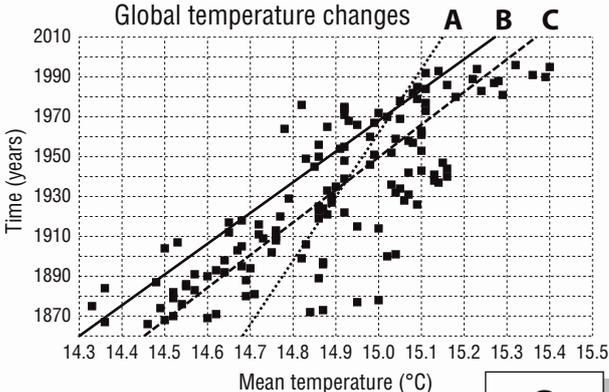


29. [Angles] *
 Find the value of $\angle ACG$, marked θ , in the cube.



90°

30. [Statistics]
 Select the most appropriate 'line of best fit'.



C

31. [Probability] *
 A red die is rolled, and then a blue die is rolled. What is the probability of obtaining a total of 7 given that a 4 was thrown with the red die?

$\frac{1}{6}$

32. [Problem Solving 1] *
 I reduced a diagram on my computer using a scale factor of 80%. What scale factor is required to return the diagram to its original size?

125%

33. [Problem Solving 2] *
 An orange can be cut into eight pieces using just three straight cuts. Find the maximum number of pieces obtainable using seven cuts.



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MATHS MATE



Teacher Resource



Teacher's Guide to the Use of Maths Mate

pages i - viii



Student Workbook Answers

pages 3 - 72



Student Workbook Short Answers

pages 1 - 8



Problem Solving Hints & Solutions

pages 1 - 18



Test Masters

pages 1 - 32



Test Answers

pages 1 - 32



Record Keeping Sheets

pages 1 - 10

1.1

- 4256
- 4.03
- 0.06
- $\frac{3x}{5}$
- $6\frac{2}{3}$
- \$6.15
- 4
- 60
- 190 : 133 : 152
- $2\frac{1}{4}$
- $12\sqrt{14}$
- 2
- \$15.50
- 3
- 90, 270
- $p + q + w$
- 22.5
- $4x^2y - 2xy^2$
- $\frac{x-2}{x}$
- 6

function	gradient (m)	x-intercept	y-intercept (c)
$y = 3x$	3	(0,0)	(0,0)
$y = 3x - 6$	3	(2,0)	(0,-6)

- 26 h 55 min
- 100 m
- 900 kg
- 72 cm^3
- 192 cm^2
- 2 m
- 6
- $32.5^\circ, 147.5^\circ, 32.5^\circ$
- 72
- $\frac{12}{25}$
- 6
- 100

1.2

- 4556
- 3.55
- 300
- $\frac{3y}{7}$
- $1\frac{3}{7}$
- \$397
- 16
- 50
- 288 : 216 : 252
- 64
- $3\sqrt{2}$
- 67
- \$80.50
- 3
- $\frac{1}{9}, \frac{1}{27}$
- $m + n - k$
- 390
- $10x^2y - 15xy$
- $\frac{2x}{3}$
- 11

function	gradient (m)	x-intercept	y-intercept (c)
$y = -5x$	-5	(0,0)	(0,0)
$y = 5x$	5	(0,0)	(0,0)

- 11 h 15 min
- 15 500 mm
- 50 m^2
- 30 cm^3
- 150 m^2
- 120 mm
- 120°
- 60°
- $\frac{4}{3}$
- $\frac{15}{17}$
- 32 s
- 4

1.3

- 1612
- 3.12
- 0.028
- $\frac{3}{f}$
- $3\frac{1}{5}$
- \$998.50
- 6
- 8
- \$54 : \$72 : \$90
- 4
- $\frac{4\sqrt{3}}{3}$
- 10
- \$98.75
- 2
- 48, 192
- 15 g
- 0.064 m^3
- $5x^3 - 15x^2 + 10x$
- $\frac{2x+5}{2x}$
- 5

function	gradient (m)	x-intercept	y-intercept (c)
$y = \frac{1}{2}x + 2$	$\frac{1}{2}$	(-4,0)	(0,2)
$y = \frac{1}{2}x + 3$	$\frac{1}{2}$	(-6,0)	(0,3)

- 2210 h on 06/02/2010
- 9600 mm
- \$30
- 2800 mm^3
- 432 cm^2
- $1\frac{2}{3}$
- 2
- 140°
- 12
- $\frac{15}{34}$
- 36
- 11, 12, 20

1.4

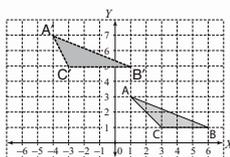
- 1.5
- 8.27
- 200
- $\frac{3}{g}$
- $2\frac{2}{5}$
- \$100 025
- 3
- 2
- 208 : 130 : 104
- 1
- $8\sqrt{15}$
- 9
- \$0
- 1
- $\frac{3}{4}, \frac{3}{8}$
- $\frac{s+t}{2}$
- 1440°
- $12x^3 + 20x^2$
- $\frac{1}{2}$
- 4

function	gradient (m)	x-intercept	y-intercept (c)
$y = -2x$	-2	(0,0)	(0,0)
$y = -2x + 2$	-2	(1,0)	(0,2)

- 2215 h on 13/02/2010
- 5800 mm
- \$3.75
- 980 m^3
- 216
- 2 cm
- 90°
- 92°
- 300
- $\frac{9}{13}$
- 108
- 100

1.5

- 1144
- 10.85
- 0.05
- $1\frac{4}{7}$
- $\frac{m}{3}$
- \$4500
- 11
- $-2t$
- 20 km
- b^{12}
- $3\sqrt{5}$
- 3
- 0.025
- $9.16 \times 10^6 \text{ km}^2$
- 30, 62
- $\frac{d}{2} + 2$
- 13
- $x^2 + 5x + 6$
- $(x+a)(x+b)$
- $-\frac{2}{3}$
- $y = 5x + 12$
- 240 000 cm
- 31.4 cm
- 44 cm^2
- 9420 m^3
- 31.4 cm^2
- θ

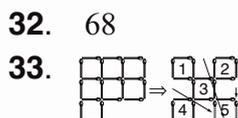


29. 38°

30. 1980 - 1990

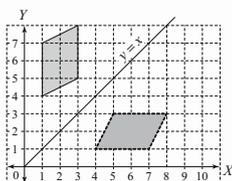
31. $\frac{12}{37}$

	Mai	Jane	Julius	Total
Yr 10 students	30	6	1	37
Yr 11 students	3	28	7	38
Yr 12 students	5	3	28	36
Total	38	37	36	111



1.6

- 205
- 6.35
- 42
- $1\frac{2}{15}$
- $\frac{3}{5}$
- \$67.50
- 5
- $2r$
- 2.5 km
- $-e^{14}$
- $10\sqrt{2}$
- 94
- $2.\dot{8}$
- $4.5 \times 10^9 \text{ years}$
- 10, 16
- $k + z - 3$
- 33
- $x^2 + x - 2$
- $(x+y)(x^2 + y^2)$
- $-\frac{3}{4}$
- $y = -\frac{1}{2}x + 1$
- 800 L
- 14 cm
- 170 cm^2
- 30.8 L
- 5680 cm^2
- β



29. 50°

30. $\frac{1}{8}$ or $\frac{3}{24}$

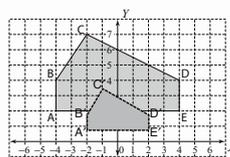
31. $\frac{22}{43}$

	Men	Women	Total
String	10	12	22
Woodwind	6	9	15
Brass	3	3	6
Total	19	24	43

32. 864 m^2
33. 3 m

1.7

- 81
- 2.03
- 0.4
- $1\frac{11}{30}$
- $1\frac{1}{5}$
- \$2400
- 1
- $-9m$
- 3 min
- $-8x^9$
- $2x\sqrt{3x}$
- 9
- $0.08\dot{3}$
- 1.3×10^4
- 24, 39
- $5b + 2$
- 12
- $x^2 - 25$
- $(a-3)(2ab-3)$
- 5
- $y = -5x - 2$
- 5000 mm^3
- 5.5 m/s
- 12.5 m^2
- 1884 cm^3
- 219.8 cm^2
- θ



29. 110°

30. D

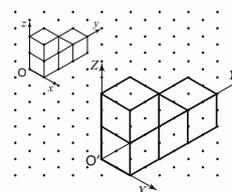
31. $\frac{1}{7}$

	Toyota	Nissan	Ford	Total
Vans	4	3	6	13
4x4	5	5	0	10
Sedans	2	9	1	12
Total	11	17	7	35

32. E
33. 12 km/h

1.8

- 99
- 2.75
- 0.1
- $\frac{17}{24}$
- $\frac{1}{2}$
- \$70 000
- 9
- $3y$
- 8 min
- $12m^8$
- $4\sqrt{2}t$
- 16
- $2.\dot{1}4285\dot{7}$
- 4.1×10^{-3}
- 57, 62
- $\frac{f+d}{3}$
- 72
- $x^2 - 16$
- $(e+f)(5+e)$
- $\frac{1}{4}$
- $y = \frac{3}{7}x - \frac{2}{7}$
- 1000 g
- 3.454 m
- 2100 mm^2
- $15\,400 \text{ mm}^3$
- 942 cm^2
- β



29. 26°

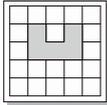
30. 30°C

31. $\frac{4}{23}$

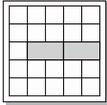
	18-35 years	36-55 years	55+ years	Total
Yes	300	900	200	1400
No	100	400	400	900
Total	400	1300	600	2300

32. $2p + 3$
33. 3

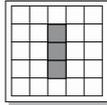
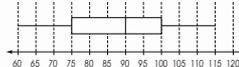
2.1

1. 1452
2. 0.957
3. 1.92
4. $\frac{3x}{4}$
5. $16\frac{1}{2}$
6. \$150/week
7. 6
8. 60
9. 1 : 600 000
10. 1000
11. 3 and 4
12. -9
13. 60
14. C
15. $3\frac{2}{5}, 4$
16. $17x^2 - 12x - 1$
17. 0
18. $2x^2 + 4x - 2$
19. $(2x + 5)^2$
20. $(-2, -3)$
21. $x = -2$
22. 2 cm²
23. 22 m
24. 0.86 cm²
25. 3200 cm³
26. 1.32 m²
27. 0.6
28. 
29. $x^\circ = 55^\circ, y^\circ = 62.5^\circ$
30. range = 8.5, IQR = 4.5
31. $\frac{1}{4}$ or 0.25
32. 2
33. 30

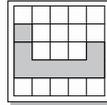
2.2

1. 540
2. 0.389
3. 0.122
4. $\frac{2d}{15}$
5. $9\frac{1}{3}$
6. \$927
7. -13
8. -2
9. 52 cm
10. $\frac{1}{4}$
11. 4 and 5
12. 230
13. 0.4 ha
14. A
15. $5\frac{1}{3}, 4\frac{2}{3}$
16. $4x + 2$
17. 4
18. $3x^2 - 10x + 12$
19. $(x - 3)^2$
20. (2,3)
21. $y = -x$
22. 0.3 m²
23. 1600 m
24. 14 cm²
25. 121.5 cm³
26. 62.4 cm²
27. 0.28
28. 
29. $x^\circ = 65^\circ, y^\circ = 115^\circ, z^\circ = 65^\circ$
30. range = 6.5, IQR = 3.5
31. $\frac{1}{6}$ or 0.16
32. A
33. 1, 6, 15, 19, 34, 52

2.3

1. 468
2. 0.55
3. 80
4. $\frac{5w}{6}$
5. $9\frac{3}{5}$
6. \$255
7. -11
8. -42
9. 1 : 800 000
10. 8
11. 8 and 9
12. -12
13. 93.5 m
14. D
15. 0.4, 0.2
16. $3y^2 - 13y - 6$
17. 15
18. $x^2 + 2xy + y^2$
19. $(3x + 2y)(3x - 2y)$
20. (-1,4)
21. $y = -x + 1$
22. 2750 mm³
23. 3000 m
24. 5.72 cm²
25. 1200 cm³
26. 1884 mm²
27. 0.8
28. 
29. 108°
30. 
31. $\frac{1}{2}$ or 0.5
32. 25
33. 286

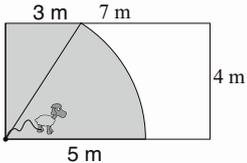
2.4

1. 93
2. 0.971845
3. 0.08
4. $\frac{9r}{10}$
5. $13\frac{1}{3}$
6. 20210
7. -9
8. -14
9. 730 cm
10. 125
11. 5 and 6
12. 9
13. 10.8 L
14. D
15. 0.25, 0.125
16. $y^3 - 4y^2 + 4y + 2$
17. 2
18. $x^2 + 6xy + 9y^2$
19. $2(2c - d)(2c + d)$
20. $(-\frac{6}{5}, 4)$
21. $y = 2x + 4$
22. 20 000 000 mm³
23. 400 m
24. 38.5 m²
25. 105 cm³
26. 1.32 m²
27. 2.4
28. 
29. 115°
30. median = 7.6, LQ = 6.8, UQ = 8.2
31. $\frac{1}{6}$ or 0.16
32. 7
33. isosceles or equilateral

2.5

1. 3048
2. 4.359
3. 0.144
4. $\frac{11}{30}$
5. $2 + 5g$
6. 20%
7. $-7q$
8. 9
9. 140 000 h
10. $4a^3b^3$
11. $2 + 3\sqrt{2}$
12. -16
13. 5
14. 10^3
15. 2, 4, 8, 16
16. $n, n + 1, n + 2$
17. -18
18. $4a^2 - 4a - 15$
19. $(x + 4)(x + 1)$
20. 24
21. (-1, 2)
22. 5500 kg/m^3
23. 65.4 cm
24. 14.5 cm^2
25. 314 m^3
26. 432 m^2
27. $2\sqrt{10}$
28. B
29. 20°
30. 2
31. $\frac{3}{5}$ or 0.6
32. 320 km
33. 25 : 16 : 9

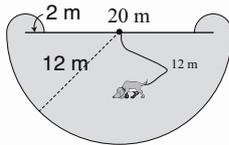
2.6

1. 46
2. 2.689
3. 0.77
4. $2\frac{37}{40}$
5. $4t + 2$
6. 255 km/h
7. $-9z$
8. -28
9. 144 000 000 km
10. $\frac{1}{2}$
11. $2\sqrt{5} - 5$
12. 1027
13. 4 days
14. 10^2
15. 1, 9, 25, 49
16. $\frac{2n+1}{2}$
17. $-\frac{19}{20}$
18. $10x^2 - 29x + 10$
19. $(y + 1)(y + 5)$
20. 0
21. (0, 1) & (3, 7)
22. 19290 kg/m^3
23. 114.2 m
24. 25 mm^2
25. 942 mm^3
26. 104 m^2
27. $\sqrt{41}$
28. 
29. $x^\circ = 60^\circ, y^\circ = 120^\circ$
30. 8
31. $\frac{1}{7}$
32. 0
33. 56

2.7

1. 8.3
2. 9.941
3. 0.36
4. $2\frac{7}{24}$
5. $3 + k$
6. \$48
7. $8w$
8. 36
9. 3 min 12 s
10. $6s^4t^2$
11. $6\sqrt{3} + 6$
12. 69
13. 10
14. 10^4
15. 1, 3, 7, 13
16. $3n$
17. -2.2
18. $x^4 + 7x^2 + 10$
19. $(x - 1)(x - 2)$
20. -40
21. (-1, -2)
22. 2699 kg/m^3
23. 11.14 m
24. 3.4 cm
25. 785 cm^3
26. 180 m^2
27. $2\sqrt{5}$
28. B
29. 30°
30. 1
31. $\frac{4}{5}$ or 0.8
32. men = 35, boats = 7
33. \$10 652

2.8

1. 52.4
2. 4.1965
3. 81
4. $4\frac{1}{6}$
5. $4m - 2$
6. \$1260
7. $-4z$
8. -9
9. 1256 km/h
10. a^3
11. $6\sqrt{5} + 20$
12. 29
13. 1.5 h
14. 10^4
15. $\frac{1}{2}, \frac{2}{3}, \frac{3}{4}, \frac{4}{5}$
16. $3n + 6$
17. $\frac{2}{3}$
18. $y^4 - 36$
19. $(a - 2)(a - 4)$
20. 6
21. (-1, 1) & (2, 4)
22. 1 kg/L
23. 135.7 mm
24. 13.5 m^2
25. 2310 m^3
26. 135 m^2
27. $3\sqrt{5}$
28. 
29. 30°
30. 1.5
31. $\frac{1}{2}$ or 50%
32. -3
33. 1 h

3.1

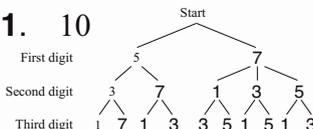
- 435
- $x = 17.25$
- $x = 0.1$
- $\frac{1}{4}$
- $3\frac{3}{5}$
- \$731
- 0
- $-3n$
- 200 L
- m^5
- $1\frac{1}{2}$
- 9
- $\frac{5}{2}$
- 3140
- $5, 4\frac{1}{2}, 4\frac{1}{3}, 4\frac{1}{4}$
- $8n$ cents
- 4
- $-6x^3 - x^2 + x$
- $(2x + 1)(2x + 5)$
- 0, -12

x	-2	-1	0	1	2	3
y	11	2	-1	2	11	26

- 1000r mL
- 48 cm
- $A = \frac{d^2}{2}$
- 1 m^3
- 880 mm^2
- 6
- 6.4
- 42°

		GIRLS		stem	BOYS	
		leaves			leaves	
9	7	6	6	1.4	8	9
		6	3	1.5	0	6
		8	5	1.6	3	4
			4	1.7	0	5
			2	1.8	1	2
			1			

- 10
- 3^{12}
- $1 + \sqrt{9} \times \sqrt{(\sqrt{9} + 6)} = 10$

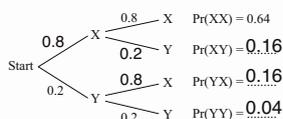


3.2

- 79.8
- $x = 5.73$
- $x = 0.01$
- $\frac{11}{15}$
- $1\frac{11}{15}$
- 25%
- 4
- $5r$
- 4500 words
- a^4
- $\frac{3}{8}$
- 84
- $\frac{1}{9}$
- 20
- $\sqrt{3}, 2, \sqrt{5}, \sqrt{6}$
- $\frac{3x}{2}$ books
- 3
- $-3x^3 + 3x$
- $(2y + 3)(5y + 1)$
- 0, 9

x	-3	-2	-1	0	1	2	3
y	15	5	-1	-3	-1	5	15

- $\frac{n}{1000}$ kg
- 32 km
- $A = a^2$
- 61 cm^3
- 282.6 cm^2
- 60
- 1.6 m
- 140°
- 155.5 cm



- 56
- 3

3.3

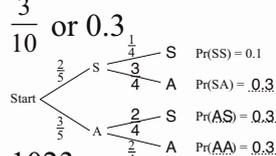
- 73.1
- $x = 0.891$
- $x = 0.01$
- $\frac{17}{60}$
- 4
- \$10 400
- 4
- $-4x$
- 5 500 000 tonnes
- $\frac{1}{p^5}$
- $1\frac{1}{5}$
- 54
- $\frac{17}{9}$
- 0.146
- 9, 25, 49, 81
- $\frac{5x}{18}$ m/s
- 0, 3
- $2y^3 + 3y^2 - 2y$
- $(3y - 1)(2y + 1)$
- 0, -2

x	1	2	3	4	5	6
y	-3	0	5	12	21	32

- $\frac{h}{24}$ days
- 36 cm
- $A = \frac{ab}{2}$
- $V = \frac{l^2w}{4\pi}$
- $96\pi \text{ cm}^2$
- 3.6
- $4\frac{8}{13}$
- 55°
- 30

		PERTH			BRISBANE		
		leaves	stem	leaves	leaves	stem	leaves
9	5	4	1	0	2	2	3
		4	1	0	2	3	4
		2	1	0	3	0	2
					3	0	2

- $\frac{3}{10}$ or 0.3
- 1023
- right-angled



3.4

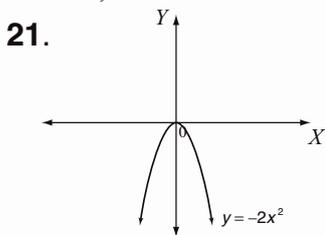
- 6.61
- $x = 0.042$
- $x = 100$
- $\frac{1}{2}$
- $\frac{16}{17}$
- \$48.60
- 2
- $2m$
- US\$2080/kg
- $\frac{1}{12}$
- $3\frac{3}{5}$
- 63
- $\frac{7}{20000}$
- 750
- 0, 2, 6, 12
- $\frac{3y}{20}$ L
- 2, 3
- $y^3 - 9y$
- $(3x + 2)(2x + 7)$
- 0, 6

x	-3	-2	-1	0	1	2	3
y	-21	-11	-5	-3	-5	-11	-21

- $\frac{d}{1000}$ km
- $\frac{14}{9}$
- $A = \pi r^2 + 2r^2$
- 700 mm
- 462 mm^2
- 20
- 1.2 m
- 70°
- 9.5
- $\frac{1}{15}$
- 1584
- 945 409

3.5

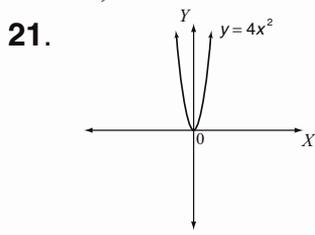
- 34.2
- $x = 0.875$
- $x = 0.01$
- $\frac{3x+7}{4}$
- 1
- 24%
- 2
- 12
- 250 g
- 6
- $7\sqrt{2}$
- 18
- $\sqrt{23}, 2^2, 3$
- 108
- $t_n = 2n$
- $2n + 1$
- yes
- $3x^2 - 9x - 10$
- $\frac{x+1}{x-1}$
- 7, -7



- 108 000
- $P = 2t + t\sqrt{2}$
- 77 cm²
- $V = \frac{\pi a^2 b}{12}$
- $TSA = 7k^2$
- $\sqrt{26}$
- can't be done
- 35°
- 1
- 15
- 9
- 48 000 km

3.6

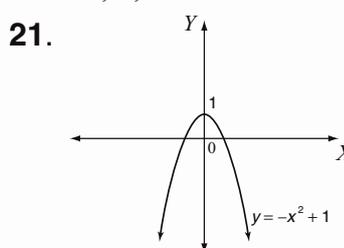
- 3.27
- $x = 0.9535$
- $x = 10$
- $\frac{y}{2}$
- $\frac{12}{xy}$
- 18 km
- 11x
- 70
- 144 g
- 2
- $4\sqrt{3}$
- 1
- $2^3, \sqrt{71}, 3^2$
- 0.09
- $t_n = 2 + n$
- n^2
- yes
- $14x^2 - 8x - 1$
- $\frac{x-3}{x+1}$
- 2, -2



- red deer
- $P = \frac{\pi r}{4} + 2r$
- 32 m²
- $V = n^4 - 1$
- $TSA = 3x^2$
- no
-
- 240°
- 1960 - 1970
- 6
- 5 : 4
- $6531 \times 742 = 4846002$

3.7

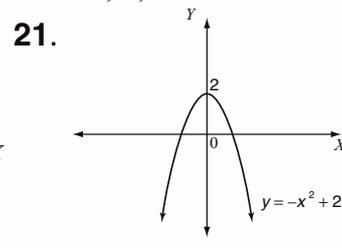
- 9.9
- $x = 0.994$
- $x = 0.01$
- $\frac{1}{8}$
- x
- 25
- 23
- 150
- 10%
- 2
- $\frac{\sqrt{6}}{4}$
- 1 000 000
- $\sqrt{2.25}, 1.45, \left(\frac{6}{5}\right)^2$
- 2×10^{-6}
- $t_n = 5n$
- $n + 1$
- no
- $7x - 11$
- $\frac{x+1}{x+3}$
- 0, 1, -1



- 74 m/s
- $P = 12x + 16$
- 216 m²
- $V = \frac{\pi a^2 b}{8}$
- $TSA = \frac{5\pi d^2}{4}$
- 20 km
- a triangular pyramid on top of a triangular prism
- 70°
- letter
- 18
- 6 L
- 20 feet

3.8

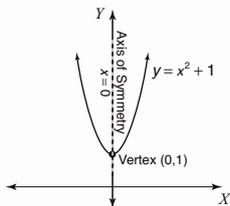
- 4.21
- $x = 0.979$
- $x = 10$
- $\frac{z+1}{2}$
- $10x^2$
- 50
- 0
- 12
- 1.44 m
- 1
- $\frac{2\sqrt{3}}{5}$
- 12
- $\sqrt{2}, 1.42, \left(1\frac{1}{5}\right)^2$
- 9.6×10^{-6}
- $t_n = 17 - 3n$
- $2n + 1$
- no
- $2x^2 + 6x - 23$
- $\frac{x-6}{3x(x+2)}$
- 0, 3, -3



- 91 m/s
- $P = 2\pi r$
- 0.43 m²
- $V = 96\pi r^3$
- $TSA = 4ab + \frac{3a^2}{2}$
- 6.72
-
- 100°
- B
- 25
- 10 000
- 6

4.1

1. 399.5
2. $x = 5.7$
3. $x = \pm 0.1$
4. $\frac{7x+23}{12}$
5. $\frac{2}{5}$
6. \$123.60
7. $2x$
8. -1
9. 12.5 times/h
10. $\frac{3}{8m}$
11. -19
12. 0
13. true
14. 1.6×10^{-3}
15. $t_n = 2n + 1$
16. $2x^3 + 4x^2 - 3x + 3$
17. 17 m/s
18. $a^2 + b^2 + c^2 + 2ab + 2ac + 2bc$
19. $x(3x - 1)(3x + 1)$
20. $-5 < x < -1$

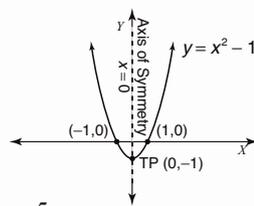


- 21.
22. 100 ha
23. 60 cm
24. $A = \frac{ah}{2}$
25. $V = \frac{32\pi}{3}$
26. A
27. $\frac{\sqrt{2}}{2}$
28. reflection in the line $x = 4$
29. 35°
30. Yr 9 range = 60,
Yr 10 range = 80

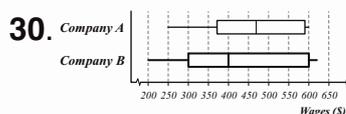
31. 24
32. 4, 42
33. 0.75 m

4.2

1. 206.7
2. $x = 2.117$
3. $x = 0.0001$
4. $\frac{7y+1}{10}$
5. $\frac{7}{h}$
6. 9261 000
7. $14w$
8. 1
9. 10.24 L
10. $\frac{32b}{c^2}$
11. $18 + 4\sqrt{15}$
12. 19
13. true
14. 8.1×10^{-9}
15. $t_n = n^2$
16. $3x^3 + x^2 + 2x + 2$
17. 450 m
18. $4a^2 + b^2 + c^2 + 4ab + 4ac + 2bc$
19. $2(x - 3y)(x + 3y)$
20. $-1 < x < 7$



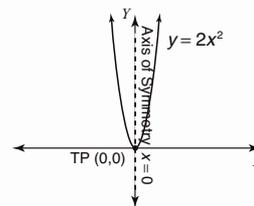
- 21.
22. $\frac{5s}{18}$ m/s
23. 54 cm
24. $A = a^2 + b^2$
25. 6 m
26. $\frac{4}{1}$ or 4 : 1
27. 1
28. B
29. 74°



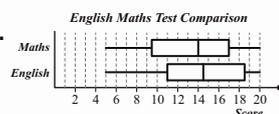
- 30.
31. 27
32. 4
33. Start both, when 4 runs out, reverse 4. When 7 runs out, reverse 4 again. When 4 runs out, biscuits are ready.

4.3

1. 3.21
2. $x = 16.05$
3. $x = \pm 0.03$
4. $\frac{2z-10}{15}$
5. $5t$
6. \$26 620
7. $9y$
8. $\frac{3}{2}$
9. 338.4 ML/min
10. $\frac{1}{48a^4b^4}$
11. $19 + 8\sqrt{5}$
12. -1
13. false
14. 2.7×10^{13}
15. $t_n = 4n + 2$
16. $5x^3 - 3x^2 - x - 6$
17. 27 000 m
18. $x^2 + 4y^2 + 9z^2 + 4xy + 6xz + 12yz$
19. $2a(abc - 2b + 3c)$
20. $x \leq -2$ or $x \geq 4$



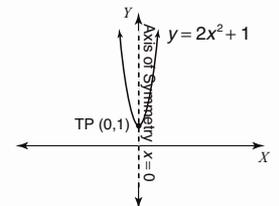
- 21.
22. d g/cm³
23. 38 cm
24. $A = 8c + 16$
25. 63π m³
26. $\frac{3}{2}$ or 3 : 2
27. $\frac{\sqrt{3}}{2}$
28. rotation of 180° about (4,4)
29. 95°



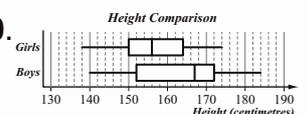
- 30.
31. 6
32. 80
33. $2n + 1$

4.4

1. 459
2. $x = 10.049$
3. $x = 0.16$
4. $\frac{5w+11}{6}$
5. $\frac{2}{3}$
6. \$1464.10
7. $-12p$
8. -1
9. 15.3 L
10. 1
11. -18
12. 0
13. true
14. 8×10^{-9}
15. $t_n = 16 - 3n$
16. $x^3 - x^2 - x + 3$
17. $-\frac{1}{4}, -1$
18. $x^2 + 4y^2 + z^2 + 4xy - 2xz - 4yz$
19. $3y(y - 2)^2$
20. $x = -2$



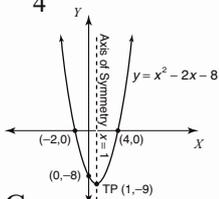
- 21.
22. $1000v$ L
23. 21 cm
24. $A = ab$
25. 720π mm³
26. sphere
27. $\frac{\sqrt{3}}{3}$
28. (6,6)
29. 60°



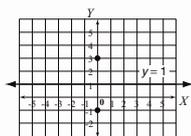
- 30.
31. 30
32. 4 days
33. 30 km

4.5

- 39
- $x = 3.29$
- $x = 0.2$
- $\frac{3}{2x}$
- 3
- \$20 000
- $-2x$
- 4
- 2 : 3 : 6
- 1
- $2(2 - \sqrt{3})$
- 2012
- 250%
- 5×10^3
- 625, 125, 25, 5
- $\$ \frac{11d}{10}$
- $y = 2x + 5$
- $x^3 + 3x^2 + 3x + 1$
- $(3a - 1)(2a + 5)$
- $-\frac{1}{4}, -1$
- 21.



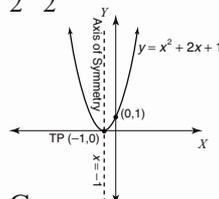
- C
- 56 cm
- 218 m²
- 190 cm³
- 11 304 cm²
- A(90°, 1), B(180°, 0), C(270°, -1)



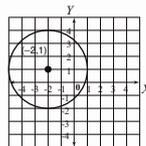
- 56°
- C
- $\frac{3}{4}$
- 5
- A = 120, B = 360, C = 72 min

4.6

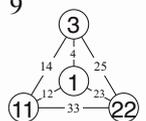
- 3.4
- $x = 1.61$
- $x = \pm 0.5$
- $\frac{4}{3y}$
- k
- \$1760
- $-2y$
- 2
- 3 : 2 : 1
- true
- $\frac{-7 - 2\sqrt{10}}{3}$
- -7
- 125%
- 7×10^{-2}
- $3, \frac{1}{3}, 3, \frac{1}{3}$
- $\frac{5b}{2}$ pens
- $y = 4x + 2$
- $a^3 + 2a^2 - 9a - 18$
- $(x - 2y)(x + 2y)(x^2 + 4y^2)$
- $\frac{1}{2}, \frac{3}{2}$
- 21.



- C
- 54 cm
- 314 cm²
- 706.5 cm³
- 235.5 cm²
- 150°

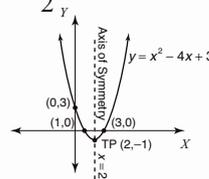


- 60°
- B
- $\frac{5}{9}$
- 32.
- 24

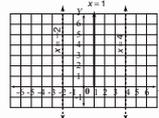


4.7

- 1.6
- $x = 0.01$
- $x = \pm 0.12$
- $\frac{y+x}{xy}$
- $k + 1$
- \$7000
- 0
- 27
- 4 : 3
- 8
- $3 - \sqrt{3}$
- 7
- 60%
- 2×10^{-4}
- 3, 4, 7, 11
- $\$ \frac{zd}{p}$
- $y = 9x^2 - 1$
- $x^3 + 10x^2 + 31x + 30$
- $(x^2 + y)^2$
- $-\frac{1}{2}, -1$
- 21.



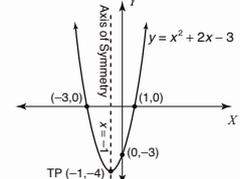
- B
- 38 cm
- 924 mm²
- 3 cm
- 314 cm²
- A(0°, 1), B(270°, 0), C(360°, 1)



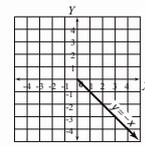
- $x^\circ = 20^\circ, y^\circ = 36^\circ$
- B
- $\frac{3}{5}$
- 6 days
- 2, 2, 9

4.8

- 35
- $x = 0.947$
- $x = 0.09$
- $\frac{2x+1}{x(x+1)}$
- $\frac{y+3}{y}$
- \$15 296
- $-2w$
- 150
- $4\frac{1}{6}$
- 16 777 216
- $\frac{5+\sqrt{3}}{2}$
- 1999
- 75%
- 1.1×10^{-2}
- 3, 1, 2, -1
- gb kg
- $y = x - 1$
- $x^3 + x^2 - x - 1$
- $3y(y - 2)^2$
- 7, -1
- 21.



- B
- 75 cm
- it increases 4 times
- 40 m
- 314 cm²
- 315°



- 90°
- C
- $\frac{1}{6}$
- 125%
- 64

MATHS MATE



Teacher Resource



Teacher's Guide to the Use of Maths Mate

pages i - viii



Student Workbook Answers

pages 3 - 72



Student Workbook Short Answers

pages 1 - 8



Problem Solving Hints & Solutions

pages 1 - 18



Test Masters

pages 1 - 32



Test Answers

pages 1 - 32



Record Keeping Sheets

pages 1 - 10

A Teacher's Guide to approaching
PROBLEM SOLVING

Dear Educator

The following Problem Solving Hints & Solutions have been designed to support users of the Maths Mate Program.

The Maths Mate problem solving questions at each level have proved challenging for many.

Within these Hints & Solutions only one or two alternative strategies have been presented to show how the problem may be solved. Often many other approaches are both practical and possible; after all, "the human race has not really started to 'think'." - Edward De Bono

Outlined on this page is a general problem solving approach that may help you to develop the problem solving skills of your students.

Inevitably, students are more likely to be successful if they:

- *have the courage to try,*
- *can find a place to start and*
- *have approach options to choose from.*

Best wishes

The Maths Mate Team

FIRST:

- * Accept the challenge.
- * Read the problem.
- * Read the problem out loud.

THEN:

- * Find out the meaning of any unknown terms.
- * Highlight the essential truths.
- * Restate the problem in your own words.
- * Break the problem up into parts.

BE SURE ABOUT:

- * What you know from the problem. (Given)
- * What you need to find out. (Goal)

CHOOSE YOUR SOLUTION STRATEGY/STRATEGIES:

1. Write a numerical/algebraic equation deciding which operations to use, given the word statements.
2. Look for a pattern then make and test generalisations/conjectures that describe the relationship between variables.
3. Draw a diagram: sketch
table
graph
number line

OR Make a model.
4. Apply standard techniques or models.
e.g. Pythagoras' Theorem
5. Simplify the problem and work on a reduced version. Extrapolate back to the original problem.
6. Be systematic. Make a list. Progress step by step.
7. Work backwards if you have the answer.
8. Use trial and error. Estimate, check against the facts and then refine your estimation.

WHERE TO START:

- * Start: with what is known
with an odd or distinctive feature
with the smallest
with the easiest.

FINALLY:

- * Double check your answer against the original statements. Does your answer satisfy all the conditions of the problem?

PRESENTATION:

- * Choose suitable modes of communication to present and explain your outcomes and results.

1.1

32. Hint: *No clues allowed!*

Solution: There are 5 different colours. All you have to do is take 6 socks from the drawer. Because you don't have 6 different colours, you will end up with having at least one pair of socks of the same colour.
The answer is **6** socks.

33. Hint: *You could start adding the numbers 1 to 100.*

OR Use a trick instead!

Solution: There are 100 brackets on the left hand side, so the equation becomes:

$$100x + (1 + 2 + 3 + \dots + 100) = 15\,050$$

The sum of the numbers 1 to 100 (S) can be written in two different ways:

$$S = 1 + 2 + 3 + 4 + \dots + 98 + 99 + 100$$

or

$$S = 100 + 99 + 98 + 97 + \dots + 3 + 2 + 1$$

Add both sums as shown in the diagram above:

$$\begin{aligned} 2S &= 101 + 101 + 101 + 101 + \dots + 101 + 101 + 101 \\ &= 100 \times 101 \\ &= 10\,100 \\ S &= \frac{10\,100}{2} = 5050 \end{aligned}$$

The equation becomes:

$$100x + 5050 = 15\,050 \quad \text{subtract 5050 from both sides}$$

$$100x = 10\,000 \quad \text{divide both sides by 100}$$

$$x = 100$$

1.2

32. Hint: *Find the number of seconds in a year, considering both a year with 365 days and a leap year with 366 days.*

Solution:

$$\begin{aligned} \text{1 year} &= 365 \text{ days} \\ &= 365 \times 24 \text{ hours} \\ &= 365 \times 24 \times 3600 \text{ seconds} \\ &= 31\,536\,000 \text{ seconds} \end{aligned}$$

$$\begin{aligned} \text{A millionth of 1 year} &= 31\,536\,000 \div 1\,000\,000 \\ &= 31.536 \quad \text{round to the nearest whole number} \\ &\approx \mathbf{32} \text{ seconds} \end{aligned}$$

$$\begin{aligned} \text{1 leap year} &= 366 \text{ days} \\ &= 366 \times 24 \text{ hours} \\ &= 366 \times 24 \times 3600 \text{ seconds} \\ &= 31\,622\,400 \text{ seconds} \end{aligned}$$

$$\begin{aligned} \text{A millionth of 1 year} &= 31\,622\,400 \div 1\,000\,000 \\ &= 31.6224 \quad \text{round to the nearest whole number} \\ &\approx \mathbf{32} \text{ seconds} \end{aligned}$$

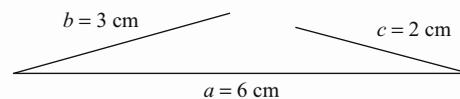
To the nearest whole second, one millionth of a year equals **32** seconds.

33. Hint: *List all the different triplets of whole numbers {a,b,c} that add to 11. Establish the rule:*

Rule: *In any triangle with side lengths a, b, c, any one side must always be smaller than the sum of the other two sides:*

$a < b + c$, $b < c + a$ and $c < a + b$ must all be true.

e.g. *A triangle with side lengths of 6, 3, 2 results in $a < b + c$ being false, so it is an impossible triangle.*



Solution: The different triplets of whole numbers that add to 11 are:

$$\begin{aligned} &\{1,1,9\} \quad \{2,2,7\} \quad \{3,3,5\} \\ &\{1,2,8\} \quad \{2,3,6\} \quad \{3,4,4\} \\ &\{1,3,7\} \quad \{2,4,5\} \\ &\{1,4,6\} \\ &\{1,5,5\} \end{aligned}$$

Using the rule above, impossible triangles have been eliminated. The only possible triangles are {1,5,5}, {2,4,5}, {3,3,5} and {3,4,4}.

Using 11 matchsticks, **4** different triangles can be formed.

32. **Hint:** Any two digit number AB can be represented in base 10 as: $AB = 10 \times A + B$. Use expanded notation for a 2-digit number and algebra.

e.g. $58 = 5 \times 10 + 8$

Solution: Let AB represent the two digit number that is twice the product of its digits.

Write the equation:

$$10 \times A + B = 2 \times A \times B \quad \text{solve for } B$$

$$B(2A - 1) = 10A$$

$$B = \frac{10A}{2A - 1} \quad \text{write as a sum of two fractions with denominator } 2A - 1, \text{ so one fraction can be reduced to a whole number.}$$

$$B = \frac{10A - 5 + 5}{2A - 1} \quad \text{factorise}$$

$$B = \frac{5(2A - 1) + 5}{2A - 1} \quad \text{write as a sum of two fractions}$$

$$B = \frac{5(2A - 1)}{2A - 1} + \frac{5}{2A - 1} \quad \text{reduce the first fraction}$$

$$B = 5 + \frac{5}{2A - 1}$$

So $2A - 1$ must be a positive or negative factor of 5.

Therefore $2A - 1$ must equal ± 1 or ± 5 .

$$2A - 1 = -1 \quad A = 0 \text{ and } B = 0 \text{ (false)}$$

$$2A - 1 = 1 \quad A = 1 \text{ and } B = 10 \text{ (false)}$$

$$2A - 1 = -5 \quad A = -2 \text{ and } B = 4 \text{ (false)}$$

$$2A - 1 = 5 \quad A = 3 \text{ and } B = 6 \text{ (true)}$$

Check against the initial statement: $36 = 2 \times 3 \times 6$

The two digit whole number that is twice the product of its digits is **36**.

33. **Hint:** Solve the equation for a and find restrictions for b .

Solution:

$$a + b + ab = 39 \quad \text{solve for } a$$

$$a(b + 1) = 39 - b$$

$$a = \frac{39 - b}{b + 1} \quad \text{write as a sum of two fractions with denominator } b + 1, \text{ so one fraction can be reduced to a whole number.}$$

$$a = \frac{39 - b + 1 - 1}{b + 1} \quad \text{factorise}$$

$$a = \frac{-(b + 1) + 40}{b + 1} \quad \text{write as a sum of two fractions}$$

$$a = \frac{-(b + 1)}{b + 1} + \frac{40}{b + 1} \quad \text{reduce the first fraction}$$

$$a = -1 + \frac{40}{b + 1}$$

a and b must be positive integers, so $b + 1$ must be a positive factor of 40.

Therefore $b + 1$ must equal 1, 2, 4, 5, 8, 10, 20 or 40.

$$b + 1 = 1 \rightarrow b = 0 \text{ and } a = 39 \text{ (false, } b \text{ must be positive)}$$

$$b + 1 = 2 \rightarrow b = 1 \text{ and } a = 19 \rightarrow a + b = 20$$

$$b + 1 = 4 \rightarrow b = 3 \text{ and } a = 9 \rightarrow a + b = 12$$

$$b + 1 = 5 \rightarrow b = 4 \text{ and } a = 7 \rightarrow a + b = 11$$

$$b + 1 = 8 \rightarrow b = 7 \text{ and } a = 4 \rightarrow a + b = 11$$

$$b + 1 = 10 \rightarrow b = 9 \text{ and } a = 3 \rightarrow a + b = 12$$

$$b + 1 = 20 \rightarrow b = 19 \text{ and } a = 1 \rightarrow a + b = 20$$

$$b + 1 = 40 \rightarrow b = 39 \text{ and } a = 0 \text{ (false, } a \text{ must be positive)}$$

The three possible values for $a + b$ are **11, 12 and 20**.

32. **Hint:** Use the index laws:

$$(1) a^{m+n} = a^m \times a^n$$

$$(2) a^{mn} = (a^m)^n$$

$$\begin{aligned} \text{Solution: } x^{(2a+3b)} &\stackrel{(1)}{=} x^{2a} \times x^{3b} \\ &\stackrel{(2)}{=} (x^a)^2 \times (x^b)^3 \end{aligned}$$

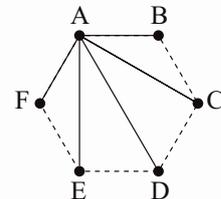
$$\text{Substitute } x^a = 2 \text{ and } x^b = 3 \rightarrow = 2^2 \times 3^3$$

$$\begin{aligned} \text{Order of operations} &\rightarrow = 4 \times 27 \\ &= \mathbf{108} \end{aligned}$$

33. **Hint: Diagonals of a hexagon ($n = 6$):**

In a hexagon we can draw 5 lines from A to each of B, C, D, E and F . Two of these lines (AB and AF) are sides of the hexagon, so diagonals from $A = 5 - 2 = 3$. In total we have $6 \times 3 = 18$ diagonals. But lines from A to C and C to A are the same so we have exactly half of 18 different diagonals, which is 9.

Use this to find the general formula for the number of diagonals of a polygon with n sides.



Solution:

For any polygon with n sides (vertices) we can draw $n - 1$ lines from each corner (vertex) to the others.

Two of these lines are sides of the polygon. So we are left with $(n - 1) - 2 = n - 3$ diagonals from each vertex.

That leads to a total of $n(n - 3)$ diagonals. As with the hint, lines double up so we have exactly half of $n(n - 3)$ different diagonals.

Therefore the formula for the number of diagonals of a polygon with n sides is $\frac{n(n - 3)}{2}$

Using algebra, write the quadratic equation:

$$\frac{n(n - 3)}{2} = 4850 \quad \text{expand to rearrange the equation to polynomial form}$$

$$n^2 - 3n - 9700 = 0 \quad \text{factorise}$$

$$(n - 100)(n + 97) = 0 \quad \text{use the null factor law}$$

The only positive solution is $n = 100$.

There are **100** sides in the polygon with 4850 diagonals.

OR Use the quadratic formula:

For the equation $ax^2 + bx + c = 0$,

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$n^2 - 3n - 9700 = 0$$

$$a = 1, b = -3, c = -9700$$

$$n = \frac{3 \pm \sqrt{9 + 38800}}{2} = \frac{3 \pm 197}{2} = 100 \text{ or } -97$$

32. **Hint:** Use trial and error. A table format may help.

OR Use algebra.

Solution: Let x = number of 2 room apartments
 y = number of 3 room apartments
 and a = total number of apartments.
 Trials should consider that $a = x + y = 88$

Trials	2 room apartments		3 room apartments		Total		Result
	x	rooms	y	rooms	a	rooms	rooms
1	50	100	38	114	88	214	✗
2	60	120	28	84	88	204	✗
3	68	136	20	60	88	196	✓

OR Write the equations:

(1) $x + y = 88$ for the number of apartments

or (1) $y = 88 - x$

(2) $2x + 3y = 196$ for the number of rooms

Substitute equation (1) into equation (2) to eliminate y :

$2x + 3(88 - x) = 196$ expand brackets

$2x + 264 - 3x = 196$ add like terms

$-x + 264 = 196$ subtract 264 from both sides

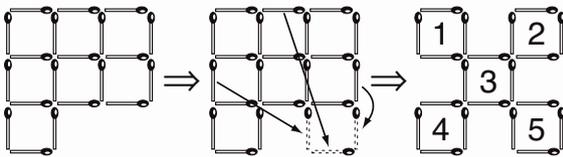
$-x = -68$

$x = 68$

There are **68** apartments with 2 rooms.

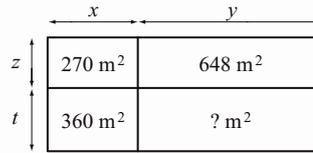
33. **Hint:** Make a model. Use trial and error.

Solution:



32. **Hint:** Use the formula for the area of a rectangle. Use algebra, following the notations below.

Solution:



Write the simultaneous equations:

(1) $xz = 270$

(2) $yz = 648$

(3) $xt = 360$

We need to find the product ty , which represents the missing area.

(2) $z = \frac{648}{y}$

(3) $x = \frac{360}{t}$

Substitute equations (2) and (3) into equation (1):

(1) $\frac{360}{t} \times \frac{648}{y} = 270$

$\frac{233280}{ty} = 270$

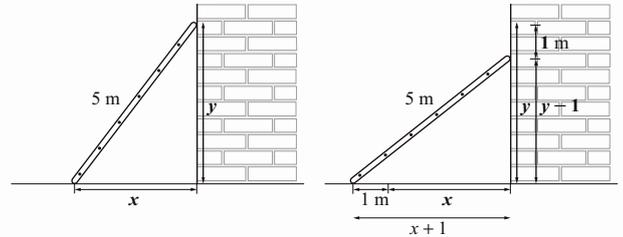
$ty = \frac{233280}{270}$

$ty = 864$

So the missing area is **864 m²**

33. **Hint:** Use Pythagoras' theorem.

Solution:



According to the diagram, the Pythagorean triad that applies to the right-angled triangle before the movement is $(x, y, 5)$

After the movement down the wall and forward on the floor, the triad becomes $(x + 1, y - 1, 5)$.

The only Pythagorean triad in which 5 represents the length of the hypotenuse is $(3, 4, 5)$.

Then either $x + 1 = 3$ and $y - 1 = 4$ ($x = 2$ and $y = 5$) ✗
 or $x + 1 = 4$ then $y - 1 = 3$ ($x = 3$ and $y = 4$) ✓

The top of the ladder is now $y - 1 = 4 - 1$
 $= 3$ m above ground.

32. **Hint:** Establish the rules:

RULE 1

Even number + Even number = Even number

RULE 2

Even number \times Even number = Even number

Solution: n is an even number so:

- I) $n + n$ is always an even number (RULE 1)
 II) $n + n + n$ is always an even number (RULE 1)
 III) $n \times n \times n$ is always an even number (RULE 2)
 I, II and III are even, so **E** is true.

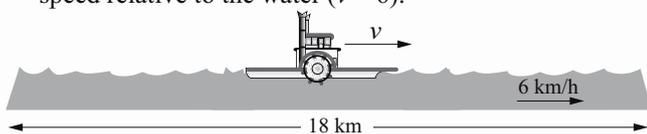
Check with trial and error.

33. **Hint:** Use the formula: $\text{time} = \frac{\text{distance travelled}}{\text{speed}}$
 Use algebra.

Solution: Let v = boat's speed relative to the water.

Down stream, the river's speed adds to the boat's speed relative to the water ($v + 6$).

Up stream, the river's speed subtracts from the boat's speed relative to the water ($v - 6$).



Down stream, the trip takes: $t_1 = \frac{18}{v+6}$ hours

Up stream, the trip takes: $t_2 = \frac{18}{v-6}$ hours

In total, the trip takes 4 hours: $t_1 + t_2 = 4$

or $\frac{18}{v+6} + \frac{18}{v-6} = 4$ expand to arrange to polynomial form

$$18(v-6) + 18(v+6) = 4(v+6)(v-6)$$

$$v^2 - 9v - 36 = 0 \quad \text{factorise}$$

$$(v-12)(v+3) = 0 \quad \text{use the null factor law}$$

Either $v = 12$ or $v = -3$. The only positive solution is 12.

The boat's speed relative to the water is **12 km/h**.

1.8

32. **Hint:** Express q and r in terms of p .

Solution: p is the smallest of the three consecutive integers p , q and r , so $q = p + 1$

$$r = q + 1$$

$$= p + 2$$

$$\text{Then } q + r = (p + 1) + (p + 2) = 2p + 3$$

33. **Hint:** Use algebra.

Solution: By squaring both sides of the equation:

$$6 + \sqrt{6 + \sqrt{6 + \sqrt{6 + \sqrt{6 + \dots}}}} = n^2$$

$$\text{But } \sqrt{6 + \sqrt{6 + \sqrt{6 + \sqrt{6 + \dots}}}} = n$$

The equation becomes $6 + n = n^2$

$$n^2 - n - 6 = 0 \quad \text{factorise}$$

$$(n-3)(n+2) = 0 \quad \text{use the null factor law}$$

Either $n = 3$ or $n = -2$.

The positive solution is $n = 3$.

32. **Hint:** Start by calculating the denominator.

Solution:

$$1 + \frac{1}{1+1} = 1 + \frac{1}{2} = \frac{3}{2}$$

$$\text{So } \rightarrow \frac{3}{1 + \frac{1}{1+1}} = \frac{3}{\frac{3}{2}} = 3 \times \frac{2}{3} = 2$$

33. **Hint:** Work backwards. Use trial and error.

OR Use algebra and show on a number line all possible intervals for A .

Solution: Let A , B , C , D and E represent the two digit whole numbers at every stage of the process.

$$\boxed{A} \times 2 \rightarrow \boxed{B} \div 3 \rightarrow \boxed{C} \times 4 \rightarrow \boxed{D} \div 5 \rightarrow \boxed{E}$$

According to the chain, A must be a multiple of 15 (even when A is multiplied by 2 and 4, it still has to evenly divide by 3 and 5).

By trial and error, we find $A = 30$ is the only solution.

$$\boxed{30} \times 2 \rightarrow \boxed{60} \div 3 \rightarrow \boxed{20} \times 4 \rightarrow \boxed{80} \div 5 \rightarrow \boxed{16}$$

OR Using algebra, we can write:

$$B = 2A \rightarrow 10 \leq 2A \leq 99 \rightarrow 5 \leq A \leq 49 \quad (1)$$

$$C = \frac{2A}{3} \rightarrow 10 \leq \frac{2A}{3} \leq 99 \rightarrow 15 \leq A \leq 148 \quad (2)$$

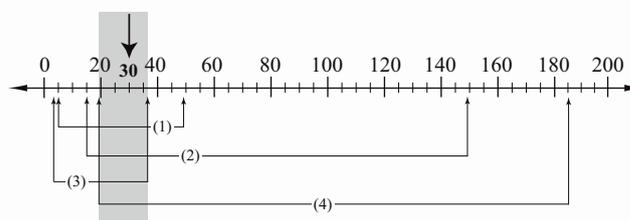
and A is a multiple of 3

$$D = \frac{8A}{3} \rightarrow 10 \leq \frac{8A}{3} \leq 99 \rightarrow 4 \leq A \leq 37 \quad (3)$$

$$E = \frac{8A}{15} \rightarrow 10 \leq \frac{8A}{15} \leq 99 \rightarrow 19 \leq A \leq 185 \quad (4)$$

and A is a multiple of 15

A must be a multiple of 15 and the interval where all the possible solutions for A lie, is between 19 and 37 (shown on the diagram as the intersection of all four intervals). The only multiple of 15 in this interval is $A = 30$



32. **Hint:** Establish the rule:

$$\frac{a}{b} > \frac{c}{d} \quad \frac{ad}{bd} > \frac{bc}{bd}$$

Compare each fraction with $\frac{1}{2}$. Then compare between them the fractions that are greater than $\frac{1}{2}$.

Solution:

A) $\frac{111}{221}$ or $\frac{1}{2} \rightarrow \frac{222}{442}$ or $\frac{221}{442}$
 But $222 > 221$, so $\frac{111}{221} > \frac{1}{2}$

B) $\frac{75}{151}$ or $\frac{1}{2} \rightarrow \frac{150}{302}$ or $\frac{151}{302}$
 But $150 < 151$, so $\frac{75}{151} < \frac{1}{2}$

C) $\frac{333}{998}$ or $\frac{1}{2} \rightarrow \frac{333}{998}$ or $\frac{499}{998}$
 But $333 < 499$, so $\frac{333}{998} < \frac{1}{2}$

D) $\frac{113}{225}$ or $\frac{1}{2} \rightarrow \frac{226}{450}$ or $\frac{225}{450}$
 But $226 > 225$, so $\frac{113}{225} > \frac{1}{2}$

E) $\frac{101}{301}$ or $\frac{1}{2} \rightarrow \frac{202}{602}$ or $\frac{301}{602}$
 But $202 < 301$, so $\frac{101}{301} < \frac{1}{2}$

A) and D) are the only fractions greater than $\frac{1}{2}$, so we have to compare these two fractions:

$$\frac{111}{221} \text{ or } \frac{113}{225} \rightarrow \frac{111 \times 225}{221 \times 225} \text{ or } \frac{221 \times 113}{221 \times 225}$$

But $111 \times 225 = 24975 > 221 \times 113 = 24973$

$$\text{so } \frac{111}{221} > \frac{113}{225}$$

A) is the largest fraction.

33. **Hint:** Establish the rules:

RULE 1

For an odd number of terms, the middle term of the sequence equals the average value of the sequence.

RULE 2

For an even number of terms, the average of the two middle terms of the sequence equals the average value of the sequence.

Solution:

$$\text{Average} = \frac{\text{Sum of all terms of the sequence}}{\text{Number of terms}}$$

Number of terms	Average value (middle term)	Sequence
2	$\frac{105}{2} = 52.5$	52, 53
3	$\frac{105}{3} = 35$	34, 35, 36
4	$\frac{105}{4} = 26.25$	impossible
5	$\frac{105}{5} = 21$	19, 20, 21, 22, 23
6	$\frac{105}{6} = 17.5$	15, 16, 17, 18, 19, 20
7	$\frac{105}{7} = 15$	12, 13, 14, 15, 16, 17, 18
8	$\frac{105}{8} = 13.125$	impossible
9	$\frac{105}{9} \approx 11.66$	impossible
10	$\frac{105}{10} = 10.5$	6, 7, 8, 9, 10, 11, 12, 13, 14, 15
11	$\frac{105}{11} \approx 9.45$	impossible
12	$\frac{105}{12} = 8.75$	impossible
13	$\frac{105}{13} \approx 8.076$	impossible
14	$\frac{105}{14} = 7.5$	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14

There are seven sequences of consecutive positive numbers that add to 105 and they start with 1, 6, 12, 15, 19, 34 and 52.

2.3

32. **Hint:** Use the formula: $(a - b)^2 = a^2 - 2ab + b^2$

Solution: $a = 24$ and $b = 19$

$$\begin{aligned} 24^2 - 2 \times 24 \times 19 + 19^2 &= (24 - 19)^2 \\ &= 5^2 \\ &= 25 \end{aligned}$$

33. **Hint:** Start by trying to find the numbers where you have the most information. Use trial and error.

Solution:

$$\begin{array}{r} \text{A B C} \\ \times \quad \text{B} \\ \hline \text{A A B B} \end{array}$$

(1) $B \times C$ ends in B

(B,C) can be one of the pairs:

(2,1), (2,6), (3,1), (4,1), (4,6), (5,1), (5,3), (5,7), (5,9), (6,1), (7,1), (8,1), (8,6), (9,1)

(2) $B \times B + \text{carry over from units}$ ends in B

By trying out the pairs above, we find the only possibility is $B = 8$ and $C = 6$.

ABC represents 286.

$$\begin{array}{r} 286 \\ \times 648 \\ \hline 2288 \end{array}$$

32. **Hint:** Add the brackets. Look for a pattern. Simplify.

Solution:

$$\begin{aligned} & \left(1 + \frac{2}{3}\right) \left(1 + \frac{2}{5}\right) \left(1 + \frac{2}{7}\right) \dots \left(1 + \frac{2}{17}\right) \left(1 + \frac{2}{19}\right) \\ &= \frac{5}{3} \times \frac{7}{5} \times \frac{9}{7} \times \dots \times \frac{19}{17} \times \frac{21}{19} \\ &= \frac{21}{3} \\ &= 7 \end{aligned}$$

33. **Hint:** Rearrange the equation to polynomial form and then factorise. Use the null factor law to establish the type of triangle.

Solution: $\frac{c-b}{a} + \frac{a-c}{b} + \frac{b-a}{c} = 0$

$$bc(c-b) + ac(a-c) + ab(b-a) = 0 \quad \text{expand}$$

$$bc^2 - b^2c + a^2c - ac^2 + ab^2 - a^2b = 0 \quad \text{factorise by grouping conveniently}$$

$$c^2(b-a) + c(a^2-b^2) + ab(b-a) = 0$$

$$c^2(b-a) + c(a-b)(a+b) + ab(b-a) = 0$$

$$(b-a)(c^2 - ac - cb + ab) = 0$$

$$(b-a)[c(c-a) - b(c-a)] = 0$$

$$(b-a)(c-a)(c-b) = 0$$

The last equation is true if one of the following is true:

$$a = b \rightarrow \text{isosceles triangle}$$

$$\text{or } a = c \rightarrow \text{isosceles triangle}$$

$$\text{or } b = c \rightarrow \text{isosceles triangle}$$

$$\text{or } a = b \text{ and } a = c \rightarrow \text{equilateral triangle}$$

$$\text{or } a = b \text{ and } b = c \rightarrow \text{equilateral triangle}$$

$$\text{or } a = c \text{ and } b = c \rightarrow \text{equilateral triangle}$$

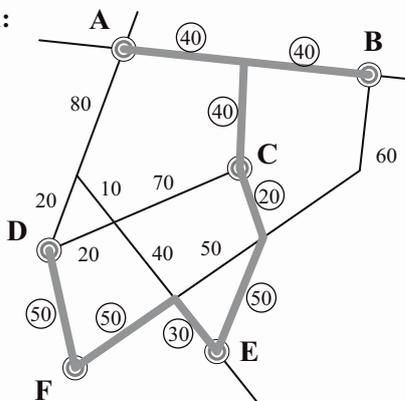
$$\text{or } a = b \text{ and } a = c \text{ and } b = c \rightarrow \text{equilateral triangle}$$

The triangle can be either **isosceles** or **equilateral**.

2.5

32. **Hint:** You can start at any point. Try to find the shortest path to connect two neighbouring towns. Progress step by step, comparing the paths. Use trial and error.

Solution:



Join the two closest towns DF. Now add the closest of the remaining towns as economically as possible:

E to F.

Continue adding the closest town to the network until all towns are added: C to E, A to C, then B to A/C.

The minimum length of cable required is **320 km**.

33. **Hint:** Draw a diagram. Use the formula for the area of a triangle. Establish the rules:

RULE 1 (For ratios of two terms)

If $a : b = 1 : 2$

and $c : d = 3 : 4$, then $ac : bd = (1 \times 3) : (2 \times 4) = 3 : 8$

RULE 2 (For ratios of three terms)

If $a : b : c = 1 : 2 : 3$

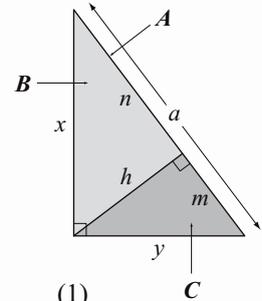
and $d : e : f = 4 : 5 : 6$, then $ad : be : cf = 4 : 10 : 18$

Solution:

$$\text{Area } \Delta A = \frac{xy}{2}$$

$$\text{Area } \Delta B = \frac{nh}{2}$$

$$\text{Area } \Delta C = \frac{mh}{2}$$



$$\text{In } \Delta A \rightarrow y : x : a = 3 : 4 : 5 \quad (1)$$

$$\text{In } \Delta B \rightarrow h : n : x = 3 : 4 : 5 \quad (2)$$

$$\text{In } \Delta C \rightarrow m : h : y = 3 : 4 : 5 \quad (3)$$

Multiplying equations (2) and (3)

$$\text{RULE 2} \rightarrow mh : nh : xy = 9 : 16 : 25 \quad (4)$$

$$\begin{aligned} \text{Area } \Delta A : \text{Area } \Delta B : \text{Area } \Delta C &= \frac{xy}{2} : \frac{nh}{2} : \frac{mh}{2} \\ &= xy : nh : mh \end{aligned}$$

$$(4) \rightarrow = 25 : 16 : 9$$

$$\text{Area } \Delta A : \text{Area } \Delta B : \text{Area } \Delta C = \mathbf{25 : 16 : 9}$$

2.6

32. **Hint:** Establish the facts:

For even exponents, the expansion of $(-1)^n$ is always +1
For odd exponents, the expansion of $(-1)^n$ is always -1

Solution: I) n is an even number

$(n+1, n+3$ are odd and $n+2$ is even)

$$(-1)^n + (-1)^{n+1} + (-1)^{n+2} + (-1)^{n+3}$$

$$= 1 + (-1) + 1 + (-1)$$

$$= 0$$

II) n is an odd number

$(n+1, n+3$ are even and $n+2$ is odd)

$$(-1)^n + (-1)^{n+1} + (-1)^{n+2} + (-1)^{n+3}$$

$$= (-1) + 1 + (-1) + 1$$

$$= 0$$

The value of the sum is **0** for any natural number n .

33. **Hint:** Look for a pattern in the last two digits of the expansion of 6^n .

Solution: For even exponents, the last two digits form the repetitive cycle:

36, 96, 56, 16, 76, 36, 96, 56, 16, 76, with the last two digits repeating every 10 steps.

i.e. $6^2, 6^{12}, 6^{22}, \dots, 6^{662}, \dots$ always end in 36
 $6^4, 6^{14}, 6^{24}, \dots, 6^{664}, \dots$ always end in 96
 $6^6, 6^{16}, 6^{26}, \dots, 6^{666}, \dots$ always end in 56
 $6^8, 6^{18}, 6^{28}, \dots, 6^{668}, \dots$ always end in 16
 $6^{10}, 6^{20}, 6^{30}, \dots, 6^{670}, \dots$ always end in 76

So the last two digits of 6^{666} are **56**.

2.7

32. **Hint:** Remember the numbers of boats and men in both arrangements are the same. Try redistributing Arrangement 1 to make Arrangement 2. Start with the empty boats. Be systematic.

OR Use algebra.

Solution:

Arrangement 1:

Some full boats with 4 men



7 men on the shore



Arrangement 2:

Some full boats with 7 men



2 empty boats



In moving from arrangement 1 to arrangement 2:

Firstly we need 2 empty boats so empty 2 full boats.

This gives $2 \times 4 = 8$ spare men and **2 empty boats**

There are now $7 + 8 = 15$ men on shore.

Finally we need boats with 7 men in each so add 3 men to each full boat of 4 men (from the 15 men left on shore).

We can do this 5 times to give **5 full boats with 7 men in each**.

We have thus reached the second arrangement.

Total number of boats = $2 + 5 = 7$

Total number of men = $2 \times 0 + 5 \times 7 = 35$

There are **7 boats and 35 men**.

OR

Using simultaneous equations, let

x = number of boats

and y = number of men

In the first arrangement: (1) $y = 4x + 7$

In the second arrangement: (2) $y = 7(x - 2)$

Let equation (1) equal equation (2):

$$4x + 7 = 7(x - 2) \quad \text{expand}$$

$$4x + 7 = 7x - 14 \quad \text{add like terms}$$

$$3x = 21 \quad \text{divide both sides by 3}$$

$$x = 7$$

Substituting $x = 7$ into equation (1), we find $y = 35$

There are **7 boats and 35 men**.

33. **Hint:** Start with what is given or can be deduced. Use trial and error.

Solution:

Tens of

thousands: **M = 1**, because two 4 digit numbers can not add to 20 000.

$$\begin{array}{r} \text{S} \text{ E} \text{ N} \text{ D} \\ +_1 \text{ 1} \text{ O} \text{ R} \text{ E} \\ \hline \text{1} \text{ O} \text{ N} \text{ E} \text{ Y} \end{array}$$

Thousands: $S = 8$ or $S = 9$, because 1 must be carried over to tens of thousands

O = 0 is the only possibility.

If $S = 8$, we need a 1 carried over from the hundreds, so then $8 + 1 + 1 = 10$.

Hundreds: $E + 0$ ends in N has no carry over, so **S = 9**

$$\begin{array}{r} \text{9} \text{ E} \text{ N} \text{ D} \\ +_1 \text{ 1} \text{ 0} \text{ R} \text{ E} \\ \hline \text{1} \text{ 0} \text{ N} \text{ E} \text{ Y} \end{array}$$

Hundreds: $E + 0 + 1 = N$, so (E,N) are consecutive numbers: (2,3), (3,4), (4,5), (5,6), (6,7) or (7,8)

By trial and error we find **E = 5** and **N = 6**

$$\begin{array}{r} \text{9} \text{ 5} \text{ 6} \text{ D} \\ +_1 \text{ 1} \text{ 0} \text{ R} \text{ 5} \\ \hline \text{1} \text{ 0} \text{ 6} \text{ 5} \text{ Y} \end{array}$$

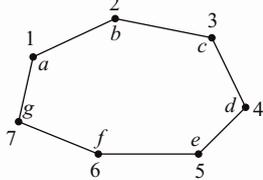
Tens: $6 + R + 1$ ends in 5, so **R = 8**

Units: Using trial and error, **D = 7** and **Y = 2**

MONEY represents **10 652**

32. **Hint:** Draw a diagram. Use algebra. Discover what happens at each vertex.

Solution:



Let a, b, c, d, e, f, g represent the integers at the vertices of the polygon shown.

At vertex 2: $b = a + c$ (1)

At vertex 3: $c = b + d$ (2)

Substitute equation (1) into equation (2):

$$c = a + c + d$$

$$a + d = 0$$

$$\boxed{d = -a}$$

At vertex 4: $d = c + e$ (3)

Substitute equation (2) into equation (3):

$$d = b + d + e$$

$$b + e = 0$$

$$\boxed{e = -b}$$

At vertex 5: $e = d + f$ (4)

Substitute equation (3) into equation (4):

$$e = c + e + f$$

$$c + f = 0$$

$$\boxed{f = -c}$$

At vertex 6: $f = e + g$ (5)

Substitute equation (4) into equation (5):

$$f = d + f + g$$

$$d + g = 0$$

$$\boxed{g = -d = a}$$

vertex 7 (g) = vertex 1 (a)

So the polygon must have only **6** vertices (sides).

33. **Hint:** Be sure to have all 3 people arrive at the destination at the same time. This way no one's efforts are being wasted.

Solution:

STAGE 1: Person 1 (on the Motorbike) takes person 2 and drops them off at just the right place so that they can run to the finish \Rightarrow **M(1+2)**

Person 3 **J(3)** starts jogging at the same time.



STAGE 2: Person 1 (on the Motorbike) returns to meet Person 3 who has been jogging.



STAGE 3: Person 1 (on the Motorbike) takes person 3 to the finish line, just as person 2 finishes.



d_1 is the distance jogged by person 3 in stage 1.

The motorbike is 5 times as fast so it travels distance $5d_1$

d_2 is the distance jogged by person 3 in stage 2.

The motorbike is 5 times as fast so it travels distance $5d_2$

Using the journey of person 2 (motorbike stage 1 - jog stage 2 - jog stage 3), the 30 km journey is:

$$30 = 5d_1 + d_2 + d_1$$

$$30 = 6d_1 + d_2 \quad \dots\dots(1)$$

OR

Using the journey of person 1 (motorbike only), the 30 km journey is:

$$30 = 10d_1 - 5d_2 \quad \dots\dots(2)$$

equating $\dots\dots(1)$ and $\dots\dots(2)$

$$6d_1 + d_2 = 10d_1 - 5d_2$$

$$6d_2 = 4d_1$$

$$3d_2 = 2d_1$$

substitute into $\dots\dots(1)$

$$30 = 9d_2 + d_2$$

$$30 = 10d_2$$

$$d_2 = 3 \text{ km}$$

substitute back into $\dots\dots(1)$

$$d_1 = 4.5 \text{ km}$$

The distance travelled by the motorbike at 60 km/h was $10d_1 + 5d_2 = 45 \text{ km} + 15 \text{ km} = 60 \text{ km}$

Therefore the time taken was **1 h**.

3.1

32. **Hint:** For easy comparison, write both powers with the same exponent. Use the index law $a^{mn} = (a^m)^n$

Solution:

$$\text{Index law} \rightarrow 2^{18} = (2^3)^6$$

$$\text{Order of operations} \rightarrow = 8^6$$

$$\text{Similarly } 3^{12} = (3^2)^6 = 9^6$$

$$\text{By comparison } 9^6 > 8^6 \\ \text{so } 3^{12} > 2^{18}$$

3^{12} is greater.

33. **Hint:** Use trial and error.

Solution: A possible solution is:

$$1 + \sqrt{9} \times \sqrt{(\sqrt{9} + 6)} = 10 \\ 1 + 3 \times \sqrt{3 + 6} \\ = 1 + 3 \times 3 \\ = 1 + 9 \\ = 10$$

3.2

32. **Hint:** Draw a number line to count the number of houses. Establish the rule:

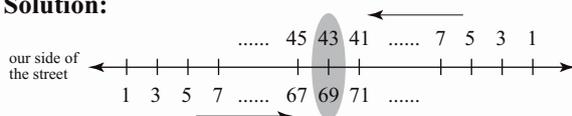
In the sequence 1, 3, 5, 7,, $2n + 1$ of consecutive odd numbers, there are

$$\frac{(2n+1)+1}{2} = \frac{2(n+1)}{2} = n + 1 \text{ terms.}$$

e.g. The sequence 1, 3 has $\frac{3+1}{2} = 2$ terms

The sequence 1, 3, 5 has $\frac{5+1}{2} = 3$ terms

Solution:



The sequence 1, 3, 5, ... , 69 has $\frac{69+1}{2} = 35$ terms

Counting from left to right, number 69 (our house) is the 35th house.

The sequence 1, 3, 5, ... , 43 has $\frac{43+1}{2} = 22$ terms

Counting from right to left, number 43 (our house) is the 22nd house.

Total number of houses on our side of the street:

$$35 + 22 - 1 = 56$$

The answer is **56**.



3.1 - 3.3

33. **Hint:** Draw a diagram. Use trial and error.

Solution: Start trying what happens if Charles has 2 helpers, then 3 helpers and so on.



People	Start	End of Day 1	State of Supplies after Ration Giveaway	End of Day 2	State of Supplies after Ration Giveaway	End of Day 3	State of Supplies after Ration Giveaway	End of Day 4	End of Day 5	End of Day 6	End of Day 7	End of Day 8
Charles												
Helper 1												
Helper 2												
Helper 3												

Charles needs a minimum of **3** helpers to safely cross the desert.

3.3

32. **Hint:** Play with a strip of paper. Make an organised list. Look for a pattern. A table format may help.

Solution: Any time the paper is folded, find a relationship between the number of folds, the number of parts into which the paper is divided and the number of creases formed.

Number of folds	Number of parts	Number of creases
1	$2 = 2^1$	1 ($2^1 - 1$)
2	$4 = 2^2$	3 ($2^2 - 1$)
3	$8 = 2^3$	7 ($2^3 - 1$)
4	$16 = 2^4$	15 ($2^4 - 1$)
5	$32 = 2^5$	31 ($2^5 - 1$)
6	$64 = 2^6$	63 ($2^6 - 1$)
7	$128 = 2^7$	127 ($2^7 - 1$)
8	$256 = 2^8$	255 ($2^8 - 1$)
9	$512 = 2^9$	511 ($2^9 - 1$)
10	$1024 = 2^{10}$	1023 ($2^{10} - 1$)

N.B. The number of creases is 1 less than the number of parts.

Paper folded in half ten times would have **1023** creases.

33. **Hint:** Rearrange the equation to polynomial form and then simplify.

Solution:

$$\sqrt{2(a+b)} = \sqrt{a+c} + \sqrt{a-c} \quad \text{square both sides}$$

$$2(a+b) = (a+c) + 2\sqrt{(a+c)(a-c)} + (a-c)$$

$$2a + 2b = 2a + 2\sqrt{(a+c)(a-c)} \quad \text{subtract } 2a \text{ from both sides}$$

$$2b = 2\sqrt{(a+c)(a-c)} \quad \text{divide both sides by 2}$$

$$b = \sqrt{(a+c)(a-c)} \quad \text{square both sides}$$

$$b^2 = (a+c)(a-c) \quad \text{expand brackets}$$

$$b^2 = a^2 - c^2 \\ a^2 = b^2 + c^2$$

The sides of the triangle satisfy Pythagoras' theorem, so the triangle is **right-angled**.

32. **Hint:** Use algebra.

Solution:

1986 population	x
1990 population (decrease factor of 10%)	10% less than the 1986 population means: $x - \frac{10x}{100} = \frac{90x}{100}$
1994 population (increase factor of 10%)	10% more than the 1990 population means: $\frac{90x}{100} + \frac{10}{100} \times \frac{90x}{100}$ $= \frac{90x}{100} \left(1 + \frac{10}{100}\right)$ $= \frac{90x}{100} \times \frac{110}{100}$ $= \frac{99x}{100}$

There were 16 more people living in Coober Pedy in 1986 than in 1994:

$$1986 \text{ population} - 1994 \text{ population} = 16$$

$$x - \frac{99x}{100} = 16$$

$$\frac{x}{100} = 16$$

$$x = 1600$$

Substitute $x = 1600$ in the table:

1986 population	$x = 1600$
1990 population (decrease factor of 10%)	$\frac{90x}{100} = \frac{90 \times 1600}{100} = 1440$
1994 population (increase factor of 10%)	$\frac{99x}{100} = \frac{99 \times 1600}{100} = 1584$

The answer is **1584**.

33. **Hint:** Start by trying to find the numbers you have the most information on. Use trial and error.

Solution: There is no whole number that starts with 0, so A, K, N and S can't be 0.

$$\begin{array}{r} \text{ALASKA} \\ \text{KANSAS} \\ + \text{NEVADA} \\ \hline \text{STATES} \end{array}$$

Units: $A + S + A$ ends in S
 $A + A$ ends in 0
 $A = 0$ or $A = 5$
 A is not 0, so $A = 5$

$$\begin{array}{r} \text{5L5SK5} \\ \text{K5NS5S} \\ + \text{NEV5D5} \\ \hline \text{ST5TES} \end{array}$$

Hundreds of thousands:
 $5 + K + N \leq S$ and $S \leq 9$

then $K + N \leq 4$

(K,N) can be one of the pairs:

(1,3), (3,1), (1,2), (2,1)

By trial and error, (1,3), (3,1) and (2,1) are eliminated.

So $K = 1$ and $N = 2$

$$\begin{array}{r} \text{5L5S15} \\ \text{152S5S} \\ + \text{2EV5D5} \\ \hline \text{ST5TES} \end{array}$$

Hundreds of thousands:

(no carry) $5 + 1 + 2 = 8 \rightarrow S = 8$

or $5 + 1 + 2 + 1 = 9 \rightarrow S = 9$

↑ carry over from tens of thousands

If $S = 8$, in the hundreds column $8 + 8 + 5$ can end in either 1 or 2, which leads to $T = 1$ or 2 (impossible, 1 and 2 have already been used)

So $S = 9$

$$\begin{array}{r} \text{1 2 1} \\ \text{5L5915} \\ \text{152959} \\ + \text{2EV5D5} \\ \hline \text{9T5TE9} \end{array}$$

Hundreds: $9 + 9 + 5 = 23$ (2 carry)

Thousands: $2 + 5 + 2 + V$ ends in 5

then $9 + V$ ends in 5

So $V = 6$

Tens: By trial and error we find

$D = 3$

$$\begin{array}{r} \text{1 1 2 1 1} \\ \text{5L5915} \\ \text{152959} \\ + \text{2E6535} \\ \hline \text{9T5TE9} \end{array}$$

Tens: $1 + 1 + 5 + 3 = 10$

So $E = 0$

Hundreds: $1 + 9 + 9 + 5 = 24$

So $T = 4$

Tens of

thousands: $1 + L + 5 + 0 = 14$

So $L = 8$

The final solution is:

$$\begin{array}{r} \text{1 1 2 1 1} \\ \text{585915} \\ \text{152959} \\ + \text{206535} \\ \hline \text{945409} \end{array}$$

STATES represents the number **945409**.

32. **Hint:** Use trial and error. A table format may help.
 OR Use algebra and solve for:
 p = number of partridges at 3 coins for every 5 birds
 P = number of pigeons at 2 coins each
 s = number of sparrows at 1 coin for every pair
 b = number of birds bought.

Solution: Trials should consider that:
 $b = p + P + s = 30$
 p is a multiple of 5
 s is a multiple of 2.

Trials	partridges		pigeons		sparrows		Total		Result
	p	coins	P	coins	s	coins	coins	coins	
1	10	6	10	20	10	5	30	31	✗
2	5	3	9	18	16	8	30	29	✗
3	15	9	9	18	6	3	30	30	✓

OR Write the simultaneous equations:

(1) $p + P + s = 30$ number of birds

(2) $\frac{3p}{5} + 2P + \frac{s}{2} = 30$ number of coins

or

(1) $s = 30 - p - P$

Substitute equation (1) into equation (2):

$$\frac{3p}{5} + 2P + \frac{30 - p - P}{2} = 30$$

$$6p + 20P + 150 - 5p - 5P = 300$$

$$p + 15P = 150 \quad \text{solve for } P$$

$$P = \frac{150 - p}{15} \quad \text{write as a sum of two fractions}$$

$$P = 10 - \frac{p}{15}$$

P must be a whole number, so $p = 15$ and then $P = 9$

The peasant bought 9 pigeons.

33. **Hint:** Think of the tyre usage as a ratio between the distance travelled and the maximum distance allowed for the tyres. For each pair of tyres to spend the same amount of time on the front and back, then they have to be interchanged at half of the total distance.

Solution:

Let d = distance travelled, in km, with new tyres until the tyres are interchanged
 $=$ distance travelled, in km, after the tyres are interchanged

The greatest distance I can travel on 1 set of tyres = $2d$

$$\text{the back tyre usage} = \frac{d}{60000}$$

$$\text{the front tyre usage} = \frac{d}{40000}$$

Complete usage of the tyres can be expressed by the

$$\text{equation: } \frac{d}{60000} + \frac{d}{40000} = 1$$

$$5d = 120000$$

$$d = 24000$$

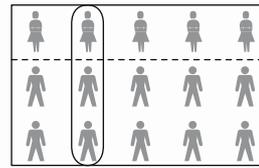
$$2d = 48000$$

The greatest distance that can be travelled on one set of tyres with maximum usage is **48 000 km**.



32. **Hint:** Draw a diagram. Find the number of men and the number of women in each group.

Solution:

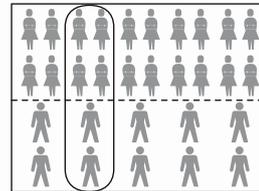


GROUP 1 (10 men)

Women : Men = 1 : 2

Women : 10 = 1 : 2

Women = 5



GROUP 2 (10 men)

Women : Men = 2 : 1

Women : 10 = 2 : 1

Women = 20

Combining the two groups together:

$$\text{Women} = 5 + 20 = 25$$

$$\text{Men} = 10 + 10 = 20$$

The ratio Women : Men becomes

$$25 : 20 = 5 : 4$$

33. **Hint:** Place the largest digits in the thousands and the smallest digits in the units. Use trial and error.

Solution: There are lots of combinations to try, but we will try only some of the two general tables shown below:

6,5 4,3 2,1

7	↓	↓	↓
×	□	□	□

the 4 largest products (out of possible 8)

$\begin{array}{r} 7542 \\ \times 631 \\ \hline 7542 \\ 226260 \\ 4525200 \\ \hline 4759002 \end{array}$	$\begin{array}{r} 7541 \\ \times 632 \\ \hline 7541 \\ 226230 \\ 4524600 \\ \hline 4765912 \end{array}$	$\begin{array}{r} 7532 \\ \times 641 \\ \hline 7632 \\ 301280 \\ 4519200 \\ \hline 4828012 \end{array}$	$\begin{array}{r} 7531 \\ \times 642 \\ \hline 7632 \\ 301240 \\ 4518600 \\ \hline 4834902 \end{array}$
---	---	---	---

7,5 4,3 2,1

6	↓	↓	↓
×	□	□	□

the 4 largest products (out of possible 8)

$\begin{array}{r} 6542 \\ \times 731 \\ \hline 6542 \\ 196260 \\ 4579400 \\ \hline 4782202 \end{array}$	$\begin{array}{r} 6541 \\ \times 732 \\ \hline 6532 \\ 196230 \\ 4578700 \\ \hline 4788012 \end{array}$	$\begin{array}{r} 6532 \\ \times 741 \\ \hline 6532 \\ 261280 \\ 4572400 \\ \hline 4840212 \end{array}$	$\begin{array}{r} 6531 \\ \times 742 \\ \hline 6532 \\ 261240 \\ 4571700 \\ \hline 4846002 \end{array}$
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The combination that gives the largest product is **6531 × 742 = 4846002**

32. **Hint:** Solve using algebra.

Solution: Let x = number of litres of pure water added to 4 L of ocean water to reduce the concentration of salt from 5% to 2%.

Concentration	Water	Salt
5% salt	4 L	$\frac{5}{100} \times 4 = \frac{1}{5} = 0.2$ kg
2% salt	$(4 + x)$ L	$\frac{2}{100} \times (4 + x) = \frac{4 + x}{50}$ kg

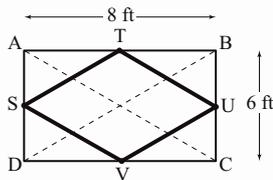
No matter how much pure water we add to 4 L of ocean water, the quantity of salt stays the same, only the concentration changes.

$$\begin{aligned} \text{The equation becomes: } \frac{4+x}{50} &= 0.2 \\ 4+x &= 10 \\ x &= 6 \end{aligned}$$

6 L of pure water have to be added to the ocean water.

33. **Hint:** Draw a diagram. Establish the starting point of the ball. Use similar triangles.

Solution: Let ABCD represent the billiard table.



The ball rebounds off the sides of the table and returns exactly to its original position, so the only possibility for the starting point of the ball is to be in the middle of any side of the table.

i.e. The ball starts at S, rebounds off the other three sides and returns exactly to S. STUV is a rhombus, with sides parallel to the diagonals of ABCD

$\triangle AST \cong \triangle ADB$ (all angles are congruent)

$$\frac{AT}{AB} = \frac{ST}{DB} \quad \text{or} \quad \frac{4}{8} = \frac{ST}{10}$$

$$ST = 5$$

$$\begin{aligned} \text{Perimeter of the rhombus STUV} &= 4 \times ST \\ &= 4 \times 5 \\ &= 20 \text{ ft} \end{aligned}$$

The total distance travelled by the ball is **20 feet**.

32. **Hint:** Start with what is given or can be deduced. OR Simplify the problem working on a reduced version.

Solution: We know that some people are one-legged and wear only one sandal.

Then we know that half of the rest of the population go barefoot and half wear 2 sandals each. This is the same as the rest of the population wearing 1 sandal each (an average of 1 sandal each).

So, the problem is equivalent to:

10 000 people wearing 1 sandal each which leads to a total of **10 000** sandals.

An example in proof:

Lets assume that 1000 people (out of the 10 000 total) are one legged. The same reasoning can then be done for a general case of x = number of one-legged people.

There are 9000 people left.

4500 wear 2 sandals each and that makes 9000 sandals.

4500 go barefoot and that makes 0 sandals.

Total number of sandals = 1000 + 9000 = **10 000**

33. **Hint:** Compare the number of single digit to double digit answers. What happens when you multiply by 1? Work on the lines with distinctive features.

Solution: Having only 1 single digit answer, the multiplication table must be 5 or greater.

Consider $A \times A = FA$. The only numbers from 5 to 9 that, when multiplied by themselves, produce themselves as the last digit are 5 and 6.

It can't be the $5 \times$ multiplication table because 5

multiplied by any other number always ends in a 0 or a 5.

So it is the $6 \times$ multiplication table.

32. **Hint:** Establish the rules:

RULE 1

For an odd number of terms, the middle term of the sequence equals the average value of the sequence.

RULE 2

For an even number of terms, the average of the two middle terms of the sequence equals the average value of the sequence.

Solution:

$$\text{Average} = \frac{\text{Sum of all terms of the sequence}}{\text{Number of terms}}$$

Number of terms	Average value (middle term)	Sequence
2	$\frac{85}{2} = 42.5$	42, 43
3	$\frac{85}{3} \approx 28.333$	impossible
4	$\frac{85}{4} = 21.25$	impossible
5	$\frac{85}{5} = 17$	15, 16, 17, 18, 19
6	$\frac{85}{6} \approx 14.166$	impossible
7	$\frac{85}{7} \approx 12.142$	impossible
8	$\frac{85}{8} = 10.625$	impossible
9	$\frac{85}{9} \approx 9.444$	impossible
10	$\frac{85}{10} = 8.5$	4, 5, 6, 7, 8, 9, 10, 11, 12, 13

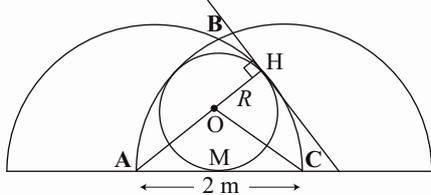
The three sequences start with 4, 15 and 42.

33. **Hint:** Draw a diagram, showing the radius (R) of the circle centred at O. Use this property:

The angle between the tangent and radius at the point of contact is always a right angle.

Use Pythagoras. Use algebra and solve for R.

Solution:



Let H be the point of contact between the circles centred at O and A.

OH and AH are radii in each of these circles, so they must be perpendicular to the same tangent at the point of contact. So A, O, H are collinear points.

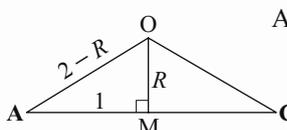
$$AH = 2m \rightarrow AO = 2 - R$$

$$OH = R$$

AC is tangent to the circle at M.

Then OM = R is perpendicular to AC, because the triangle AOC is an isosceles triangle and

$\Delta AOM \cong \Delta OMC$ (RHS)



Applying Pythagoras in ΔAOM :

$$AO^2 = AM^2 + OM^2$$

$$(2 - R)^2 = 1^2 + R^2$$

$$4 - 4R + R^2 = 1 + R^2$$

$$4R = 3$$

$$R = \frac{3}{4} = 0.75m$$

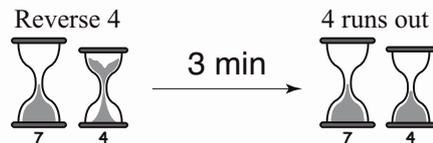
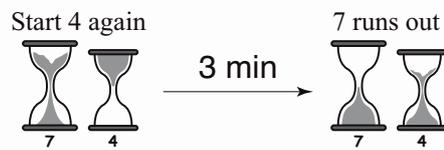
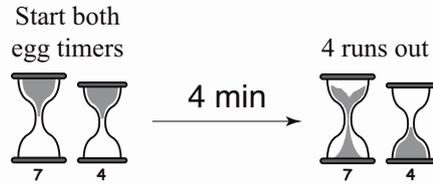


32. **Hint:** Make a model. Alternatively mentally rotate one of the dice so that the 2's match. What do you see?

Solution: Rotate the first die so that it is in the same position as the second. So, number 4 is opposite to number 1.

33. **Hint:** Use trial and error. The egg timers can be used consecutively to calculate 3 minutes.

Solution:



The biscuits are ready exactly in 10 minutes.

32. **Hint:** Simplify the problem and work on a reduced version. Extrapolate back to the original problem.

Solution: We can start with the assumption that 1 cat can catch 1 rat in 1 minute. Then ten of these cats can catch 10 rats in 1 minute. The same 10 cats can then catch 100 rats in 10 minutes.

1 cat	→ 1 rat	→ 1 min
↓ × 10	↓ × 10	
10 cats	→ 10 rats	→ 1 min
	↓ × 10	↓ × 10
10 cats	→ 100 rats	→ 10 min

Similarly:

$\frac{5}{4}$ cat	→ $\frac{5}{4}$ rat	→ $\frac{5}{4}$ min
↓ × 8	↓ × 8	
10 cats	→ 10 rats	→ $\frac{5}{4}$ min
	↓ × 8	↓ × 8
10 cats	→ 80 rats	→ 10 min

The answer is 80 rats.

4.3 (cont.)



33. **Hint:** Look for a pattern. Establish the number of toothpicks needed for 1, 2, 3 and 4 triangles. Find a relationship between the number of triangles and the number of toothpicks.

Solution: The first triangle in every pattern of triangles requires 3 toothpicks, then the rest require only 2 toothpicks each.

Pattern Number	Number of Triangles	NUMBER OF TOOTHPICKS
1	1	$3 = 2 \times 1 + 1$
2	2	$3 + 2 \times 1 = 3 + 2 \times (2 - 1) = 2 \times 2 + 1 = 5$
3	3	$3 + 2 \times 2 = 3 + 2 \times (3 - 1) = 2 \times 3 + 1 = 7$
4	4	$3 + 2 \times 3 = 3 + 2 \times (4 - 1) = 2 \times 4 + 1 = 9$
.....
n	n	$3 + 2 \times (n - 1) = 2n + 1$

The algebraic expression for the number of toothpicks required to make a pattern n triangles long is $2n + 1$.

4.4

32. **Hint:** Don't guess! Check for the right operations.

Solution: If 8 builders need 6 days, then 4 builders (half of the number of builders) will need double the amount of time: ie 12 days.

Then, $4 \times 3 = 12$ builders need a third of the time, ie $12 \div 3 = 4$ days to complete the job.

The answer is **4 days**.

33. **Hint:** Distance travelled = Speed \times Time

Consider this: For how long does the blowfly travel?

Solution: The blowfly keeps flying till the two cyclists meet.

The cyclists meet after 1 hour having travelled 20 km each.

Distance travelled by the blowfly = $30 \text{ km/h} \times 1 \text{ h}$
= **30 km**

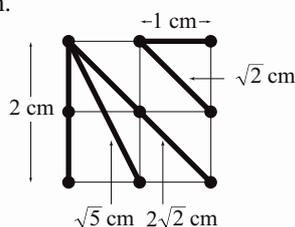
4.5

32. **Hint:** Draw as many different segments in the diagram as possible.

Use Pythagoras to find their lengths: $a^2 = b^2 + c^2$

Solution:

Segments with lengths of 1, 2, $\sqrt{2}$, $\sqrt{5}$ and $2\sqrt{2}$ can be drawn in the diagram.



There are **5** segments of different lengths in the diagram.

33. **Hint:** Find the rate at which Alex, Brad and Celia work, if they work together.

Then find the rates if each one of them works alone.

Solution: We can assume there are 180 apples to be picked. Any number can be chosen, but for convenience we chose 180, which is the LCM of 90, 60 and 45.

It doesn't necessarily match a real life situation, but it helps solve the problem.

If they work in pairs:

(1) Alex and Brad can pick $\frac{180}{90} = 2$ apples/min

(2) Brad and Celia can pick $\frac{180}{60} = 3$ apples/min

(3) Alex and Celia can pick $\frac{180}{45} = 4$ apples/min

(1) + (2) + (3) $\rightarrow 2 + 3 + 4 = 9$ apples/minute

If they work together:

(4) Alex, Brad and Celia can pick

$$\frac{2+3+4}{2} = 4.5 \text{ apples/min.}$$

If they work alone:

(4) - (1) **Celia** can pick $4.5 - 2 = 2.5$ apples/min.

180 apples at a rate of 2.5 apples/min take

$$\frac{180}{2.5} = \mathbf{72 \text{ min}}$$

(4) - (2) **Alex** can pick $4.5 - 3 = 1.5$ apples/min.

210 apples at a rate of 1.5 apples/min take

$$\frac{180}{1.5} = \mathbf{120 \text{ min}}$$

(4) - (3) **Brad** can pick $4.5 - 4 = 0.5$ apples/min

210 apples at a rate of 0.5 apples/min take

$$\frac{180}{0.5} = \mathbf{360 \text{ min}}$$

OR Algebraically, let x = apples to be picked

A, B, C = rates in apples/minute, if each person works alone

$$\frac{x}{90} = \text{apples/minute picked by Alex and Brad}$$

$$\frac{x}{60} = \text{apples/minute picked by Brad and Celia}$$

$$\frac{x}{45} = \text{apples/minute picked by Alex and Celia}$$

Write the simultaneous equations:

$$\begin{cases} (1) A + B = \frac{x}{90} \\ (2) B + C = \frac{x}{60} \xrightarrow{(1)+(2)+(3)} 2(A + B + C) = \frac{x}{90} + \frac{x}{60} + \frac{x}{45} \\ (3) A + C = \frac{x}{45} \end{cases}$$

$$(4) A + B + C = \frac{1}{2} \times \left(\frac{x}{90} + \frac{x}{60} + \frac{x}{45} \right) = \frac{1}{2} \times \frac{9x}{180} = \frac{x}{40}$$

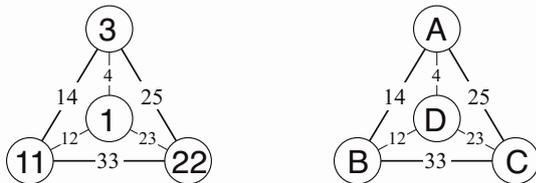
$$(4) - (1) C = \frac{x}{40} - \frac{x}{90} = \frac{5x}{360} = \frac{x}{72} \rightarrow C = \mathbf{72 \text{ min}}$$

$$(4) - (2) A = \frac{x}{40} - \frac{x}{60} = \frac{x}{120} \rightarrow A = \mathbf{120 \text{ min}}$$

$$(4) - (3) B = \frac{x}{40} - \frac{x}{45} = \frac{x}{360} \rightarrow B = \mathbf{360 \text{ min}}$$

32. **Hint:** Solve the exterior triangle first. Try any reasonable guess in the top circle and observe your results. OR Use algebra.

Solution: Whatever you place in the top circle to get 14 and 25 on the sides, your base circles must have the same difference, which is 11. So you require two numbers that have a difference of 11 but add to 33. By trial and error we get to 11 and 22. The 22 must go on the right where the largest number is required for the 25. The 11 goes on the left and this leads to a 3 at the top. The central number must be 1.



OR Algebraically write the simultaneous equations:

$$(1) \quad A + B = 14 \quad \text{or} \quad A = 14 - B$$

$$(2) \quad B + C = 33 \quad \text{or} \quad C = 33 - B$$

$$(3) \quad A + C = 25$$

Substitute equations (1) and (2) into equation (3):

$$\begin{aligned} (14 - B) + (33 - B) &= 25 \\ -2B &= -22 \\ \mathbf{B} &= \mathbf{11} \end{aligned}$$

Substitute $B = 11$ into equation (2):

$$C = 33 - 11$$

$$\mathbf{C = 22}$$

Substitute $B = 11$ into equation (1):

$$A = 14 - 11$$

$$\mathbf{A = 3}$$

33. **Hint:** Explain the idea $2^n \times 5^n \Rightarrow n$ zeros.

e.g. $2 \times 5 = 10$, $2^2 \times 5^2 = 100$, $2^3 \times 5^3 = 1000$

Solution: There are more factors of 2 than factors of 5 in the product $100! = 1 \times 2 \times \dots \times 98 \times 99 \times 100$

So we have to find how many 5's are in the product and we know that we will have 2's to match.

Then, each pair 2×5 will give a zero, so we'll be able to find the total number of zeros.

Multiples of 5	Prime Factors
5	5
10	2×5
15	3×5
20	$2^2 \times 5$
25	5^2
30	$2 \times 3 \times 5$
35	5×7
40	$2^3 \times 5$
45	$3^2 \times 5$
50	2×5^2
55	5×11
60	$2^2 \times 3 \times 5$
65	5×13
70	$2 \times 5 \times 7$
75	3×5^2
80	$2^4 \times 5$
85	5×17
90	$2 \times 3^2 \times 5$
95	5×19
100	$2^2 \times 5^2$

There are 24 factors of 5 in the product

$100! = 1 \times 2 \times \dots \times 98 \times 99 \times 100$

Then $2^{24} \times 5^{24} \Rightarrow 24$ zeros

100 factorial (100!) would have **24 zeros** at the end.

4.7

32. **Hint:** Make an organised list. Be systematic.

Solution:

Day (24 h)	1		2		3		4		5		6	
	day	night										
Metres moved	+3	-2	+3	-2	+3	-2	+3	-2	+3	-2	+3	-2
Height up wall	3	1	4	2	5	3	6	4	7	5	8	6

After 6 days the snail reached the top of the well.

4.7 (cont.)



33. **Hint:** List all the combinations of 3 numbers that add to 13. Also list their products and look for similar results.

Solution:

$a + b + c = 13$	$a \times b \times c$
(1,1,11)	11
(1,2,10)	20
(1,3,9)	27
(1,4,8)	32
(1,5,7)	35
(1,6,6)	36
(2,2,9)	36
(2,3,8)	40
(2,4,7)	56
(2,5,6)	60
(3,3,7)	63
(3,4,6)	72
(3,5,5)	75
(4,4,5)	80

For all the products other than 36, the answer is unique and the teacher would have guessed the 3 ages straight away (he knows the number of his classroom!) For the product 36, he needs another clue. The eldest child is playing violin means that the triplet (1,6,6) is not possible.

The answer is **(2,2,9)**

33. **Hint:** Simplify the problem and work on 1 and 2-dimensional models first. Make an organised list and look for patterns.

Solution: Solve these problems first in the given order:

1. Find the maximum number of pieces obtainable when making 7 cuts in a string (**line**).

No of cuts	0	1	2	3	4	5	6	7
No of pieces	1	2	3	4	5	6	7	8

Increase rate (new pieces) +1 +1 +1 +1 +1 +1 +1

3 cuts,
4 pieces

2. What is the maximum number of portions of a pizza (**circle**), obtainable using 7 cuts?

No of cuts	0	1	2	3	4	5	6	7
Total portions	1	2	4	7	11	16	22	29

Increase rate (new portions) +1 +2 +3 +4 +5 +6 +7



3 cuts,
7 pieces

this is exactly the second line in the table above

A pattern emerges:

Each time when making a new cut the number of new portions equal the numbers in the second line of the table in question 1 above.

3. Find the maximum number of pieces of an orange (**sphere**), obtainable using 7 cuts.

Three cuts produce 8 pieces (see diagram)

and it is essential to decide about the maximum number of pieces obtainable using 4 cuts.



3 cuts,
8 pieces

Cutting at an angle, we can cut through 7 of the existing 8 pieces and thus obtaining 7 new pieces. Add this to the existing 8 pieces and we total 15 pieces.

A pattern emerges:

Each time when making a new cut the number of new pieces equals the numbers in the second line of the table in question 2 above.

No of cuts	0	1	2	3	4	5	6	7
No of pieces	1	2	4	8	15	26	42	64

Increase rate (new pieces) +1 +2 +4 +7 +11 +16 +22

this is exactly the second line in the table above

So, the maximum number of pieces of orange obtainable using 7 cuts is **64**.

4.8

32. **Hint:** Solve algebraically.

Solution:

Original size	x
Reduced size (Scale Factor 80%)	80% of x means $\frac{80}{100} \times x$
Original size (Scale Factor $y\%$)	$\frac{y}{100} \times \frac{80 \times x}{100} = x$ Divide both sides by x $\frac{y}{100} \times \frac{80}{100} = 1$ $y = \frac{10\,000}{80} = 125\%$

The drawing must be enlarged by a scale factor of **125%** to return it to its original size.

MATHS MATE



Teacher Resource



Teacher's Guide to the Use of Maths Mate

pages i - viii



Student Workbook Answers

pages 3 - 72



Student Workbook Short Answers

pages 1 - 8



Problem Solving Hints & Solutions

pages 1 - 18



Test Masters

pages 1 - 32



Test Answers

pages 1 - 32



Record Keeping Sheets

pages 1 - 10



Name:

1. [Long \times ,+] $99 \times 34 =$

2. [Decimal +,-] $4.88 - 0.99 + 1.22 =$

3. [Decimal \times ,+] $0.4 \times 0.5 =$

4. [Fraction +,-] $\frac{4a}{7} + \frac{2a}{7} =$

5. [Fraction \times ,+] $6\frac{3}{5} \div 3 =$

6. [Percentages] Increase \$30 000 by 0.25% \$

7. [Integer +,-] $(+4) + (-5) + (-9) =$

8. [Integer \times ,+] $(-4) \times (+12) =$

9. [Rates / Ratios] Divide \$108 in the ratio 3 : 5 : 4 \$: \$: \$

10. [Indices] Evaluate $\frac{(-2)^5}{(-2)^3}$

11. [Square Roots / Surds] Simplify $2\sqrt{3} \times 4\sqrt{10}$

12. [Order of Operations] $9 + 4 \times 72 \div 3 =$

13. [Exploring Number] An electricity bill for \$305.20 is divided evenly between four students. How much does each pay? \$

14. [Scientific Notation] How many significant figures are there in 1001?

15. [Number Patterns] Complete the pattern: $\frac{5}{36}, \frac{5}{6}, 5, 30,$,

16. [Expressions] Write the following as an algebraic expression: A number that is h less than the sum of i and j

17. [Substitution] The average of x and y can be found using the formula $a = \frac{x+y}{2}$. If $x = 3.6$ and $y = 5.8$ find the value of a .

18. [Expansion] Expand $-2x(4x - 3)$

19. [Factorisation] Factorise and simplify $\frac{15ax - 6x^2}{6x^2}$

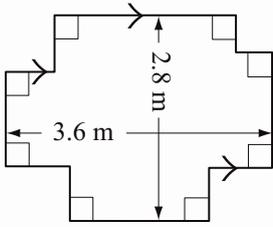
20. [Equations] Solve for x : $-7(2 - x) = 21$

21. [Graphs & Functions] Complete the table:

function	gradient (m)	x-intercept	y-intercept (c)
$y = -2x + 6$			
$y = 2x - 6$			

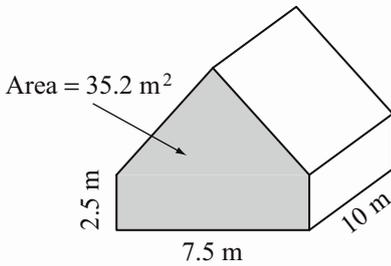
22. [Units of Measurement / Time] The Smith family departs Sydney on August 3rd at 1620 hours and arrives in Singapore on August 3rd at 2330 hours. How long was their journey, given Singapore time is 2 hours behind Sydney time? h min

23. [Perimeter]
Find the perimeter of the shape.

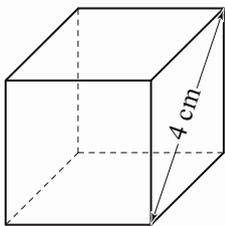

 m

24. [Area]
A rectangular field has dimensions 500 m by 300 m. How many kilograms of fertiliser are needed if it is to be applied at the rate of 80 kg per hectare?
[1 ha = 10 000 m²]

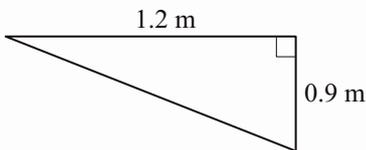
25. [Volume]
What is the volume of air inside the shed?


 m³

26. [Surface Area]
Find the total surface area of the cube.


 cm²

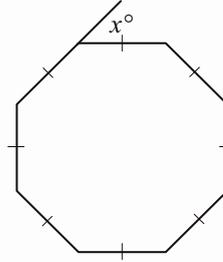
27. [Pythagoras / Trigonometry]
Find the length of the hypotenuse of this triangle.


 m

28. [Shape / Location]
What is the order of rotational symmetry of this shape? That is, in rotating the shape through 360°, how often will it look exactly as it did at the start? [Hint: A square has an order of 4.]



29. [Angles]
Find the value of x° .



30. [Statistics]
Find the mean of the following distribution.

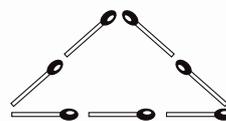
Score	0	1	2	3	4
Frequency	12	10	5	2	1

31. [Probability]
A 52 card deck of playing cards is shuffled, and a card is dealt from the top of the deck. Determine the probability of the card being either a 10, a Jack, a Queen, a King or an Ace.



32. [Problem Solving 1]
In your drawer you have 6 white socks, 4 black socks, 2 red socks and 2 green socks. There is a power failure and you reach into the drawer in the dark. How many socks must you take with you to ensure you have a pair of the same colour?

33. [Problem Solving 2]
Seven matchsticks can be used to form a triangular enclosure in two different ways, {3,2,2} and {1,3,3}, as shown below. How many different triangles can be formed using 13 matchsticks?



{3,2,2}



{1,3,3}



Name:

1. [Long \times ,+] $164 \times 25 =$

2. [Decimal +,-] $2.82 - 2.87 + 1.05 =$

3. [Decimal \times ,+] $0.06 \times 0.9 =$

4. [Fraction +,-] $\frac{6y}{11} - \frac{3y}{11} =$

5. [Fraction \times ,+] $4\frac{6}{7} \div 2 =$

6. [Percentages] Increase \$30 000 by 0.75%

7. [Integer +,-] $(-1) - (-6) + (+5) =$

8. [Integer \times ,+] $(-45) \div (-9) =$

9. [Rates / Ratios] Divide \$480 in the ratio 9 : 4 : 7
 : :

10. [Indices] Evaluate $\left(\frac{1}{5}\right)^{-2}$

11. [Square Roots / Surds] Simplify $8\sqrt{7} \times 2\sqrt{5}$

12. [Order of Operations] $8 + 6 - 32 \div 4 =$

13. [Exploring Number] A Lotto prize of \$663 250 is shared by four people. How much does each receive?

14. [Scientific Notation] How many significant figures are there in 0.0502?

15. [Number Patterns] Complete the pattern:
 50, 10, 2, $\frac{2}{5}$, ,

16. [Expressions] Write the following as an algebraic expression:
 The average of m and n

17. [Substitution] Given that the formula for the area of a kite is $A = \frac{ab}{2}$, find A when $a = 8.5$ and $b = 4$.

18. [Expansion] Expand $5x(x^2 - 3)$

19. [Factorisation] Factorise and simplify $\frac{-5x - 10}{2x + 4}$

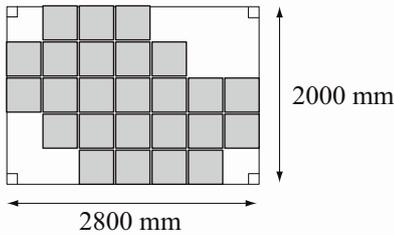
20. [Equations] Solve for x :
 $-2(x - 6) = 18$

21. [Graphs & Functions] Complete the table:

function	gradient (m)	x -intercept	y -intercept (c)
$y = 4x$			
$y = 4x + 2$			

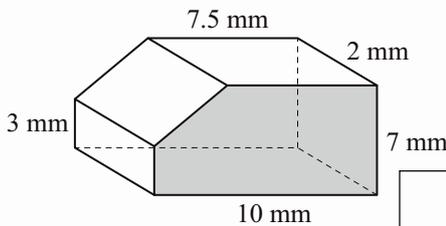
22. [Units of Measurement / Time] The Barnes family departs London on June 19th at 2300 hours and arrives in Melbourne on June 21st at 0455 hours. How long was their journey, given London time is 10 hours behind Melbourne time?
 h min

23. [Perimeter]
Find, in metres, the perimeter of the paved area.

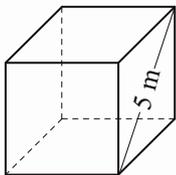


24. [Area]
Find the area of paving needed to construct a 1.5 metre wide path around a rectangular pool with dimensions 5 m by 4 m.

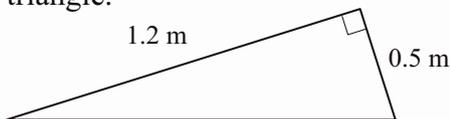
25. [Volume]
Find the volume of the prism.



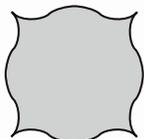
26. [Surface Area]
Find the total surface area of the cube.



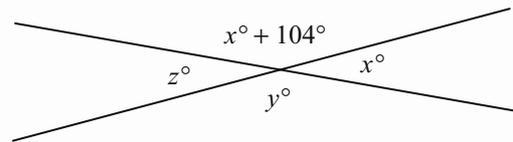
27. [Pythagoras / Trigonometry]
Find the length of the hypotenuse of this triangle.



28. [Shape / Location]
For the shape shown, find the minimum angle of rotation required to regain the original image.



29. [Angles]
Find the values of x° , y° and z° .



30. [Statistics]
Find the mean of the following distribution.

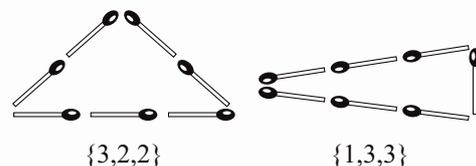
Score	6	7	8	9	10	11	12
Frequency	5	10	20	30	20	10	5

31. [Probability]
Three cards are drawn at random from a deck of 52. The probability of choosing three of a kind (3 Aces, 3 Kings, 3 Queens ... or 3 Twos) is: $\frac{52}{52} \times \frac{3}{51} \times \frac{2}{50} = \frac{1}{425}$
What is the probability of not choosing three of a kind?



32. [Problem Solving 1]
In your drawer you have 4 white socks, 2 black socks, 2 red socks, 6 brown socks and 4 green socks. There is a power failure and you reach into the drawer in the dark. How many socks must you take with you to ensure you have a pair of the same colour?

33. [Problem Solving 2]
Seven matchsticks can be used to form a triangular enclosure in two different ways, $\{3,2,2\}$ and $\{1,3,3\}$ as shown below. How many different triangles can be formed using 9 matchsticks?





Name:

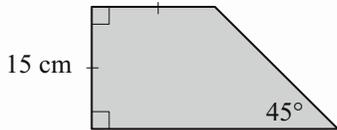
- | | |
|--|--|
| <p>1. [Long \times,$+$]
$826 \div 7 =$ <input style="width: 60px; height: 25px; border: 1px solid black;" type="text"/></p> <p>2. [Decimal $+$,$-$]
$6.4 + 0.64 + 0.064 =$ <input style="width: 60px; height: 25px; border: 1px solid black;" type="text"/></p> <p>3. [Decimal \times,$+$]
$8 \div 0.04 =$ <input style="width: 60px; height: 25px; border: 1px solid black;" type="text"/></p> <p>4. [Fraction $+$,$-$]
$\frac{7}{9} - \frac{4}{6} =$ <input style="width: 60px; height: 25px; border: 1px solid black;" type="text"/></p> <p>5. [Fraction \times,$+$]
$\frac{n}{8} \times \frac{4}{n} =$ <input style="width: 60px; height: 25px; border: 1px solid black;" type="text"/></p> <p>6. [Percentages]
Mr Jones invested \$2500 at 5% per annum simple interest. How much interest would he earn after 3 years?
\$ <input style="width: 60px; height: 25px; border: 1px solid black;" type="text"/></p> <p>7. [Integer $+$,$-$]
$-5 - (7 - 10) =$ <input style="width: 60px; height: 25px; border: 1px solid black;" type="text"/></p> <p>8. [Integer \times,$+$]
$(+2x) \times (-1) =$ <input style="width: 60px; height: 25px; border: 1px solid black;" type="text"/></p> <p>9. [Rates / Ratios]
Lions can run at up to 80 km/h. At this rate how far can a lion run in 3 minutes?
<input style="width: 60px; height: 25px; border: 1px solid black; text-align: center;" type="text"/> km</p> <p>10. [Indices]
Evaluate $(-2x^2)^3$ <input style="width: 60px; height: 25px; border: 1px solid black;" type="text"/></p> <p>11. [Square Roots / Surds]
Simplify $\sqrt{75}$ <input style="width: 60px; height: 25px; border: 1px solid black;" type="text"/></p> <p>12. [Order of Operations]
$(4 \times 4 - 6)^3 - 2^3 =$ <input style="width: 60px; height: 25px; border: 1px solid black;" type="text"/></p> <p>13. [Exploring Number]
Write $\frac{3}{80}$ as a decimal. <input style="width: 60px; height: 25px; border: 1px solid black;" type="text"/></p> | <p>14. [Scientific Notation]
Express 0.00018 m, the thickness of a fingernail, in scientific notation. <input style="width: 60px; height: 25px; border: 1px solid black;" type="text"/></p> <p>15. [Number Patterns]
Complete the pattern:
4, 4, 8, 12, 20, <input style="width: 60px; height: 25px; border: 1px solid black; text-align: center;" type="text"/>, <input style="width: 60px; height: 25px; border: 1px solid black; text-align: center;" type="text"/></p> <p>16. [Expressions]
Write the following as an algebraic expression:
A quarter of the sum of c and d <input style="width: 60px; height: 25px; border: 1px solid black;" type="text"/></p> <p>17. [Substitution]
If $p = 10$ and $q = -5$, find the value of $2p + 3q$ <input style="width: 60px; height: 25px; border: 1px solid black;" type="text"/></p> <p>18. [Expansion]
Expand and simplify $2x(x - 1) + 4(x - 1)$ <input style="width: 60px; height: 25px; border: 1px solid black;" type="text"/></p> <p>19. [Factorisation]
Factorise $2x + 3a + ax + 6$ <input style="width: 60px; height: 25px; border: 1px solid black;" type="text"/></p> <p>20. [Equations]
Solve for x:
$3(2x - 1) = 0$ <input style="width: 60px; height: 25px; border: 1px solid black;" type="text"/></p> <p>21. [Graphs & Functions]
Find the equation of the line joining the points K(0,-2) and L(-3,0), using the formula $y - y_1 = m(x - x_1)$ where $m = \frac{y_2 - y_1}{x_2 - x_1}$
<input style="width: 60px; height: 25px; border: 1px solid black; text-align: center;" type="text"/> $y =$ <input style="width: 60px; height: 25px; border: 1px solid black;" type="text"/></p> <p>22. [Units of Measurement / Time]
The capacity of a cup is 250 mL. Find its volume in cm^3. <input style="width: 60px; height: 25px; border: 1px solid black;" type="text"/></p> |
|--|--|

23. [Perimeter]
Using $\pi \approx \frac{22}{7}$ find the circumference of a golf buggy wheel with radius 140 mm.

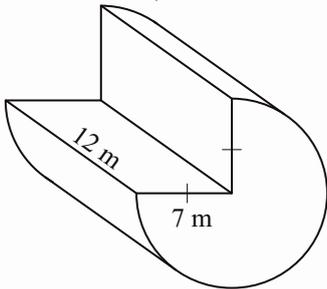


radius = 140 mm

24. [Area]
Find the area of the trapezium.

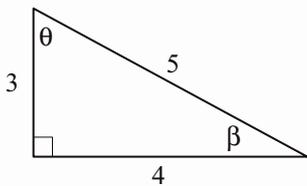


25. [Volume]
Using $\pi \approx \frac{22}{7}$ find the volume of the solid.

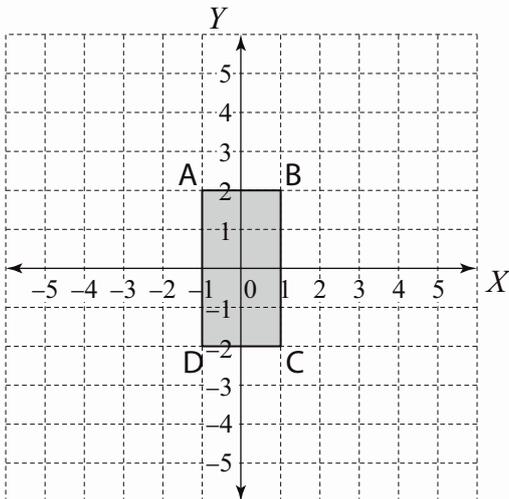


26. [Surface Area]
Using $TSA = \pi r(r + s)$ where $\pi \approx \frac{22}{7}$, find the total surface area of a cone of radius 4 cm and slant height 10 cm.

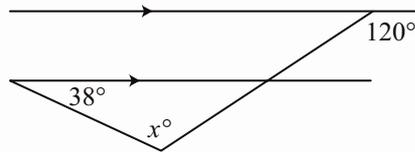
27. [Pythagoras / Trigonometry]
For which angle is the sine ratio 0.6?



28. [Shape / Location]
Redraw the rectangle ABCD after translating it -4 units horizontally and -3 units vertically.

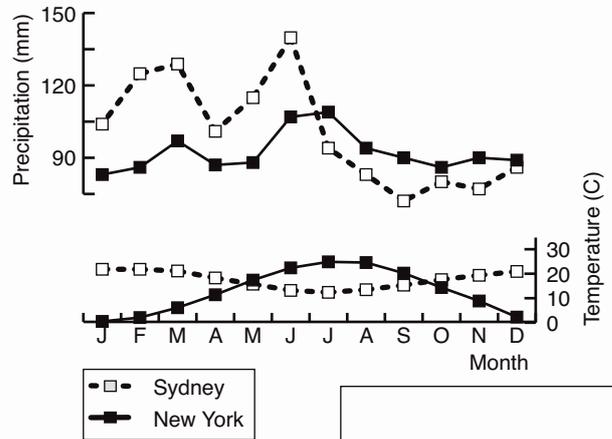


29. [Angles]
Find the value of x° .



30. [Statistics]
In which month are the climates of New York and Sydney most alike?

Average Temperature and Precipitation



31. [Probability]
What is the probability that a passenger chosen at random from the airport flies business class?

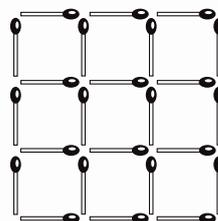
[Complete the two-way table.]

	Business class	Economy class	Total
Dassault-Brequet	10	0	10
BAe 125			
Boeing 747		440	490
Total	74	440	

32. [Problem Solving 1]
If n is an odd integer, which of the following must also be odd?

- I. $n + n$ II. $n + n + n$ III. $n \times n \times n$
A) I only B) II only
C) III only D) II and III only
E) I, II and III

33. [Problem Solving 2]
Remove four matches from this arrangement to leave exactly six squares.





Name:

- | | |
|--|--|
| <p>1. [Long \times,\div]
$420 \div 5 =$ <input type="text"/></p> <p>2. [Decimal $+$,$-$]
$4 + 0.25 - 0.38 =$ <input type="text"/></p> <p>3. [Decimal \times,\div]
$0.6 \div 0.02 =$ <input type="text"/></p> <p>4. [Fraction $+$,$-$]
$\frac{4}{6} + \frac{3}{8} =$ <input type="text"/></p> <p>5. [Fraction \times,\div]
$\frac{4}{y} \times \frac{y}{5} =$ <input type="text"/></p> <p>6. [Percentages]
Susan invested \$10 000 at 6.5% per annum simple interest. How much interest would she earn after 2 years?
\$ <input type="text"/></p> <p>7. [Integer $+$,$-$]
$-3 + (8 - 15) =$ <input type="text"/></p> <p>8. [Integer \times,\div]
$(+72w) \div (-9) =$ <input type="text"/></p> <p>9. [Rates / Ratios]
Gulls can fly at up to 40 km/h. At this rate what distance can a gull fly in 3 minutes?
<input type="text"/> km</p> <p>10. [Indices]
Simplify $-(3y^5)^2$ <input type="text"/></p> <p>11. [Square Roots / Surds]
Simplify $\sqrt{28}$ <input type="text"/></p> <p>12. [Order of Operations]
$(2 - 15 + 13)^2 - 20 =$ <input type="text"/></p> <p>13. [Exploring Number]
Write $\frac{7}{25}$ as a decimal. <input type="text"/></p> | <p>14. [Scientific Notation]
Express 43 500 in scientific notation. <input type="text"/></p> <p>15. [Number Patterns]
Complete the pattern:
5, 5, 10, 15, <input type="text"/>, <input type="text"/></p> <p>16. [Expressions]
Write the following as an algebraic expression:
3 more than four lots of x <input type="text"/></p> <p>17. [Substitution]
If $y = -1$ and $z = 6$, find the value of $4y - z$ <input type="text"/></p> <p>18. [Expansion]
Expand and simplify $x(x - 7) - (x - 7)$ <input type="text"/></p> <p>19. [Factorisation]
Factorise $2xy - 3y + 2x - 3$ <input type="text"/></p> <p>20. [Equations]
Solve for x:
$\frac{2}{3}(3x + 1) = 0$ <input type="text"/></p> <p>21. [Graphs & Functions]
Find the equation of the line joining the points M(0,-2) and N(-1,3), using the formula $y - y_1 = m(x - x_1)$ where $m = \frac{y_2 - y_1}{x_2 - x_1}$
<input type="text"/> $y =$ <input type="text"/></p> <p>22. [Units of Measurement / Time]
The capacity of a water tank is 1200 L. Find its volume in m^3. <input type="text"/></p> |
|--|--|

23. [Perimeter]
A circle has a circumference of 88 mm. Using $\pi \approx \frac{22}{7}$ find its diameter.

24. [Area]
Find the area of the shape.
-

25. [Volume]
Using $\pi \approx \frac{22}{7}$ find the volume of the solid.
-

26. [Surface Area]
Using $TSA = 2\pi r(r + h)$ where $\pi \approx 3.14$, find the total surface area of a cylindrical can of radius 7 cm and height 13 cm.

27. [Pythagoras / Trigonometry]
For which angle is the tangent ratio 0.75?
-

28. [Shape / Location]
Redraw the triangle after a rotation of 90° anticlockwise about the origin.
-

29. [Angles]
Find the value of x° .
-

30. [Statistics]
Which of the three cities shown below has the highest total annual precipitation?
- Average Monthly Precipitation**
-
- | Month | Sydney | New York | Rome |
|-------|--------|----------|------|
| J | 100 | 85 | 85 |
| F | 125 | 85 | 75 |
| M | 130 | 95 | 55 |
| A | 100 | 90 | 50 |
| M | 115 | 90 | 50 |
| J | 140 | 105 | 20 |
| J | 105 | 105 | 10 |
| A | 85 | 95 | 20 |
| S | 75 | 90 | 75 |
| O | 85 | 90 | 105 |
| N | 85 | 90 | 105 |
| D | 90 | 90 | 100 |

31. [Probability]
What is the probability that a professor chosen at random at the conference is an Australian chemist? [Complete the two-way table.]
- | | Americans | Australians | Europeans | Total |
|----------------|-----------|-------------|-----------|-------|
| Mathematicians | 30 | 5 | | 45 |
| Physicians | | | 3 | 33 |
| Chemists | 40 | | 20 | 80 |
| Total | 91 | 34 | | |

32. [Problem Solving 1]
If n is an integer, which of the following
I. $2n$ II. $2n + n$ III. $2n \times n$
must be even?
A) I only B) II only
C) III only D) I and II only
E) I and III only

33. [Problem Solving 2]
Remove four matches from the arrangement below to leave exactly five squares.
-



Name:

1. [Long \times ,+] $41 \times 26 =$

2. [Decimal +,-] $1 - 0.044 =$

3. [Decimal \times ,+] $3.4 \times 0.9 =$

4. [Fraction +,-] $\frac{d}{5} - \frac{d}{15} =$

5. [Fraction \times ,+] $7 \times 1\frac{1}{5} =$

6. [Percentages]
Anya gives 5% of her income to charity. If she gives \$3 per week to charity, what is her weekly income? \$

7. [Integer +,-] $-5 - (2 - 6) =$

8. [Integer \times ,+] $(+8) \times (-3) \div (+4) =$

9. [Rates / Ratios]
Mildura and Hay are 290 km apart. How many centimetres apart are they on a map with a scale factor of 1 : 500 000?

10. [Indices] Evaluate $\frac{1}{3^{-2}}$

11. [Square Roots / Surds]
Between which two consecutive whole numbers does $5\sqrt{2}$ lie?

12. [Order of Operations] $8 + 10 \times 64 \div 2 =$

13. [Exploring Number]
A cyclist rides 75 km in 5 hours. At this rate how long would it take her to ride 120 km? h

14. [Scientific Notation]
Which is the order of magnitude of 0.0015?
[i.e. What power of 10 appears in the scientific notation of the number? OR What power of 10 is the number closest to?]
A) 10^{-4} B) 10^{-3} C) 10^{-2} D) 10^0

15. [Number Patterns]
Complete the pattern:
4.8, 2.4, 1.2, 0.6, ,

16. [Expressions]
Find the difference between the following polynomials:
 $(k^2 + k - 2) - (k^2 - 5k - 4)$

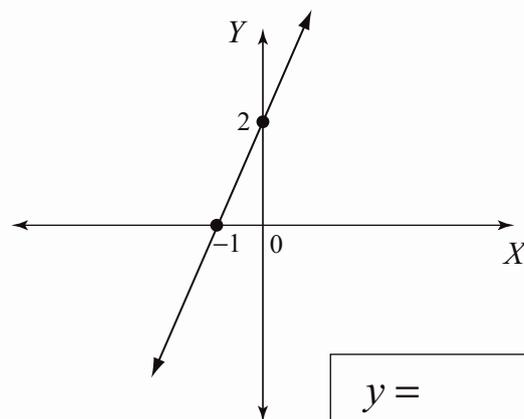
17. [Substitution]
If $e = 3$ and $f = 5$, simplify $e^2 - 2f$

18. [Expansion]
Expand and simplify $3(x + 2)^2 - 3x$

19. [Factorisation]
Factorise $a^2 + 10ab + 25b^2$

20. [Equations]
Solve the simultaneous equations:
 $2x - y = 3$
 $3x + y = 12$

21. [Graphs & Functions]
Find the equation of the line.



22. [Units of Measurement / Time]
Convert 2 square metres to square centimetres.

23. [Perimeter]
Find the perimeter of the square.

Area = 81 Ha

 m

24. [Area]
Using $\pi \approx 3.14$ find the area of the shaded region.

10 m

 m²

25. [Volume]
A skew pyramid is formed from a cube as shown. Find its volume.

6 cm

 cm³

26. [Surface Area]
Find the total surface area of the triangular prism.

6 cm, 8 cm, 10 cm, 14 cm

 cm²

27. [Pythagoras / Trigonometry]
Use the triangle to calculate the value of $\sin \theta$.

28. [Shape / Location]
Draw the view from the front of the solid.

29. [Angles]
Find the value of y° .

30. [Statistics]
For the box-and-whisker plot, find the range and the interquartile range (IQR).

range = IQR =

31. [Probability]
If two dice are thrown, what is the probability of rolling a pair of 'ones'?

32. [Problem Solving 1]
Factorise and evaluate:
 $42^2 + 2 \times 42 \times 58 + 58^2 =$

33. [Problem Solving 2]
The number 15 can be expressed as a sum of two or more consecutive, positive integers in three different ways:
1 + 2 + 3 + 4 + 5
or 4 + 5 + 6
or 7 + 8.
In how many ways can 63 be expressed as such a sum?



Name:

1. [Long \times ,+] $65 \times 16 =$

2. [Decimal +,-] $1 - 0.234 =$

3. [Decimal \times ,+] $0.04 \div 0.8 =$

4. [Fraction +,-] $\frac{w}{2} + \frac{w}{3} =$

5. [Fraction \times ,+] $3 \times 2\frac{3}{4} =$

6. [Percentages]
My pay cut of 5% means I earn \$30 less per week. What is my weekly wage now? \$

7. [Integer +,-] $3 - (7 + 4) =$

8. [Integer \times ,+] $(-6) \times (-9) \div (-2) =$

9. [Rates / Ratios]
Port Augusta and Whyalla are 77 km apart. How many centimetres apart are they on a map with a scale factor of 1 : 1 000 000?

10. [Indices]
Evaluate $(0.2)^{-2}$

11. [Square Roots / Surds]
Between which two consecutive whole numbers does $3\sqrt{3}$ lie?

12. [Order of Operations] $5 + 2 - 18 \div 3 =$

13. [Exploring Number]
A lion moves 13 m in 2 bounds. What distance will it cover in 7 bounds at this rate? m

14. [Scientific Notation]
Which is the order of magnitude of 23 800?
[i.e. What power of 10 appears in the scientific notation of the number? OR What power of 10 is the number closest to?]
A) 10^3 B) 10^4
C) 10^5 D) 10^6

15. [Number Patterns]
Complete the pattern:
0.8, 0.4, 0.2, 0.1, ,

16. [Expressions]
Add the following polynomials:
 $(-2p^2 - p + 5) + (-p^2 - 3p - 6)$

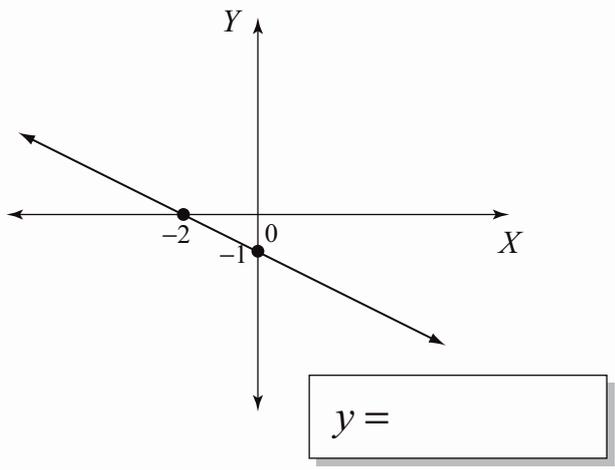
17. [Substitution]
If $a = 5$, $b = 0$ and $x = 4$,
simplify $ab - x^2$

18. [Expansion]
Expand and simplify
 $(x - 2y)^2$

19. [Factorisation]
Factorise $3x^2 - 27$

20. [Equations]
Solve the simultaneous equations:
 $4x - y = 4$
 $4x + 2y = 4$

21. [Graphs & Functions]
Find the equation of the line.



22. [Units of Measurement / Time]
Change 1.25 cubic metres to cubic centimetres.

23. [Perimeter]
Find the perimeter of the rhombus.

 mm

24. [Area]
Using $\pi \approx 3.14$ find the area of the shaded region.

 cm²

25. [Volume]
A square pyramid sits atop a cube as shown. Find the volume of the solid.

 cm³

26. [Surface Area]
Find the total surface area of the triangular prism.

 cm²

27. [Pythagoras / Trigonometry]
Use the triangle to calculate the value of $\cos \theta$.

28. [Shape / Location]
Draw the view from the front of the solid.

29. [Angles]
Find the values of x° , y° and z° .

 $x^\circ =$ $y^\circ =$ $z^\circ =$

30. [Statistics]
For the box-and-whisker plot, find the range and the interquartile range (IQR).

 range = IQR =

31. [Probability]
If two dice are thrown one after the other, what is the probability of obtaining a 3 on the first die?

32. [Problem Solving 1]
Factorise and evaluate: $76^2 - 24^2 =$

33. [Problem Solving 2]
The number 84 can be expressed as a sum of two or more consecutive, positive integers in three different ways:
 $27 + 28 + 29$
 or $9 + 10 + 11 + 12 + 13 + 14 + 15$
 or $7 + 8 + 9 + 10 + 11 + 12 + 13 + 14$.
 In how many ways can 75 be expressed as such a sum?



Name:

1. [Long \times, \div]
 $37.8 \div 6 =$

2. [Decimal $+, -$]
 $100 - 0.19 =$

3. [Decimal \times, \div]
 $1.6 \times 0.08 =$

4. [Fraction $+, -$]
 $\frac{4}{6} - \frac{2}{15} =$

5. [Fraction \times, \div]
 $\frac{3}{4}(12 + 4d) =$

6. [Percentages]
 A 5% discount on the furniture saved Alex \$270. How much did he pay? \$

7. [Integer $+, -$]
 $(+q) - (-6q) =$

8. [Integer \times, \div]
 $(4 - 7) \times (4 - 7) =$

9. [Rates / Ratios]
 The Moon is approximately 375 000 km from Earth. How long does it take the light to travel from the Moon to Earth? [The speed of light is approximately 300 000 km/s.] s

10. [Indices]
 Simplify $\frac{5st^4 \times 4s^3}{10st^5}$

11. [Square Roots / Surds]
 Expand and simplify $\sqrt{7}(4 - \sqrt{7})$

12. [Order of Operations]
 $(5 \times 1)^3 + 2^2 =$

13. [Exploring Number]
 At 60 km/h a car can drive from the city to the coast in 3 hours. What average speed is required for the car to travel the same distance in 2 hours? km/h

14. [Scientific Notation]
 Estimate the order of magnitude of 19.5×510

15. [Number Patterns]
 Write the first four terms of the sequence $t_n = \frac{n}{n+2}$ where $n \geq 1$

16. [Expressions]
 Write algebraic expressions for each of the three consecutive odd numbers where the smallest of the three numbers is n .

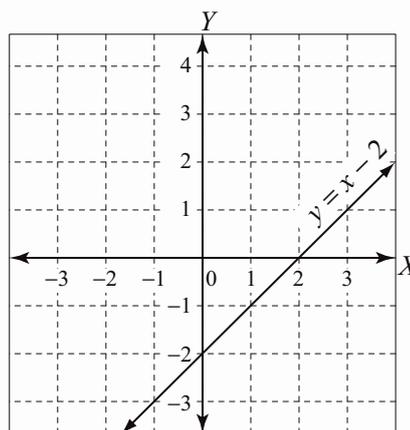
17. [Substitution]
 If $a = \frac{2}{3}$ and $b = \frac{1}{4}$, find the value of $2a - 3b$

18. [Expansion]
 Expand and simplify $(4x + 1)(x - 4)$

19. [Factorisation]
 Factorise $u^2 - 5u + 6$

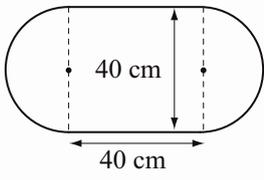
20. [Equations]
 Solve for x : $\frac{3x}{2} - \frac{x}{3} = 7$

21. [Graphs & Functions]
 Solve $y = x - 2$ and $x + y = 2$ simultaneously by drawing the second graph.

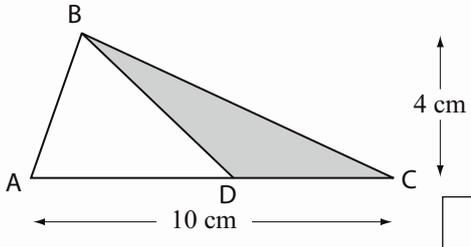


22. [Units of Measurement / Time]
 Iron has a density of 7.874 g/cm^3 .
 Express the density in kg/m^3 .

23. [Perimeter]
 Using $\pi \approx 3.14$ find the perimeter of the shape.

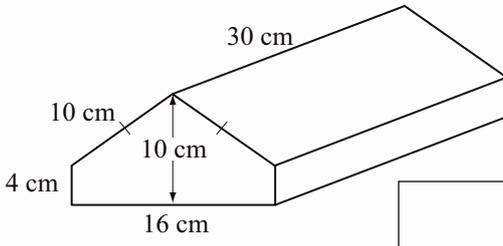


24. [Area]
 Find the length AD such that triangle ABD has the same area as triangle BCD.

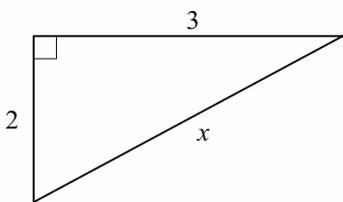


25. [Volume]
 Using $V = \frac{1}{3}\pi r^2 h$ where $\pi \approx \frac{22}{7}$, find the volume of a cone of base radius 3.5 cm and height 6 cm.

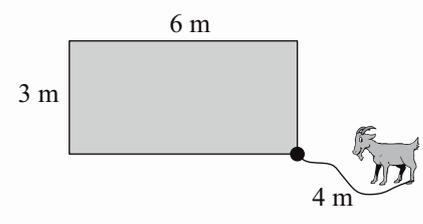
26. [Surface Area]
 Find the total surface area of the solid.



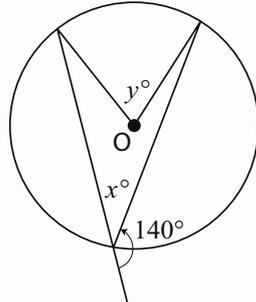
27. [Pythagoras / Trigonometry]
 Find, in surd form, the value of x .



28. [Shape / Location]
 A goat is tethered by a 4 m rope to the outside corner of a $6 \text{ m} \times 3 \text{ m}$ shed. Show the dimensions and the shape of the region over which the goat can graze.



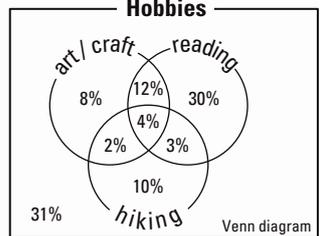
29. [Angles]
 Find the values of x° and y° .



30. [Statistics]
 Find the interquartile range for the distribution.

Number of letters	3	4	5	6	7	8	9	10
Frequency	4	5	7	6	5	5	0	1

31. [Probability]
 Find the probability that a surveyed person selected at random did not list reading as a hobby.

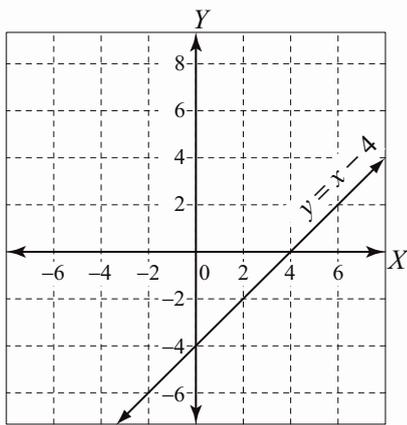


32. [Problem Solving 1]
 Find the sum:
 $(-1)^1 - (-1)^2 + (-1)^3 - \dots + (-1)^{49} - (-1)^{50}$

33. [Problem Solving 2]
 What are the last two digits in the expansion of 2^{222} ?



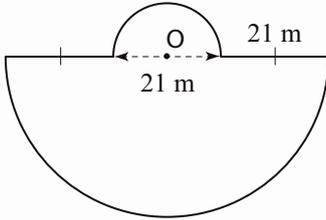
Name:

1. [Long \times, \div]
 $48.64 \div 8 =$
2. [Decimal $+, -$]
 $7 - 0.0444 =$
3. [Decimal \times, \div]
 $7.48 \times 0.02 =$
4. [Fraction $+, -$]
 $1\frac{5}{6} + \frac{3}{10} =$
5. [Fraction \times, \div]
 $\frac{1}{7}(14k + 56) =$
6. [Percentages]
A 15% discount on books saved me \$24.
How much did I pay? \$
7. [Integer $+, -$]
 $(-2p) - (-p) =$
8. [Integer \times, \div]
 $(5 - 8) \times (5 - 8) =$
9. [Rates / Ratios]
The Sun is approximately 150 000 000 km from Earth. How long does it take the light to travel from the Sun to Earth? [The speed of light is approximately 300 000 km/s.] s
10. [Indices]
Simplify $\frac{3a^4b \times 4a^3b^2}{6a^2b^3}$
11. [Square Roots / Surds]
Expand and simplify $\sqrt{2}(6 - \sqrt{2})$
12. [Order of Operations]
 $2 \times 5 + 21 \div 7 =$
13. [Exploring Number]
Five assistants can count the local electoral votes in 4 days. How many assistants, working at the same rate, are needed to count the same number of votes in 2 days?
14. [Scientific Notation]
Estimate the order of magnitude of 3.9×258
15. [Number Patterns]
Write the first four terms of the sequence $t_n = \frac{3n+1}{n}$ where $n \geq 1$
16. [Expressions]
Write a simple algebraic expression for the average of two consecutive odd numbers where the smaller of the two numbers is n .
17. [Substitution]
If $d = \frac{1}{3}$ and $e = \frac{1}{6}$, find the value of $4d - 3e$
18. [Expansion]
Expand and simplify $(3x - 2)(2x + 6)$
19. [Factorisation]
Factorise $z^2 - 15z + 56$
20. [Equations]
Solve for x : $\frac{2x}{5} - \frac{x}{3} = 2$
21. [Graphs & Functions]
Solve $y = x - 4$ and $x + y = 0$ simultaneously by drawing the second graph.


22. [Units of Measurement / Time]
Magnesium has a density of 1.737 g/cm^3 .
Express the density in kg/m^3 .

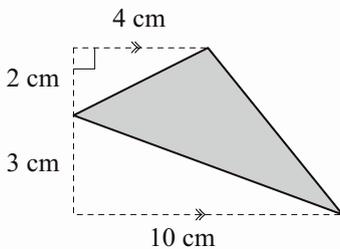
1737 kg/m^3

23. [Perimeter]
Using $\pi \approx \frac{22}{7}$ find the perimeter of the shape.



174 m

24. [Area]
Find the area of the shaded triangle.

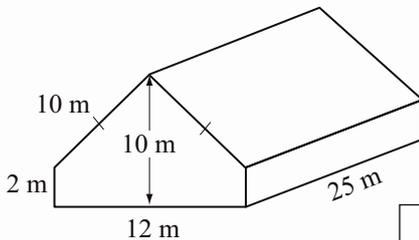


16 cm^2

25. [Volume]
Using $V = \pi r^2 h$ where $\pi \approx 3.14$, find the volume of a cylinder of base radius 5 cm and height 40 cm.

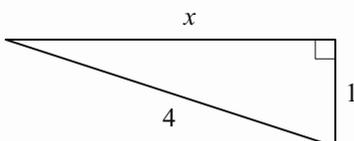
3140 cm^3

26. [Surface Area]
Find the total surface area of the solid.



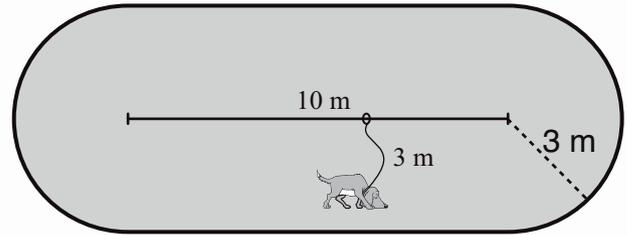
1044 m^2

27. [Pythagoras / Trigonometry]
Find, in surd form, the value of x .

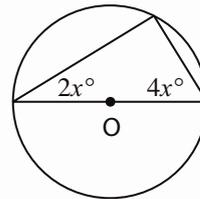


$\sqrt{15}$

28. [Shape / Location]
A dog is tethered by a 3 m rope to a ring which is free to slide along a straight rail 10 m long. Show the dimensions and the shape of the region over which the dog can wander.



29. [Angles]
Find the value of x° .



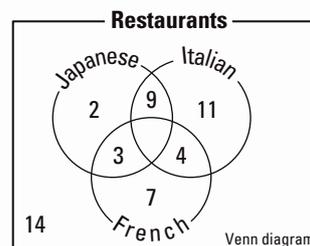
15°

30. [Statistics]
A die was rolled 30 times and the results recorded. Find the value of the interquartile range.

Score	1	2	3	4	5	6
Frequency	5	7	8	3	5	2

2

31. [Probability]
Fifty people were asked about the types of restaurants they had eaten at in the last 12 months. Find the probability that a person chosen at random from the surveyed group, had not eaten at an Italian restaurant in that time.



$\frac{13}{25}$

32. [Problem Solving 1]
Find the sum:
 $1 \times (-1)^1 + 2 \times (-1)^2 + 3 \times (-1)^3 + \dots + 100 \times (-1)^{100}$

50

33. [Problem Solving 2]
What are the last two digits in the expansion of 4^{444} ?

56



Name:

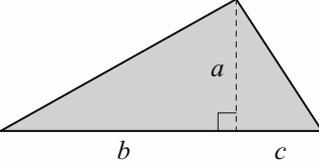
1. [Long $\times, +$]
 $18 \times 2.9 =$
2. [Decimal $+, -$]
 $x - 7.5 = 5.45$
3. [Decimal $\times, +$]
 $0.96 \div x = 96$
4. [Fraction $+, -$]
 $\frac{1}{2} - \frac{1}{5} + \frac{1}{6} =$
5. [Fraction $\times, +$]
 $1\frac{1}{2} \times 3\frac{1}{2} =$
6. [Percentages]
Paul bought a car 3 years ago for \$2500 and recently sold it for \$800. Express the loss as a percentage of the cost price.
7. [Integer $+, -$]
 $(4 - 5) - (6 - 7) =$
8. [Integer $\times, +$]
 $\frac{12xy}{-4y} =$
9. [Rates / Ratios]
On average, one person in the world dies every six seconds from drinking water contaminated with water-borne diseases. How many people die every day from a lack of safe water to drink?
10. [Indices]
Simplify and express using positive indices
 $\frac{4y^{-2}}{y^2}$
11. [Square Roots / Surds]
Evaluate $\frac{7\sqrt{3} \times \sqrt{15}}{\sqrt{20}}$
12. [Order of Operations]
 $6 \times 3 - (25 \div 5) =$
13. [Exploring Number]
Write the recurring decimal $0.\dot{4}$ as a fraction in simplest form.
14. [Scientific Notation]
Express 0.03×10^{-1} as a basic numeral.
15. [Number Patterns]
Write the first four terms of the sequence $t_n = (n + 2)^2$ where $n \geq 1$
16. [Expressions]
A cheetah moves 18 metres in 6 bounds. At this rate how many metres would it move in z bounds?
17. [Substitution]
For what values of x is $\frac{-5}{x(x+5)}$ undefined?
18. [Expansion]
Expand and simplify $x(x+3)(x+2)$
19. [Factorisation]
Factorise $4x^2 + 15x - 4$
20. [Equations]
Solve for x :
 $x^2 + 10x = 0$
21. [Graphs & Functions]
Complete the table of values for the parabola of equation $y = -2x^2 + 1$

x	-3	-2	-1	0	1	2	3
y							

22. [Units of Measurement / Time]
How many metres in t millimetres?

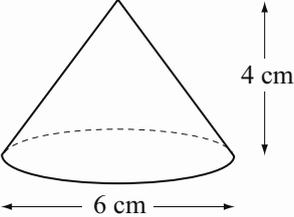
23. [Perimeter]
A rectangle has an area of 48 cm^2 . If its length is three times its width, find its perimeter.

24. [Area]
Write a formula for the area A of the triangle.

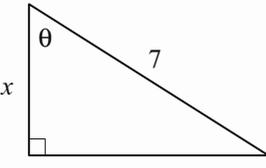


25. [Volume]
Plastic is used to make a hollow cube which has an outer edge length of 10 cm. Find the volume of plastic used if each wall has a thickness of 1 cm.

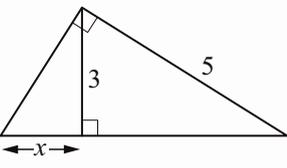
26. [Surface Area]
Find the total surface area of the cone.
[Leave your answer as a multiple of π .]



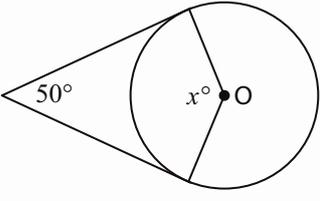
27. [Pythagoras / Trigonometry]
Find the value of x , given $\cos \theta = 0.6$



28. [Shape / Location]
Using similarity, find the value of x .



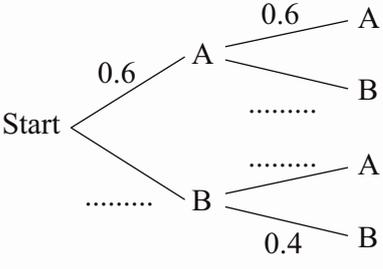
29. [Angles]
Find the value of x° .



30. [Statistics]
Find the difference between the medians of the two sets of data.

leaf	stem	leaf
4 0	13	3
4	14	1 3 4
9 5 2	15	2 4
1	16	5
6 3	17	1 3 5
7 7 5	18	2 5

31. [Probability]
Complete the probability tree diagram and find the probability that event A occurs first, then event B follows.



32. [Problem Solving 1]
Which is greater: 10^{100} or 1000^{10} ?

33. [Problem Solving 2]
Each letter stands for a different digit. What number does PLANETS represent?
[Need help? SOS = 525]

$$\begin{array}{r} \text{S A T U R N} \\ + \text{U R A N U S} \\ \hline \text{P L A N E T S} \end{array}$$



Name:

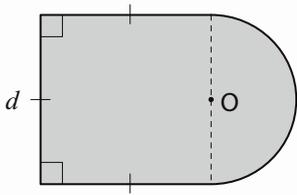
1. [Long \times ,+] $33 \times 1.4 =$
2. [Decimal +,-] $x - 1.5 = 0.94$ $x =$
3. [Decimal \times ,+] $x \times 711 = 7.11$ $x =$
4. [Fraction +,-] $\frac{2}{3} + \frac{2}{4} - \frac{5}{6} =$
5. [Fraction \times ,+] $3\frac{1}{3} \div 1\frac{1}{9} =$
6. [Percentages] Lucy invested \$3200 on the stock market, and later sold out for \$4000. Express the profit as a percentage of the amount invested.
7. [Integer +,-] $(6 - 8) + (10 - 12) =$
8. [Integer \times ,+] $\frac{-15w}{-3} =$
9. [Rates / Ratios] If, on average, two babies are born somewhere in the world every second, how many people are born every day?
10. [Indices] Simplify and express using positive indices $\frac{5a^2b^{-7}}{a^{-2}b^{-7}}$
11. [Square Roots / Surds] Evaluate $\frac{3\sqrt{7} \times 4\sqrt{14}}{6\sqrt{2}}$
12. [Order of Operations] $3 \times (8 + 7) =$
13. [Exploring Number] Change the recurring decimal $2.\bar{8}$ to a mixed number in simplest form.
14. [Scientific Notation] Express 2.5×10^{-4} as a basic numeral.
15. [Number Patterns] Write the first four terms of the sequence $t_n = (-1)^n$ where $n \geq 1$
16. [Expressions] If the cost of 5 kg of strawberries is \$6.00, what is the cost of m kg? \$
17. [Substitution] For what value of x is $\frac{-1}{3x - 9}$ undefined?
18. [Expansion] Expand and simplify $x(2x - 1)(x + 4)$
19. [Factorisation] Factorise $6y^2 - y - 15$
20. [Equations] Solve for x : $2x^2 - 6x = 0$
21. [Graphs & Functions] Complete the table of values for the parabola of equation $y = -x^2 - 5$

x	-3	-2	-1	0	1	2	3
y							

22. [Units of Measurement / Time]
How many litres in c millilitres?

23. [Perimeter]
How many kilometres of fence are required to enclose a rectangular paddock with an area of 48 km^2 if its width is 4 km ?

24. [Area]
Write a formula for the area A of the shape.
[Leave your answer as a multiple of π .]

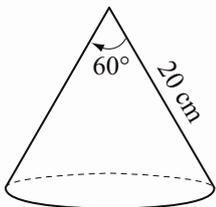


$A =$

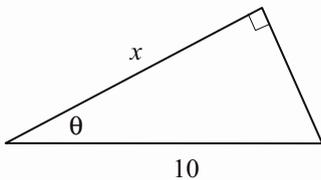
25. [Volume]
Rain water from the flat roof of a building 20 m by 11 m flows into a cylindrical tank of diameter 4 m . Find the increase in the depth of water in the tank after 20 mm of rain.
(Use $\pi \approx \frac{22}{7}$)

 m

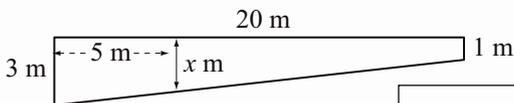
26. [Surface Area]
Using $\pi \approx 3.14$ find the total surface area of the cone.


 cm^2

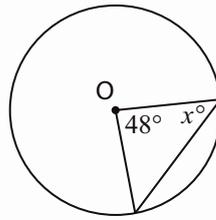
27. [Pythagoras / Trigonometry]
Find the value of x , given $\cos \theta = 0.81$



28. [Shape / Location]
A side view from a plan of a swimming pool is shown. What is the depth of the pool 5 m from the deep end?


 m

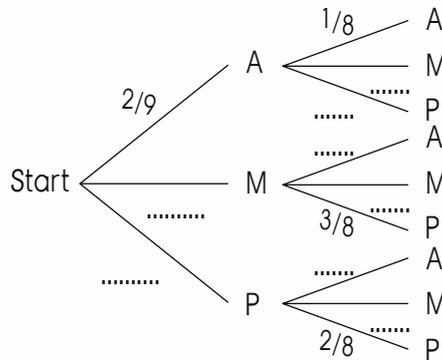
29. [Angles]
Find the value of x° .



30. [Statistics]
Find the difference between the medians of the two sets of data.

leaf	stem	leaf
3 1	7	1 4
5 2 0	8	3 5 5
4 0	9	2 7
3 1	10	1 4
3 1	11	1 8

31. [Probability]
A bowl of fruit contains 2 apples, 4 mandarins and 3 pears. If two pieces are picked randomly one after the other, find the probability of selecting two mandarins.
[Complete the tree diagram to help solve the problem.]



$\text{Pr}(\text{MM}) =$

32. [Problem Solving 1]
Which is greater: 9^4 or 27^2 ?

33. [Problem Solving 2]
Each letter stands for a different digit. What number does CLAIM represent?

$$\begin{array}{r} \text{THIS} \\ \text{IS} \\ + \text{HIS} \\ \hline \text{CLAIM} \end{array} \quad (\text{Henry V - Shakespeare})$$



Name:

1. [Long \times, \div]
 $20.4 \div 3 =$

2. [Decimal $+, -$]
 $1 - x = 0.062$

3. [Decimal \times, \div]
 $x \times 0.3 = 30$

4. [Fraction $+, -$]
 $\frac{t+1}{4} + \frac{t-2}{2} =$

5. [Fraction \times, \div]
 $\frac{4x}{5xy} \times \frac{y}{10x} =$

6. [Percentages]
 At a weekend market, Marlon sold 64% of his mangoes on the first day and 50% of the remainder the next day. If he has 45 kg left, how much did he sell altogether?

7. [Integer $+, -$]
 $(+25) + (-4) + (-12) =$

8. [Integer \times, \div]
 $(-4) \times (+8) \div (-2) =$

9. [Rates / Ratios]
 Typically, high quality 18-carat white gold contains gold, silver, copper and palladium in the ratio 75 : 4 : 4 : 17. How many grams of copper would there be in a necklace made from 50 grams of this white gold?

10. [Indices]
 Given $2^x = 1$, find the value of x .

11. [Square Roots / Surds]
 Rationalise $\frac{2}{\sqrt{3}}$

12. [Order of Operations]
 $(5 \times 4)^2 =$

13. [Exploring Number]
 Place in descending order:
 $\frac{10}{9}, \sqrt{1.21}, \left(\frac{21}{20}\right)^2$

14. [Scientific Notation]
 Evaluate and express as a basic numeral
 $(0.16 \times 10^3) \times (4 \times 10^{-3})$

15. [Number Patterns]
 Find the rule of the sequence t_n where $n \geq 1$
 3, 6, 9, 12, 15,

16. [Expressions]
 If n is an integer, which of the following must be an odd number?
 $2(n+1), 4n+1, 2n, n+1$

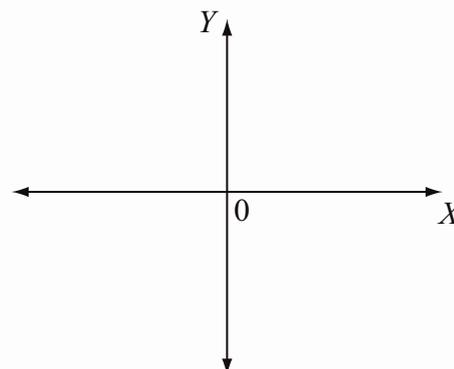
17. [Substitution]
 Does the ordered pair (5,4) satisfy the relation $3x < y^2$?

18. [Expansion]
 Expand and simplify
 $3x(x+2) - (x+1)(x-2)$

19. [Factorisation]
 Factorise and simplify
 $\frac{x^2 - 3x - 10}{x^2 - 25}$

20. [Equations]
 Solve for x :
 $x(x^2 - 121) = 0$

21. [Graphs & Functions]
 Sketch the parabola of equation $y = x^2 - 4$ without plotting points.

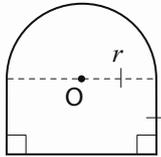


22. [Units of Measurement / Time]

A wolf can reach a speed of 12 m/s, while a giraffe can run 50 km/h.
Which animal is faster?

23. [Perimeter]

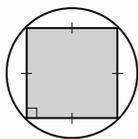
Write a formula for the perimeter P of the shape.



$P =$

24. [Area]

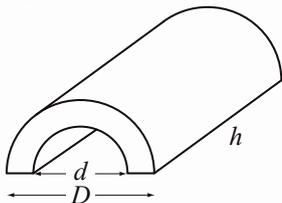
The area of the circle is $100\pi \text{ m}^2$. Find the area of the square inside the circle.



m^2

25. [Volume]

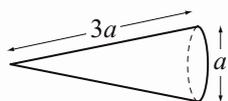
Write a simple formula for the volume V of the solid in terms of d , D , h and π .



$V =$

26. [Surface Area]

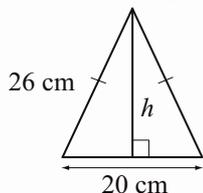
Write a formula for the total surface area TSA of the cone. [Leave your answer as a multiple of π .]



$TSA =$

27. [Pythagoras / Trigonometry]

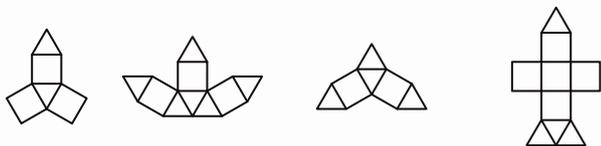
Find the height of the isosceles triangle.



cm

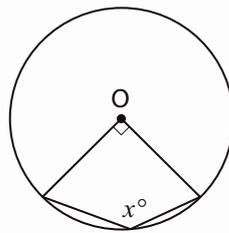
28. [Shape / Location]

Circle the net that **can not** be folded to form a model of a polyhedron.



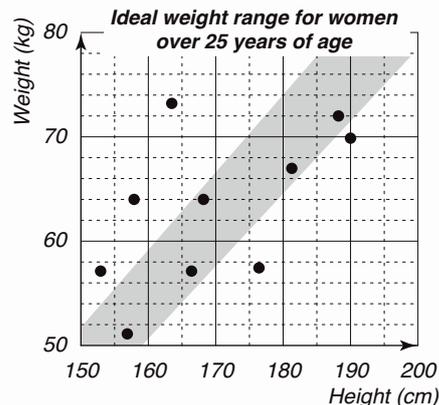
29. [Angles]

Find the value of x° .



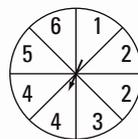
30. [Statistics]

The scatter plot shows the weight and height of ten female staff at a local factory. How many are considered too thin?



31. [Probability]

How many times would you expect to spin an even number if the spinner is spun 200 times?



32. [Problem Solving 1]

I have \$100 to buy exactly 100 animals to feed to my snake. Tender succulent mice cost \$5, large juicy fresh cockroaches are \$1 and imported blowflies are only 5¢ each. If I spend every cent buying these delicacies, and I buy at least one of each, how many cockroaches will I buy?

33. [Problem Solving 2]

The lines of a multiplication table are shown below all jumbled. Which times table is it?

$F \times I = AB$
 $F \times A = BI$
 $F \times B = CH$
 $F \times E = GB$
 $F \times F = HI$
 $F \times J = ID$
 $F \times H = IF$
 $F \times G = JH$
 $F \times C = F$



Name:

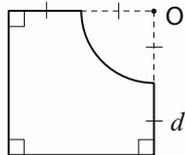
<p>1. [Long \times, \div] $13.56 \div 6 =$ <input style="width: 60px; height: 20px;" type="text"/></p> <p>2. [Decimal $+, -$] $1 - x = 0.999$ <input style="width: 60px; height: 20px;" type="text"/> $x =$</p> <p>3. [Decimal \times, \div] $0.7 \div x = 0.007$ <input style="width: 60px; height: 20px;" type="text"/> $x =$</p> <p>4. [Fraction $+, -$] $\frac{2x+1}{4} - \frac{x}{2} =$ <input style="width: 60px; height: 20px;" type="text"/></p> <p>5. [Fraction \times, \div] $\frac{3xy}{x} \div \frac{6y}{4} =$ <input style="width: 60px; height: 20px;" type="text"/></p> <p>6. [Percentages] Boys make up 60% of a class. How many students are there in the class if there are 8 more boys than girls? <input style="width: 60px; height: 20px;" type="text"/></p> <p>7. [Integer $+, -$] $(-5s) + (-s) + (-20s) =$ <input style="width: 60px; height: 20px;" type="text"/></p> <p>8. [Integer \times, \div] $(-20) \times (-2) \div (-5) =$ <input style="width: 60px; height: 20px;" type="text"/></p> <p>9. [Rates / Ratios] Typically, 18-carat gold is a combination of gold, silver and copper in the ratio 75 : 16 : 9. How many grams of silver would there be in a ring made from 25 grams of this 18 carat gold? <input style="width: 60px; height: 20px;" type="text"/> g</p> <p>10. [Indices] If $10^x = 0.01$, what is the value of x? <input style="width: 60px; height: 20px;" type="text"/></p> <p>11. [Square Roots / Surds] Rationalise $\frac{1}{\sqrt{5}}$ <input style="width: 60px; height: 20px;" type="text"/></p> <p>12. [Order of Operations] $7 \times 69 \div 23 =$ <input style="width: 60px; height: 20px;" type="text"/></p> <p>13. [Exploring Number] Place in descending order: $\sqrt{\frac{9}{4}}, 1\frac{5}{9}, \left(\frac{5}{4}\right)^2$ <input style="width: 150px; height: 20px;" type="text"/></p>	<p>14. [Scientific Notation] Evaluate and express in scientific notation $(6.4 \times 10^6) \times (0.5 \times 10^{-1})$ <input style="width: 100px; height: 20px;" type="text"/></p> <p>15. [Number Patterns] Find the rule of the sequence t_n where $n \geq 1$ 5, 6, 7, 8, 9, <input style="width: 100px; height: 20px;" type="text"/> $t_n =$</p> <p>16. [Expressions] If n is a negative number, which of the following must be positive? $n - 3, 3n, n^3, n^4$ <input style="width: 60px; height: 20px;" type="text"/></p> <p>17. [Substitution] Does the ordered pair $(-1, -2)$ satisfy the relation $5x - 2 > 4y$? <input style="width: 60px; height: 20px;" type="text"/></p> <p>18. [Expansion] Expand and simplify $(x + 3)(x - 3) - (3x - 2)^2$ <input style="width: 150px; height: 20px;" type="text"/></p> <p>19. [Factorisation] Factorise and simplify $\frac{x^2 + x - 12}{x^2 - 16}$ <input style="width: 60px; height: 20px;" type="text"/></p> <p>20. [Equations] Solve for x: $x(x^2 - 36) = 0$ <input style="width: 100px; height: 20px;" type="text"/></p> <p>21. [Graphs & Functions] Sketch the parabola with equation $y = -x^2$ without plotting points.</p> <div style="text-align: center; margin-top: 10px;"> </div>
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22. [Units of Measurement / Time]

A killer whale can swim at up to 55 km/h, while a sea lion can reach 11 m/s. Which animal is faster?

23. [Perimeter]

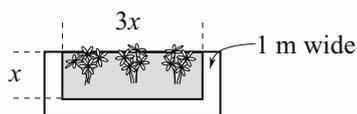
Write a formula for the perimeter P of the shape making use of the π symbol.



$P =$

24. [Area]

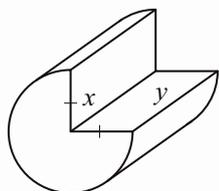
A garden bed has a 1 metre wide path around three sides as shown. The rectangular garden bed is 3 times as long as it is wide. Find the area of the garden bed given that it is exactly equal to the area of the paving around it.



m^2

25. [Volume]

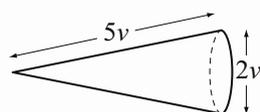
Write a simple formula for the volume V of the solid in terms of x , y and π .



$V =$

26. [Surface Area]

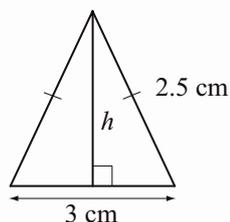
Write a formula for the total surface area TSA of the cone.



$TSA =$

27. [Pythagoras / Trigonometry]

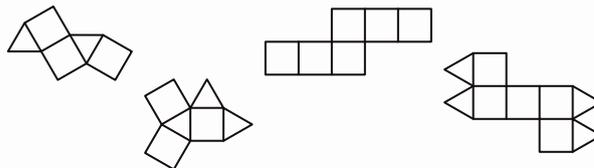
Find the height of the isosceles triangle.



cm

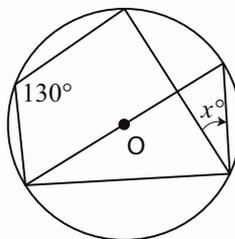
28. [Shape / Location]

Circle the net that **can not** be folded to form a model of a polyhedron.



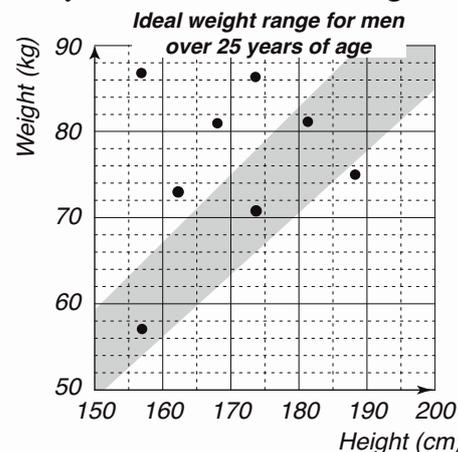
29. [Angles]

Find the value of x° .



30. [Statistics]

The scatter plot shows the weight and height of 8 male staff at the local bakery. How many are considered overweight?



31. [Probability]

How many times would you expect an odd number to occur when a fair six-sided die is rolled 100 times?

32. [Problem Solving 1]

Our fete stall sold all 120 items for a total of \$120. The cakes sold for \$5 each, the buns sold for \$2 each and the lollies for 10¢ each. How many cakes did we sell?

33. [Problem Solving 2]

The lines of a multiplication table are shown jumbled. Which times table is it?

F × B = F
F × C = HD
F × D = BH
F × H = DG
F × I = CE
F × F = HI
F × E = DB
F × G = JC
F × J = EJ



Name:

1. [Long \times ,+] $14.6 \times 11 =$

2. [Decimal +,-] $12.5 - x = 8.75$

3. [Decimal \times ,+] $x^2 = 0.04$

4. [Fraction +,-] $\frac{x-1}{5} + \frac{x+1}{2} =$

5. [Fraction \times ,+] $\frac{5}{y+5} \times \frac{y+5}{10} =$

6. [Percentages]
Tia invests \$500 at 8% per annum compound interest. What will Tia's investment be worth after 2 years?

7. [Integer +,-] $6x - (x - 8x) =$

8. [Integer \times ,+] $\frac{4-9}{9-4} =$

9. [Rates / Ratios]
A butterfly beats its wings 300 times per minute. What is the rate per second?

10. [Indices] Simplify $\frac{4a^2b^2 \times (3ab)^{-2}}{27a^{-1}}$

11. [Square Roots / Surds] Expand and simplify $(\sqrt{2} + \sqrt{3})(2\sqrt{2} + \sqrt{3})$

12. [Order of Operations] $37 \times 39 \times (6 - 6) + 24 =$

13. [Exploring Number] $\frac{12}{13} < \frac{13}{14}$ True or false?

14. [Scientific Notation] Evaluate and express in scientific notation $(6 \times 10^3)^2$

15. [Number Patterns] Find the rule of the sequence t_n where $n \geq 1$
1, 4, 7, 10,

16. [Expressions] Find the difference between the polynomials:
 $(x^3 - 2x^2 + 6) - (x^3 + x^2 - 2x - 5)$

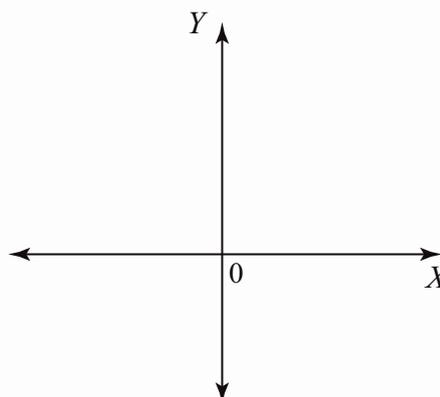
17. [Substitution] If $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$, find the solutions x_1 and x_2 , when $a = 2$, $b = 3$ and $c = -5$

18. [Expansion] Expand and simplify $(x + y + 1)^2$

19. [Factorisation] Factorise $x^3 + 4x^2 + 4x$

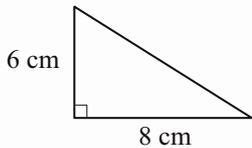
20. [Equations] Solve the inequality: $x^2 + 2x - 8 < 0$

21. [Graphs & Functions] Sketch the graph with equation $y = x^2$ labelling the intercepts, axis of symmetry and turning point.

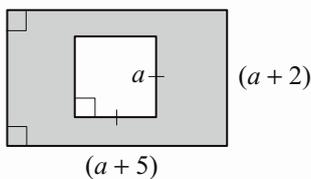


22. [Units of Measurement / Time]
How many square metres in h hectares?

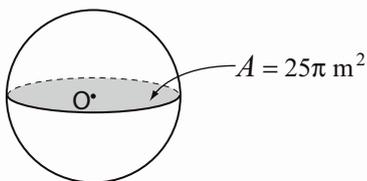
23. [Perimeter]
Find the perimeter of the triangle.
[Hint: Pythagoras' theorem will help.]



24. [Area]
Write a simple expression for the area A of the shaded region.

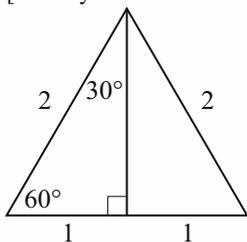


25. [Volume]
Find the volume of the sphere. [Express your answer as a multiple of π .]

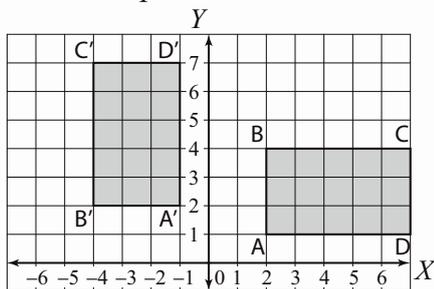


26. [Surface Area]
The volume of cube A is 27 times that of cube B. Find the value of the ratio:
 $\frac{\text{surface area of A}}{\text{surface area of B}}$

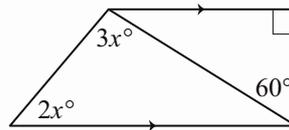
27. [Pythagoras / Trigonometry]
Use the triangle to find the value of $\sin 60^\circ$.
[Leave your answer in surd form.]



28. [Shape / Location]
What are the coordinates of the centre of rotation used to rotate the quadrilateral ABCD to its new position A'B'C'D'?

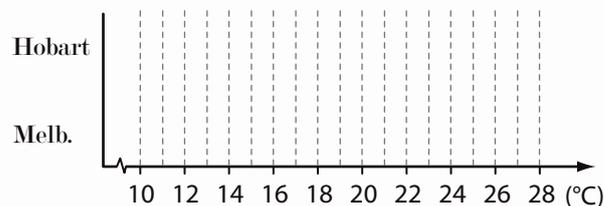


29. [Angles]
Find the value of x° .



30. [Statistics]
The maximum temperatures reached on 10 consecutive days in October are recorded for Hobart and Melbourne. Draw two comparative box plots to compare the data.

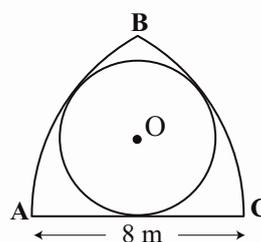
Hobart	20	15	11	17	22	26	24	24	20	18
Melbourne	24	22	19	21	25	28	27	25	23	24



31. [Probability]
How many different post codes can be made that have four digits and start with 3? [Note: All 10 digits can be used and can be repeated, e.g. 3500.]

32. [Problem Solving 1]
If it takes 12 convicts 2 days to dig a garden, how long would it take 4 convicts to do the same job?

33. [Problem Solving 2]
In this diagram, the arc AB is centred at C and the arc BC is centred at A. What is the radius of the circle centred at O?





Name:

1. [Long \times ,+] $33.4 \times 18 =$

2. [Decimal +,-] $4.8 - x = 0.035$

3. [Decimal \times ,+] $\sqrt{x} = 0.16$

4. [Fraction +,-] $\frac{t+2}{3} + \frac{t+2}{4} =$

5. [Fraction \times ,+] $\frac{4t}{t+2} \div \frac{2}{t+2} =$

6. [Percentages]
 Marcus invests \$2000 at 4% per annum compound interest. What will Marcus' investment be worth after 2 years?

7. [Integer +,-] $12s + (2s - 15s) =$

8. [Integer \times ,+] $\frac{3-12}{3-12} =$

9. [Rates / Ratios]
 The human heart beat can vary from 40 to 200 beats per minute. Express the maximum heart rate in beats per second.

10. [Indices]
 Simplify $\frac{6xy \times (x^2y)^{-1}}{2x^{-2}y^{-3}}$

11. [Square Roots / Surds]
 Expand and simplify $(2 + \sqrt{3})(2 - \sqrt{3})$

12. [Order of Operations] $(8 - 8)^7 \div 2012 =$

13. [Exploring Number] $\frac{74}{73} > \frac{75}{74}$ True or false?

14. [Scientific Notation]
 Evaluate and express in scientific notation $(5 \times 10^{-1})^2$

15. [Number Patterns]
 Find the rule of the sequence t_n where $n \geq 1$
 3, 8, 13, 18, 23,

16. [Expressions]
 Add the following polynomials:
 $(2x^3 + x^2 - 2x + 2) + (x^3 + 4x - 6)$

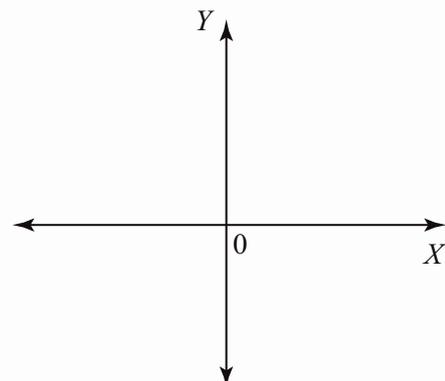
17. [Substitution]
 If $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$, find the solutions x_1 and x_2 , when $a = 1$, $b = 2$ and $c = -15$

18. [Expansion]
 Expand and simplify $(a - b + c)^2$

19. [Factorisation]
 Factorise $2x^4 - 12x^3 + 18x^2$

20. [Equations]
 Solve the inequality:
 $x^2 + 2x - 15 < 0$

21. [Graphs & Functions]
 Sketch the graph with equation $y = 2x^2 - 2$ labelling the intercepts, axis of symmetry and turning point.



22. [Units of Measurement / Time]
 How many dollars/hour are equivalent to p dollars/week if you work 40 hours per week?

23. [Perimeter]
 Find the perimeter of the trapezium.
 [Hint: Pythagoras' theorem will help.]

24. [Area]
 Write a simple formula for the area A of the shaded triangle.

25. [Volume]
 Find the volume of the solid. [Express your answer as a multiple of π .]

26. [Surface Area]
 A triangular prism, with all its edges of equal length, a cone, with a height equal to its diameter, and a sphere all have exactly the same surface area. Which of the three solids will have the greatest volume?

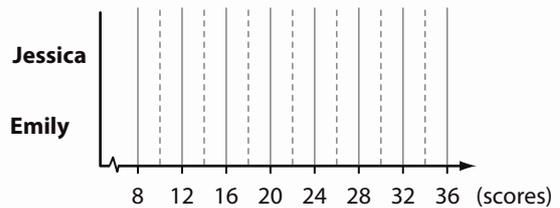
27. [Pythagoras / Trigonometry]
 Use the triangle to find the value of $\tan 60^\circ$.
 [Leave your answer in surd form.]

28. [Shape / Location]
 What are the coordinates of the centre of rotation used to rotate the triangle ABC to its new position A'B'C'?

29. [Angles]
 Through how many degrees does the big hand of a clock move in 25 minutes?

30. [Statistics]
 The number of points scored by Jessica and Emily in the first 9 games of the basketball season are shown in this table. Draw two comparative box plots to illustrate the data.

Jessica	22	13	26	15	22	24	28	10	15
Emily	21	13	9	21	23	25	13	23	27



31. [Probability]
 There are 900 different three-digit numbers. How many of these do not contain any odd digit?

32. [Problem Solving 1]
 If it takes Loretta three minutes to chop a log into three pieces, how long would it take her to chop a log into five pieces?

33. [Problem Solving 2]
 In this diagram, the arc AB is centred at C and the arc BC is centred at A. What is the radius of the circle centred at O?



Name:

1. [Long \times , \div]
 $3024 \div 27 =$

2. [Decimal $+$, $-$]
 $0.071 + x = 0.1$

3. [Decimal \times , \div]
 $x^2 = 0.0049$

4. [Fraction $+$, $-$]
 $\frac{1}{t} - \frac{1}{2t} =$

5. [Fraction \times , \div]
 $\frac{15x + 3}{5x + 1} =$

6. [Percentages]
 After 1 year a computer has lost 25% of its value and is now worth only \$1950. What did it cost new?

7. [Integer $+$, $-$]
 $(p - 2p) - (2p - p) =$

8. [Integer \times , \div]
 $\frac{-60}{-5} \times \frac{-12}{8} =$

9. [Rates / Ratios]
 Linda has \$10, James has 40% more than Linda, and Paul has three times as much as James. Express the amount of money held by Linda, James and Paul as a ratio in simplest form.

10. [Indices]
 Evaluate
 $(-1)^0 \times 1 + (-1)^1 \times 2 + (-1)^2 \times 3$

11. [Square Roots / Surds]
 Rationalise $\frac{2}{\sqrt{7} - \sqrt{5}}$

12. [Order of Operations]
 $(7 - 10) \times 4^2 - 22 =$

13. [Exploring Number]
 If X is $66\frac{1}{3}\%$ of Y , express Y as a percentage of X .

14. [Scientific Notation]
 Evaluate and express in scientific notation
 $\sqrt{6.4 \times 10^{-7}}$

15. [Number Patterns]
 If $t_1 = 8$ and $t_{n+1} = \frac{t_n}{2}$, find the first four terms of the pattern.

16. [Expressions]
 A piano was bought for x dollars, then resold at a 20% profit. In terms of x , what was the selling price?

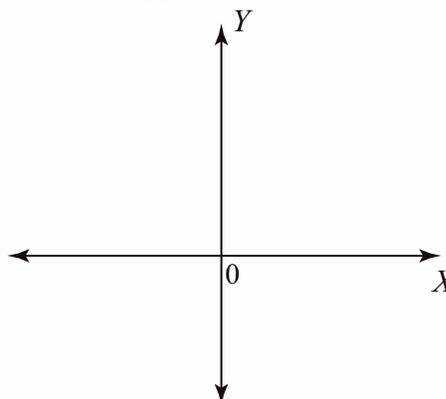
17. [Substitution]
 If $t = 2x$ and $y = t^3 + 8$, express y in terms of x .

18. [Expansion]
 Expand and simplify
 $(a + 1)(a + 1)(a + 1)$

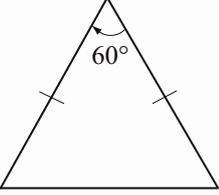
19. [Factorisation]
 Factorise
 $x^4 - 1$

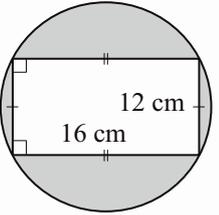
20. [Equations]
 Solve for x :
 $2x^2 + x - 3 = 0$

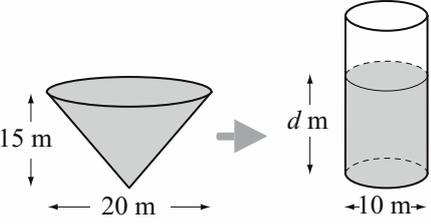
21. [Graphs & Functions]
 Sketch the graph of equation $y = x^2 - 6x + 5$ labelling the intercepts, axis of symmetry and turning point.

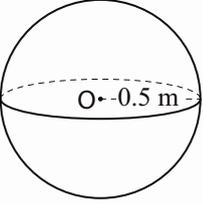


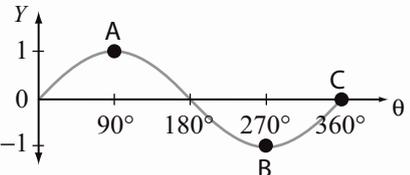
22. [Units of Measurement / Time]
 What does the prefix 'centi' represent?
 A) 10^{-2} B) 10^{-1} C) 10^1 D) 10^2

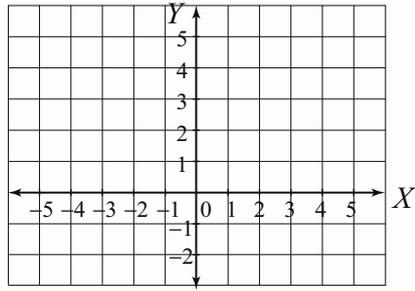
23. [Perimeter]
 Find the perimeter of the triangle.
 cm

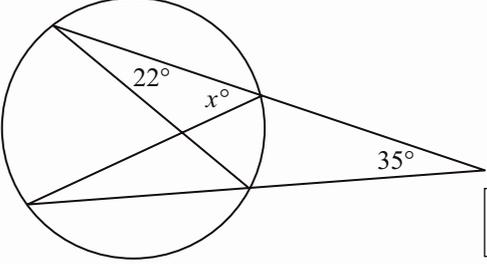
24. [Area]
 Using $\pi \approx 3.14$ find the shaded area.
 cm^2

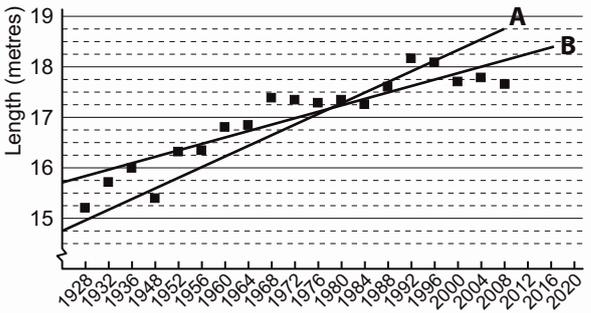
25. [Volume]
 A cone full of water has been emptied into a cylinder as shown in the diagram. What is the depth of the water in the cylinder?
 m

26. [Surface Area]
 Using $\pi \approx 3.14$ find the surface area of the sphere.
 m^2

27. [Pythagoras / Trigonometry]
 Complete the missing coordinates using the graph of $y = \sin \theta$.
 A(90° , ___) B(270° , ___) C(____, 0)


28. [Shape / Location]
 Draw the shape formed by all the points that are equally distanced from the points (0,1) and (4,1).


29. [Angles]
 Find the value of x° .


30. [Statistics]
 Select the most appropriate 'line of best fit' for the scatter plot.
Olympic Triple Jump - Winning distances for men


31. [Probability]
 A pair of dice are rolled. What is the probability of rolling a total of 10 or more, given that the first die landed on 6?

32. [Problem Solving 1]
 I reduced an image on my computer using a scale factor of 75%. What scale factor is required to return the image to its original size?

33. [Problem Solving 2]
 $50! = 50 \times 49 \times 48 \times 47 \times \dots \times 2 \times 1$
 If you were to multiply all these terms together, how many zeros would there be on the end of your answer?



Name:

1. [Long \times ,+] $546 \div 42 =$

2. [Decimal +,-] $1.9 + x = 11.03$

3. [Decimal \times ,+] $\sqrt{x} = 0.5$

4. [Fraction +,-] $\frac{1}{2w} - \frac{1}{4w} =$

5. [Fraction \times ,+] $\frac{y^2 + y}{y} =$

6. [Percentages]
A new computer is bought for \$3900. What is the value of the computer after 1 year if it has depreciated by 30%?

7. [Integer +,-] $(3t - 4t) - (5t - 6t) =$

8. [Integer \times ,+] $\frac{-7}{2} \times \frac{-8}{14} =$

9. [Rates / Ratios]
John has \$12, Maria has 25% more than John and Victor has three times as much as Maria. Express the amount of money held by John, Maria and Victor as a ratio in simplest form.

10. [Indices]
Which is greater 2^{34} or 8^{11} ?

11. [Square Roots / Surds]
Rationalise $\frac{2}{\sqrt{3} + 2}$

12. [Order of Operations] $(10001 - 10^4) \times 1998 =$

13. [Exploring Number]
If X is 125% of Y , express Y as a percentage of X .

14. [Scientific Notation]
Evaluate and express in scientific notation $\sqrt{1.6 \times 10^{-5}}$

15. [Number Patterns]
If $t_1 = \frac{1}{2}$ and $t_{n+1} = \frac{1}{t_n}$, find the first four terms of the pattern.

16. [Expressions]
To make a litre of apple juice n apples are squashed. How many apples are required to make t litres of apple juice?

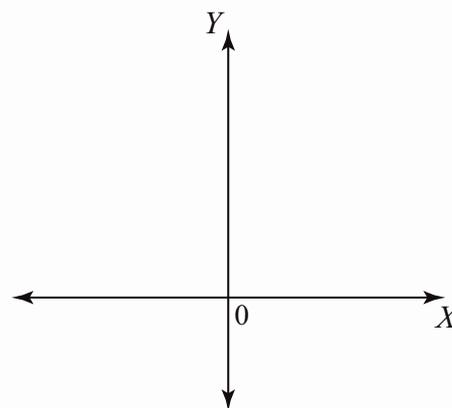
17. [Substitution]
If $t = 2x - 1$ and $y = 3t + 3$, use substitution to find y in terms of x .

18. [Expansion]
Expand and simplify $(x + 1)(x + 2)(x + 3)$

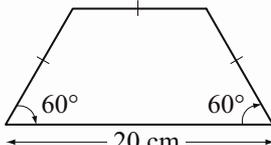
19. [Factorisation]
Factorise $50x^2 + 20x + 2$

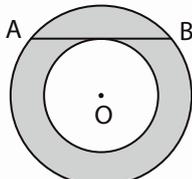
20. [Equations]
Solve for x : $2x^2 - 5x + 3 = 0$

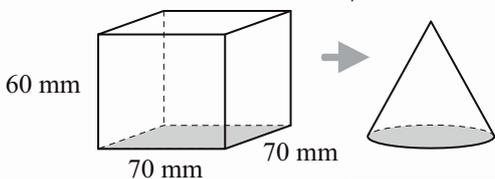
21. [Graphs & Functions]
Sketch the graph of equation $y = x^2 + 8x + 12$ labelling the intercepts, axis of symmetry and turning point.

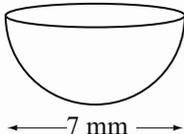


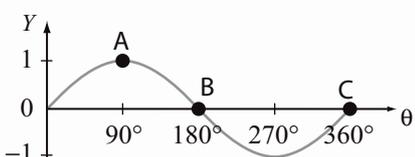
22. [Units of Measurement / Time]
What does the prefix 'milli' represent?
A) 10^{-4} B) 10^{-3} C) 10^{-2} D) 10^{-1}

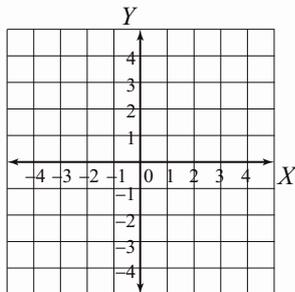
23. [Perimeter]
Find the perimeter of the trapezium.

 cm

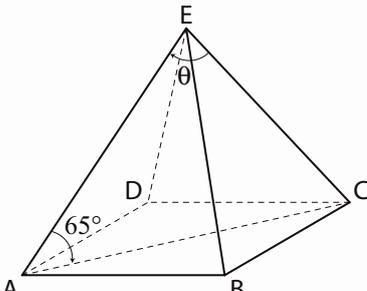
24. [Area]
AB is tangent to the smaller circle and its length is 14 cm. Using $\pi \approx \frac{22}{7}$ find the area of the shaded region. [Hint: Pythagoras' theorem will help!]

 cm^2

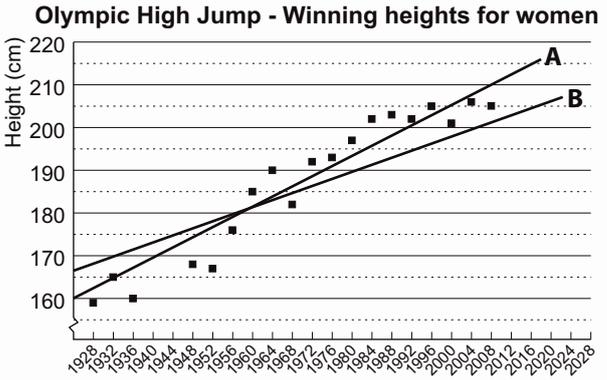
25. [Volume]
A rectangular block of wood is to be turned into a cone. What is the greatest volume the cone can have? (Use $\pi \approx \frac{22}{7}$)

 mm^3

26. [Surface Area]
Using $\pi \approx \frac{22}{7}$ find the total surface area of the solid hemisphere.

 mm^2

27. [Pythagoras / Trigonometry]
Complete the missing coordinates using the graph of $y = \sin \theta$.
A(90° , ___) B(180° , ___) C(360° , ___)


28. [Shape / Location]
Draw the shape formed by all the points that are at a distance of 2 units from the point (2,1).


29. [Angles]
Find the value of $\angle AEC$, marked θ , in the regular square pyramid.


30. [Statistics]
Select the most appropriate 'line of best fit' for the scatter plot.
Olympic High Jump - Winning heights for women


31. [Probability]
A die is rolled and then a second die is rolled. What is the probability that the total of the two throws is less than 5, given the first throw was a 2?

32. [Problem Solving 1]
I previously set the photocopier to a scale factor of 150%. What scale factor is required to copy the enlarged picture so that it returns to its original size?

33. [Problem Solving 2]
 $60! = 60 \times 59 \times 58 \times 57 \times \dots \times 2 \times 1$
If you were to multiply all these terms together how many zeros would there be on the end of your answer?

MATHS MATE



Teacher Resource



Teacher's Guide to the Use of Maths Mate

pages i - viii



Student Workbook Answers

pages 3 - 72



Student Workbook Short Answers

pages 1 - 8



Problem Solving Hints & Solutions

pages 1 - 18



Test Masters

pages 1 - 32



Test Answers

pages 1 - 32



Record Keeping Sheets

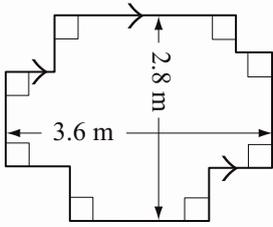
pages 1 - 10



Name:

1. [Long \times ,+] $99 \times 34 =$ **3366**
2. [Decimal +,-] $4.88 - 0.99 + 1.22 =$ **5.11**
3. [Decimal \times ,+] $0.4 \times 0.5 =$ **0.2**
4. [Fraction +,-] $\frac{4a}{7} + \frac{2a}{7} =$ **$\frac{6a}{7}$**
5. [Fraction \times ,+] $6\frac{3}{5} \div 3 =$ **$2\frac{1}{5}$**
6. [Percentages] Increase \$30 000 by 0.25% **\$ 30 075**
7. [Integer +,-] $(+4) + (-5) + (-9) =$ **-10**
8. [Integer \times ,+] $(-4) \times (+12) =$ **-48**
9. [Rates / Ratios] Divide \$108 in the ratio 3 : 5 : 4 **\$ 27 : \$ 45 : \$ 36**
10. [Indices] Evaluate $\frac{(-2)^5}{(-2)^3}$ **4**
11. [Square Roots / Surds] Simplify $2\sqrt{3} \times 4\sqrt{10}$ **$8\sqrt{30}$**
12. [Order of Operations] $9 + 4 \times 72 \div 3 =$ **105**
13. [Exploring Number] An electricity bill for \$305.20 is divided evenly between four students. How much does each pay? **\$ 76.30**
14. [Scientific Notation] How many significant figures are there in 1001? **4**
15. [Number Patterns] Complete the pattern: $\frac{5}{36}, \frac{5}{6}, 5, 30,$ **180, 1080**
16. [Expressions] Write the following as an algebraic expression: A number that is h less than the sum of i and j **$i + j - h$**
17. [Substitution] The average of x and y can be found using the formula $a = \frac{x+y}{2}$. If $x = 3.6$ and $y = 5.8$ find the value of a . **4.7**
18. [Expansion] Expand $-2x(4x - 3)$ **$-8x^2 + 6x$**
19. [Factorisation] Factorise and simplify $\frac{15ax - 6x^2}{6x^2}$ **$\frac{5a - 2x}{2x}$**
20. [Equations] Solve for x : $-7(2 - x) = 21$ **5**
21. [Graphs & Functions] Complete the table:
- | function | gradient (m) | x -intercept | y -intercept (c) |
|---------------|------------------|----------------|------------------------|
| $y = -2x + 6$ | -2 | (3,0) | (0,6) |
| $y = 2x - 6$ | 2 | (3,0) | (0,-6) |
22. [Units of Measurement / Time] The Smith family departs Sydney on August 3rd at 1620 hours and arrives in Singapore on August 3rd at 2330 hours. How long was their journey, given Singapore time is 2 hours behind Sydney time? **9 h 10 min**

23. [Perimeter]
Find the perimeter of the shape.

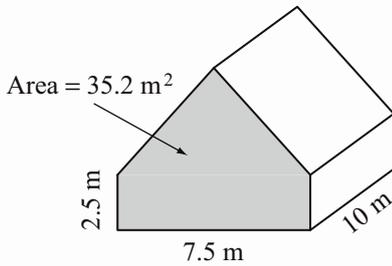


12.8 m

24. [Area]
A rectangular field has dimensions 500 m by 300 m. How many kilograms of fertiliser are needed if it is to be applied at the rate of 80 kg per hectare?
[1 ha = 10 000 m²]

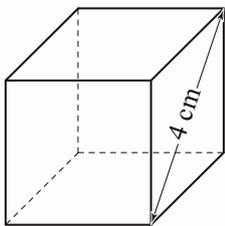
1200 kg

25. [Volume]
What is the volume of air inside the shed?



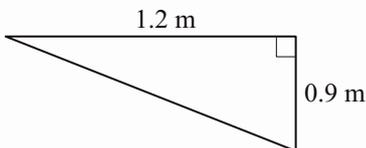
352 m³

26. [Surface Area]
Find the total surface area of the cube.



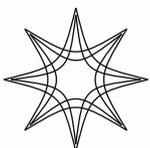
48 cm²

27. [Pythagoras / Trigonometry]
Find the length of the hypotenuse of this triangle.



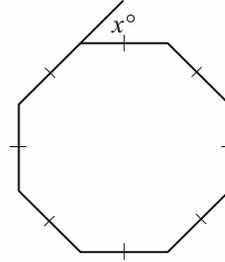
1.5 m

28. [Shape / Location]
What is the order of rotational symmetry of this shape? That is, in rotating the shape through 360°, how often will it look exactly as it did at the start? [Hint: A square has an order of 4.]



8

29. [Angles]
Find the value of x° .



45°

30. [Statistics]
Find the mean of the following distribution.

Score	0	1	2	3	4
Frequency	12	10	5	2	1

1

31. [Probability]
A 52 card deck of playing cards is shuffled, and a card is dealt from the top of the deck. Determine the probability of the card being either a 10, a Jack, a Queen, a King or an Ace.

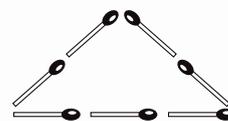


$\frac{5}{13}$

32. [Problem Solving 1]
In your drawer you have 6 white socks, 4 black socks, 2 red socks and 2 green socks. There is a power failure and you reach into the drawer in the dark. How many socks must you take with you to ensure you have a pair of the same colour?

5

33. [Problem Solving 2]
Seven matchsticks can be used to form a triangular enclosure in two different ways, {3,2,2} and {1,3,3}, as shown below. How many different triangles can be formed using 13 matchsticks?



{3,2,2}



{1,3,3}

5

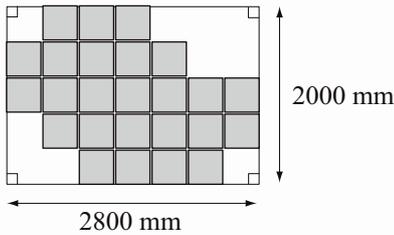


Name:

1. [Long \times ,+] $164 \times 25 =$ 4100
2. [Decimal +,-] $2.82 - 2.87 + 1.05 =$ 1
3. [Decimal \times ,+] $0.06 \times 0.9 =$ 0.054
4. [Fraction +,-] $\frac{6y}{11} - \frac{3y}{11} =$ $\frac{3y}{11}$
5. [Fraction \times ,+] $4\frac{6}{7} \div 2 =$ $2\frac{3}{7}$
6. [Percentages] Increase \$30 000 by 0.75% \$ 30 225
7. [Integer +,-] $(-1) - (-6) + (+5) =$ 10
8. [Integer \times ,+] $(-45) \div (-9) =$ 5
9. [Rates / Ratios] Divide \$480 in the ratio 9 : 4 : 7 \$ 216 : \$ 96 : \$ 168
10. [Indices] Evaluate $(\frac{1}{5})^{-2}$ 25
11. [Square Roots / Surds] Simplify $8\sqrt{7} \times 2\sqrt{5}$ $16\sqrt{35}$
12. [Order of Operations] $8 + 6 - 32 \div 4 =$ 6
13. [Exploring Number] A Lotto prize of \$663 250 is shared by four people. How much does each receive? \$165 812.50
14. [Scientific Notation] How many significant figures are there in 0.0502? 3
15. [Number Patterns] Complete the pattern: 50, 10, 2, $\frac{2}{5}$, $\frac{2}{25}, \frac{2}{125}$
16. [Expressions] Write the following as an algebraic expression: The average of m and n $\frac{m+n}{2}$
17. [Substitution] Given that the formula for the area of a kite is $A = \frac{ab}{2}$, find A when $a = 8.5$ and $b = 4$. 17
18. [Expansion] Expand $5x(x^2 - 3)$ $5x^3 - 15x$
19. [Factorisation] Factorise and simplify $\frac{-5x - 10}{2x + 4}$ or -2.5 $-\frac{5}{2}$
20. [Equations] Solve for x : $-2(x - 6) = 18$ -3
21. [Graphs & Functions] Complete the table:

function	gradient (m)	x -intercept	y -intercept (c)
$y = 4x$	4	(0,0)	(0,0)
$y = 4x + 2$	4	$(-\frac{1}{2}, 0)$	(0,2)
22. [Units of Measurement / Time] The Barnes family departs London on June 19th at 2300 hours and arrives in Melbourne on June 21st at 0455 hours. How long was their journey, given London time is 10 hours behind Melbourne time? 19 h 55 min

23. [Perimeter]
Find, in metres, the perimeter of the paved area.

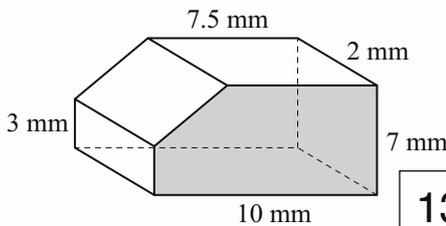


9.6 m

24. [Area]
Find the area of paving needed to construct a 1.5 metre wide path around a rectangular pool with dimensions 5 m by 4 m.

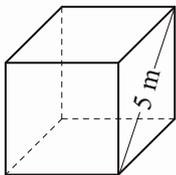
36 m²

25. [Volume]
Find the volume of the prism.



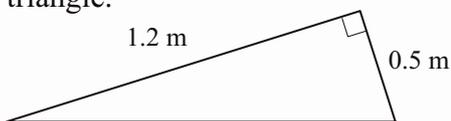
130 mm³

26. [Surface Area]
Find the total surface area of the cube.



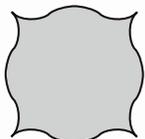
75 m²

27. [Pythagoras / Trigonometry]
Find the length of the hypotenuse of this triangle.



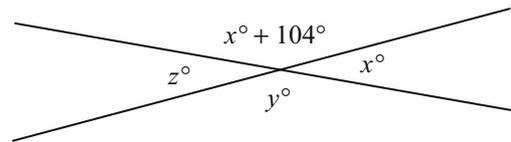
1.3 m

28. [Shape / Location]
For the shape shown, find the minimum angle of rotation required to regain the original image.



90°

29. [Angles]
Find the values of x° , y° and z° .



$$x^\circ = 38^\circ \quad y^\circ = 142^\circ \quad z^\circ = 38^\circ$$

30. [Statistics]
Find the mean of the following distribution.

Score	6	7	8	9	10	11	12
Frequency	5	10	20	30	20	10	5

9

31. [Probability]
Three cards are drawn at random from a deck of 52. The probability of choosing three of a kind (3 Aces, 3 Kings, 3 Queens ... or 3 Twos) is: $\frac{52}{52} \times \frac{3}{51} \times \frac{2}{50} = \frac{1}{425}$
What is the probability of not choosing three of a kind?

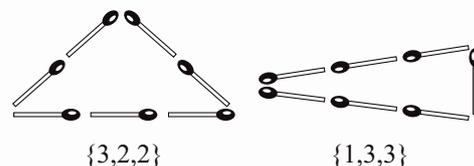


$\frac{424}{425}$

32. [Problem Solving 1]
In your drawer you have 4 white socks, 2 black socks, 2 red socks, 6 brown socks and 4 green socks. There is a power failure and you reach into the drawer in the dark. How many socks must you take with you to ensure you have a pair of the same colour?

6

33. [Problem Solving 2]
Seven matchsticks can be used to form a triangular enclosure in two different ways, {3,2,2} and {1,3,3} as shown below. How many different triangles can be formed using 9 matchsticks?



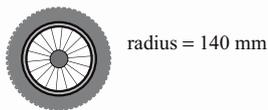
3



Name:

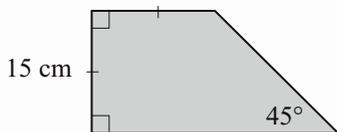
1. [Long \times , \div]
 $826 \div 7 =$ 118
2. [Decimal $+$, $-$]
 $6.4 + 0.64 + 0.064 =$ 7.104
3. [Decimal \times , \div]
 $8 \div 0.04 =$ 200
4. [Fraction $+$, $-$]
 $\frac{7}{9} - \frac{4}{6} =$ $\frac{1}{9}$
5. [Fraction \times , \div]
 $\frac{n}{8} \times \frac{4}{n} =$ $\frac{1}{2}$
6. [Percentages]
Mr Jones invested \$2500 at 5% per annum simple interest. How much interest would he earn after 3 years?
\$ 375
7. [Integer $+$, $-$]
 $-5 - (7 - 10) =$ -2
8. [Integer \times , \div]
 $(+2x) \times (-1) =$ -2x
9. [Rates / Ratios]
Lions can run at up to 80 km/h. At this rate how far can a lion run in 3 minutes?
4 km
10. [Indices]
Evaluate $(-2x^2)^3$ -8x⁶
11. [Square Roots / Surds]
Simplify $\sqrt{75}$ 5 $\sqrt{3}$
12. [Order of Operations]
 $(4 \times 4 - 6)^3 - 2^3 =$ 992
13. [Exploring Number]
Write $\frac{3}{80}$ as a decimal. 0.0375
14. [Scientific Notation]
Express 0.00018 m, the thickness of a fingernail, in scientific notation. 1.8×10^{-4} m
15. [Number Patterns]
Complete the pattern:
4, 4, 8, 12, 20, 32, 52
16. [Expressions]
Write the following as an algebraic expression:
A quarter of the sum of c and d $\frac{c+d}{4}$
17. [Substitution]
If $p = 10$ and $q = -5$, find the value of $2p + 3q$ 5
18. [Expansion]
Expand and simplify $2x(x - 1) + 4(x - 1)$ $2x^2 + 2x - 4$
19. [Factorisation]
Factorise $2x + 3a + ax + 6$ $(x + 3)(a + 2)$
20. [Equations]
Solve for x : $3(2x - 1) = 0$ $\frac{1}{2}$
21. [Graphs & Functions]
Find the equation of the line joining the points K(0, -2) and L(-3, 0), using the formula $y - y_1 = m(x - x_1)$ where $m = \frac{y_2 - y_1}{x_2 - x_1}$
 $y = -\frac{2}{3}x - 2$
22. [Units of Measurement / Time]
The capacity of a cup is 250 mL. Find its volume in cm^3 . 250 cm^3

23. [Perimeter]
Using $\pi \approx \frac{22}{7}$ find the circumference of a golf buggy wheel with radius 140 mm.



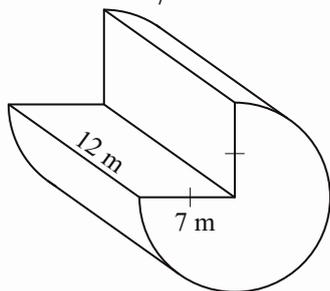
880 mm

24. [Area]
Find the area of the trapezium.



337.5 cm²

25. [Volume]
Using $\pi \approx \frac{22}{7}$ find the volume of the solid.

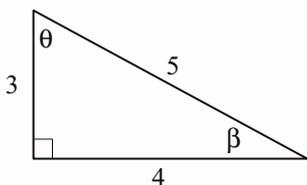


1386 m³

26. [Surface Area]
Using $TSA = \pi r(r + s)$ where $\pi \approx \frac{22}{7}$, find the total surface area of a cone of radius 4 cm and slant height 10 cm.

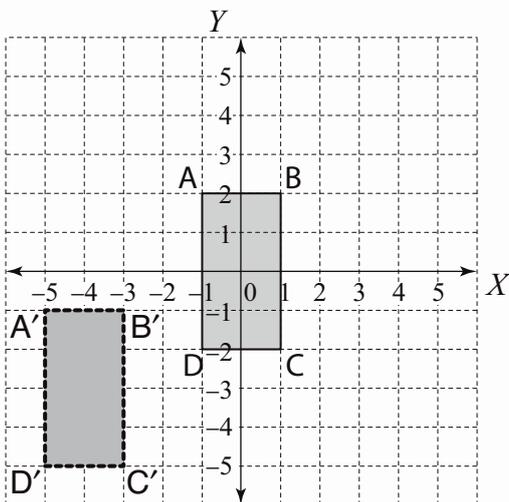
176 cm²

27. [Pythagoras / Trigonometry]
For which angle is the sine ratio 0.6?

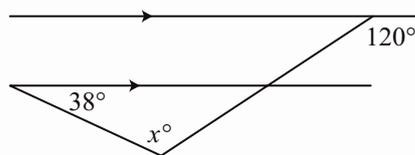


β

28. [Shape / Location]
Redraw the rectangle ABCD after translating it -4 units horizontally and -3 units vertically.



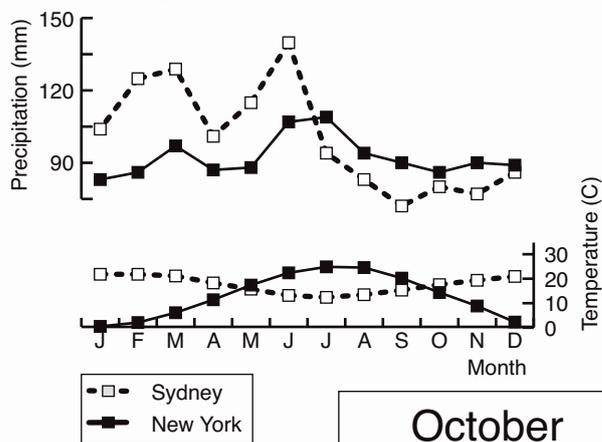
29. [Angles]
Find the value of x° .



82°

30. [Statistics]
In which month are the climates of New York and Sydney most alike?

Average Temperature and Precipitation



October

31. [Probability]
What is the probability that a passenger chosen at random from the airport flies business class?
[Complete the two-way table.]

	Business class	Economy class	Total
Dassault-Brequet	10	0	10
BAe 125	14	0	14
Boeing 747	50	440	490
Total	74	440	514

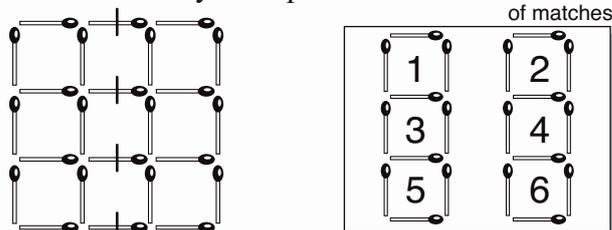
$\frac{37}{257}$

32. [Problem Solving 1]
If n is an odd integer, which of the following
I. $n + n$ II. $n + n + n$ III. $n \times n \times n$
must also be odd?

- A) I only B) II only
C) III only D) II and III only
E) I, II and III

D

33. [Problem Solving 2]
Remove four matches from this arrangement to leave exactly six squares. (or middle horizontal row of matches)





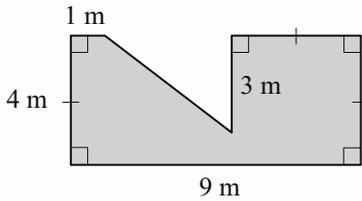
Name:

1. [Long \times , \div]
 $420 \div 5 =$ 84
2. [Decimal $+$, $-$]
 $4 + 0.25 - 0.38 =$ 3.87
3. [Decimal \times , \div]
 $0.6 \div 0.02 =$ 30
4. [Fraction $+$, $-$]
 $\frac{4}{6} + \frac{3}{8} =$ $1\frac{1}{24}$
5. [Fraction \times , \div]
 $\frac{4}{y} \times \frac{y}{5} =$ $\frac{4}{5}$
6. [Percentages]
Susan invested \$10 000 at 6.5% per annum simple interest. How much interest would she earn after 2 years?
\$ 1300
7. [Integer $+$, $-$]
 $-3 + (8 - 15) =$ -10
8. [Integer \times , \div]
 $(+72w) \div (-9) =$ -8w
9. [Rates / Ratios]
Gulls can fly at up to 40 km/h. At this rate what distance can a gull fly in 3 minutes?
2 km
10. [Indices]
Simplify $-(3y^5)^2$ -9y¹⁰
11. [Square Roots / Surds]
Simplify $\sqrt{28}$ $2\sqrt{7}$
12. [Order of Operations]
 $(2 - 15 + 13)^2 - 20 =$ -20
13. [Exploring Number]
Write $\frac{7}{25}$ as a decimal. 0.28
14. [Scientific Notation]
Express 43 500 in scientific notation. 4.35×10^4
15. [Number Patterns]
Complete the pattern:
5, 5, 10, 15, 20, 40
16. [Expressions]
Write the following as an algebraic expression:
3 more than four lots of x $4x + 3$
17. [Substitution]
If $y = -1$ and $z = 6$, find the value of $4y - z$ -10
18. [Expansion]
Expand and simplify $x(x - 7) - (x - 7)$ $x^2 - 8x + 7$
19. [Factorisation]
Factorise $2xy - 3y + 2x - 3$ $(2x - 3)(y + 1)$
20. [Equations]
Solve for x :
 $\frac{2}{3}(3x + 1) = 0$ - $\frac{1}{3}$
21. [Graphs & Functions]
Find the equation of the line joining the points M(0, -2) and N(-1, 3), using the formula $y - y_1 = m(x - x_1)$ where $m = \frac{y_2 - y_1}{x_2 - x_1}$
 $y = -5x - 2$
22. [Units of Measurement / Time]
The capacity of a water tank is 1200 L. Find its volume in m^3 . $1.2 m^3$

23. [Perimeter]
A circle has a circumference of 88 mm. Using $\pi \approx \frac{22}{7}$ find its diameter.

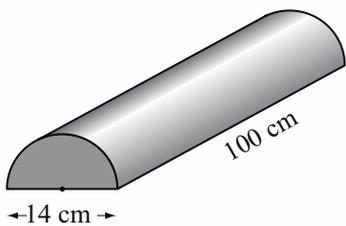
28 mm

24. [Area]
Find the area of the shape.



30 m²

25. [Volume]
Using $\pi \approx \frac{22}{7}$ find the volume of the solid.

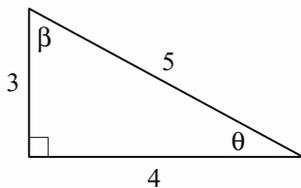


7700 cm³

26. [Surface Area]
Using $TSA = 2\pi r(r + h)$ where $\pi \approx 3.14$, find the total surface area of a cylindrical can of radius 7 cm and height 13 cm.

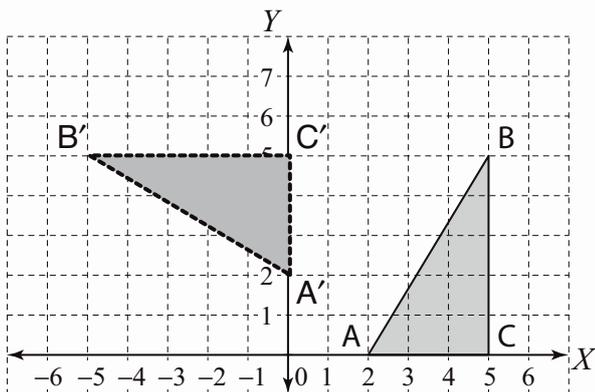
879.2 cm²

27. [Pythagoras / Trigonometry]
For which angle is the tangent ratio 0.75?

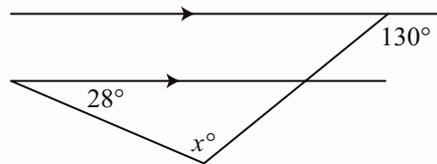


θ

28. [Shape / Location]
Redraw the triangle after a rotation of 90° anticlockwise about the origin.

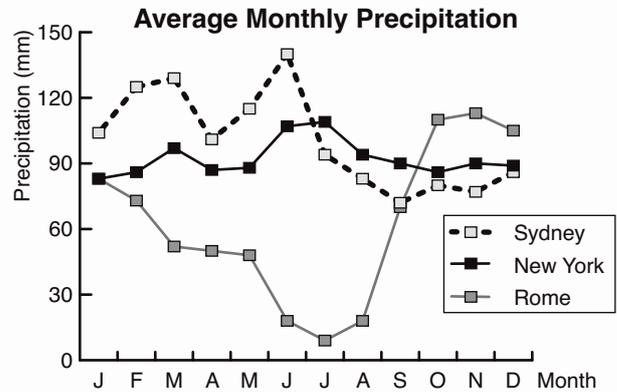


29. [Angles]
Find the value of x° .



102°

30. [Statistics]
Which of the three cities shown below has the highest total annual precipitation?



Sydney

31. [Probability]
What is the probability that a professor chosen at random at the conference is an Australian chemist? [Complete the two-way table.]

	Americans	Australians	Europeans	Total
Mathematicians	30	5	10	45
Physicians	21	9	3	33
Chemists	40	20	20	80
Total	91	34	33	158

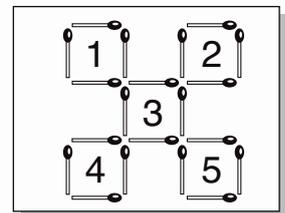
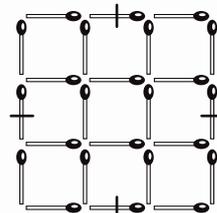
$\frac{10}{79}$

32. [Problem Solving 1]
If n is an integer, which of the following
I. $2n$ II. $2n + n$ III. $2n \times n$
must be even?

- A) I only B) II only
C) III only D) I and II only
E) I and III only

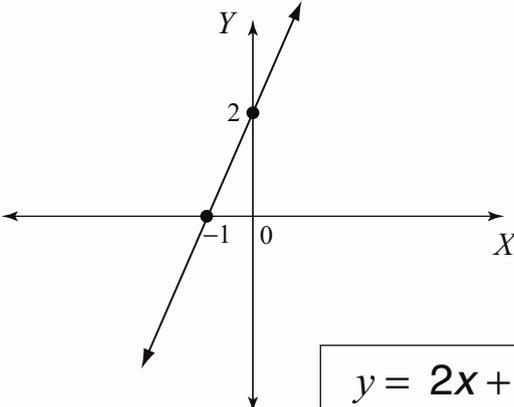
E

33. [Problem Solving 2]
Remove four matches from the arrangement below to leave exactly five squares.





Name:

1. [Long \times ,+] $41 \times 26 =$ 1066
2. [Decimal +,-] $1 - 0.044 =$ 0.956
3. [Decimal \times ,+] $3.4 \times 0.9 =$ 3.06
4. [Fraction +,-] $\frac{d}{5} - \frac{d}{15} =$ $\frac{2d}{15}$
5. [Fraction \times ,+] $7 \times 1\frac{1}{5} =$ $8\frac{2}{5}$
6. [Percentages] Anya gives 5% of her income to charity. If she gives \$3 per week to charity, what is her weekly income? \$ 60
7. [Integer +,-] $-5 - (2 - 6) =$ -1
8. [Integer \times ,+] $(+8) \times (-3) \div (+4) =$ -6
9. [Rates / Ratios] Mildura and Hay are 290 km apart. How many centimetres apart are they on a map with a scale factor of 1 : 500 000? 58 cm
10. [Indices] Evaluate $\frac{1}{3^{-2}}$ 9
11. [Square Roots / Surds] Between which two consecutive whole numbers does $5\sqrt{2}$ lie? 7 and 8
12. [Order of Operations] $8 + 10 \times 64 \div 2 =$ 328
13. [Exploring Number] A cyclist rides 75 km in 5 hours. At this rate how long would it take her to ride 120 km? 8 h
14. [Scientific Notation] Which is the order of magnitude of 0.0015? [i.e. What power of 10 appears in the scientific notation of the number? OR What power of 10 is the number closest to?] A) 10^{-4} B) 10^{-3} C) 10^{-2} D) 10^0 B
15. [Number Patterns] Complete the pattern: 4.8, 2.4, 1.2, 0.6, 0.3, 0.15
16. [Expressions] Find the difference between the following polynomials: $(k^2 + k - 2) - (k^2 - 5k - 4)$ $6k + 2$
17. [Substitution] If $e = 3$ and $f = 5$, simplify $e^2 - 2f$ -1
18. [Expansion] Expand and simplify $3(x + 2)^2 - 3x$ $3x^2 + 9x + 12$
19. [Factorisation] Factorise $a^2 + 10ab + 25b^2$ $(a + 5b)^2$
20. [Equations] Solve the simultaneous equations: $2x - y = 3$
 $3x + y = 12$ (3,3)
21. [Graphs & Functions] Find the equation of the line.  $y = 2x + 2$

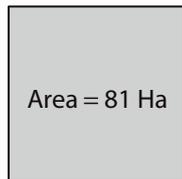
22. [Units of Measurement / Time]

Convert 2 square metres to square centimetres.

20 000 cm²

23. [Perimeter]

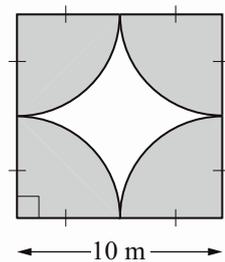
Find the perimeter of the square.



3600 m

24. [Area]

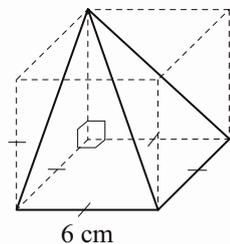
Using $\pi \approx 3.14$ find the area of the shaded region.



78.5 m²

25. [Volume]

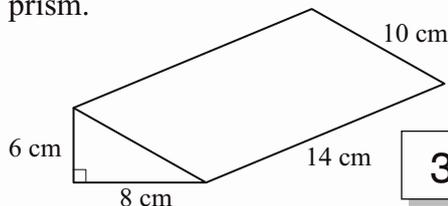
A skew pyramid is formed from a cube as shown. Find its volume.



72 cm³

26. [Surface Area]

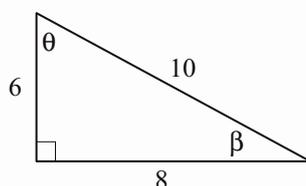
Find the total surface area of the triangular prism.



384 cm²

27. [Pythagoras / Trigonometry]

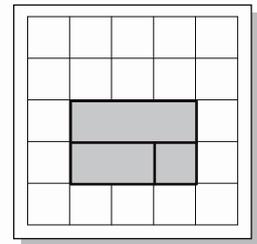
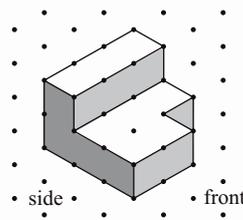
Use the triangle to calculate the value of $\sin \theta$.



0.8

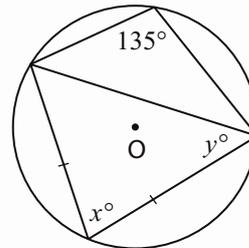
28. [Shape / Location]

Draw the view from the front of the solid.



29. [Angles]

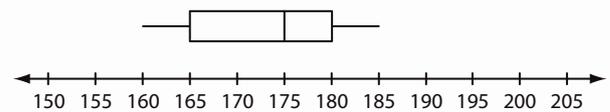
Find the value of y° .



67.5°

30. [Statistics]

For the box-and-whisker plot, find the range and the interquartile range (IQR).



range = 25

IQR = 15

31. [Probability]

If two dice are thrown, what is the probability of rolling a pair of 'ones'?



$\frac{1}{36}$

32. [Problem Solving 1]

Factorise and evaluate:
 $42^2 + 2 \times 42 \times 58 + 58^2 =$

10 000

33. [Problem Solving 2]

The number 15 can be expressed as a sum of two or more consecutive, positive integers in three different ways:

$$1 + 2 + 3 + 4 + 5$$

$$\text{or } 4 + 5 + 6$$

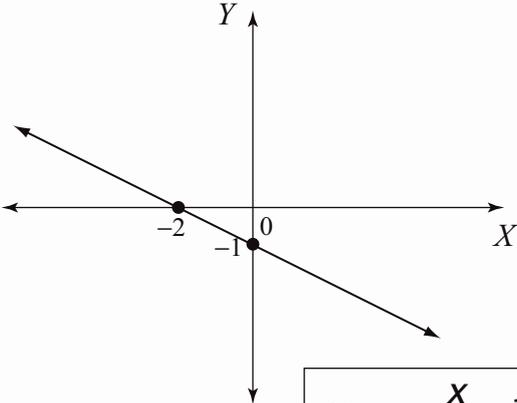
$$\text{or } 7 + 8.$$

In how many ways can 63 be expressed as such a sum?

5



Name:

1. [Long \times ,+] $65 \times 16 =$ 1040
2. [Decimal +,-] $1 - 0.234 =$ 0.766
3. [Decimal \times ,+] $0.04 \div 0.8 =$ 0.05
4. [Fraction +,-] $\frac{w}{2} + \frac{w}{3} =$ $\frac{5w}{6}$
5. [Fraction \times ,+] $3 \times 2\frac{3}{4} =$ $8\frac{1}{4}$
6. [Percentages] My pay cut of 5% means I earn \$30 less per week. What is my weekly wage now? \$ 570
7. [Integer +,-] $3 - (7 + 4) =$ -8
8. [Integer \times ,+] $(-6) \times (-9) \div (-2) =$ -27
9. [Rates / Ratios] Port Augusta and Whyalla are 77 km apart. How many centimetres apart are they on a map with a scale factor of 1 : 1 000 000? 7.7 cm
10. [Indices] Evaluate $(0.2)^{-2}$ 25
11. [Square Roots / Surds] Between which two consecutive whole numbers does $3\sqrt{3}$ lie? 5 and 6
12. [Order of Operations] $5 + 2 - 18 \div 3 =$ 1
13. [Exploring Number] A lion moves 13 m in 2 bounds. What distance will it cover in 7 bounds at this rate? 45.5 m
14. [Scientific Notation] Which is the order of magnitude of 23 800? [i.e. What power of 10 appears in the scientific notation of the number? OR What power of 10 is the number closest to?] A) 10^3 B) 10^4 C) 10^5 D) 10^6 B
15. [Number Patterns] Complete the pattern: 0.8, 0.4, 0.2, 0.1, 0.05, 0.025
16. [Expressions] Add the following polynomials: $(-2p^2 - p + 5) + (-p^2 - 3p - 6)$ $-3p^2 - 4p - 1$
17. [Substitution] If $a = 5$, $b = 0$ and $x = 4$, simplify $ab - x^2$ -16
18. [Expansion] Expand and simplify $(x - 2y)^2$ $x^2 - 4xy + 4y^2$
19. [Factorisation] Factorise $3x^2 - 27$ $3(x - 3)(x + 3)$
20. [Equations] Solve the simultaneous equations: $4x - y = 4$
 $4x + 2y = 4$ (1,0)
21. [Graphs & Functions] Find the equation of the line.  $y = -\frac{x}{2} - 1$

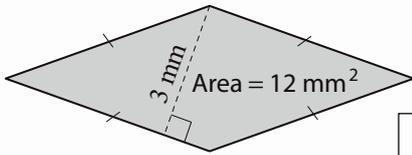
22. [Units of Measurement / Time]

Change 1.25 cubic metres to cubic centimetres.

1 250 000 cm³

23. [Perimeter]

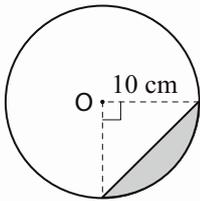
Find the perimeter of the rhombus.



16 mm

24. [Area]

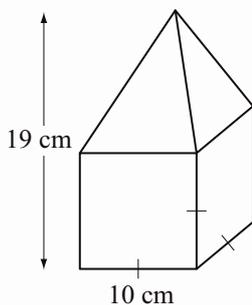
Using $\pi \approx 3.14$ find the area of the shaded region.



28.5 cm²

25. [Volume]

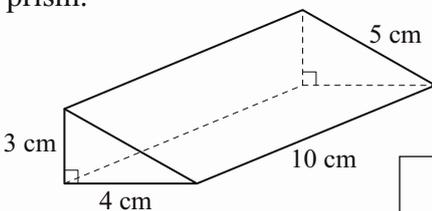
A square pyramid sits atop a cube as shown. Find the volume of the solid.



1300 cm³

26. [Surface Area]

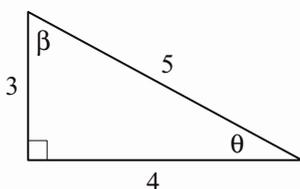
Find the total surface area of the triangular prism.



132 cm²

27. [Pythagoras / Trigonometry]

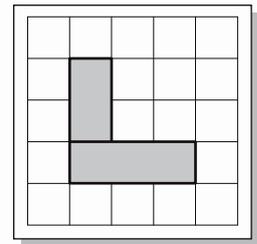
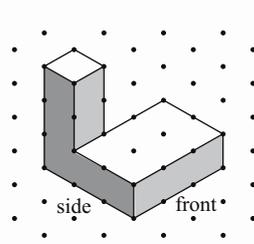
Use the triangle to calculate the value of $\cos \theta$.



0.8

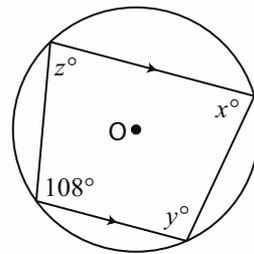
28. [Shape / Location]

Draw the view from the front of the solid.



29. [Angles]

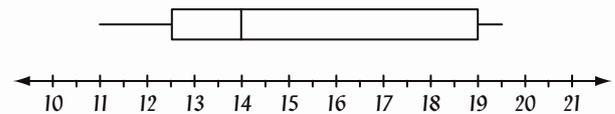
Find the values of x° , y° and z° .



$x^\circ = 72^\circ$ $y^\circ = 108^\circ$ $z^\circ = 72^\circ$

30. [Statistics]

For the box-and-whisker plot, find the range and the interquartile range (IQR).



range = 8.5 IQR = 6.5

31. [Probability]

If two dice are thrown one after the other, what is the probability of obtaining a 3 on the first die?



or $0.\dot{1}\dot{6}$

$\frac{1}{6}$

32. [Problem Solving 1]

Factorise and evaluate: $76^2 - 24^2 =$

5200

33. [Problem Solving 2]

The number 84 can be expressed as a sum of two or more consecutive, positive integers in three different ways:

$$27 + 28 + 29$$

$$\text{or } 9 + 10 + 11 + 12 + 13 + 14 + 15$$

$$\text{or } 7 + 8 + 9 + 10 + 11 + 12 + 13 + 14.$$

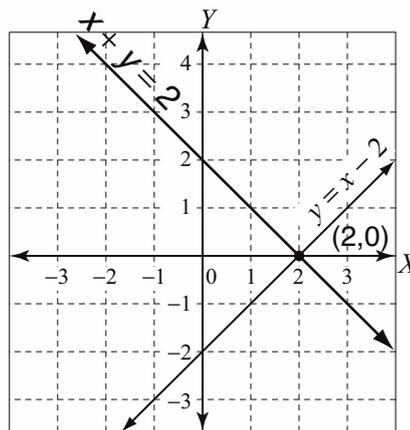
In how many ways can 75 be expressed as such a sum?

5



Name:

1. [Long \times, \div]
 $37.8 \div 6 =$ 6.3
2. [Decimal $+, -$]
 $100 - 0.19 =$ 99.81
3. [Decimal \times, \div]
 $1.6 \times 0.08 =$ 0.128
4. [Fraction $+, -$]
 $\frac{4}{6} - \frac{2}{15} =$ $\frac{8}{15}$
5. [Fraction \times, \div]
 $\frac{3}{4}(12 + 4d) =$ $9 + 3d$
6. [Percentages]
A 5% discount on the furniture saved Alex \$270. How much did he pay? \$ 5130
7. [Integer $+, -$]
 $(+q) - (-6q) =$ $7q$
8. [Integer \times, \div]
 $(4 - 7) \times (4 - 7) =$ 9
9. [Rates / Ratios]
The Moon is approximately 375 000 km from Earth. How long does it take the light to travel from the Moon to Earth? [The speed of light is approximately 300 000 km/s.] 1.25 s
10. [Indices]
Simplify $\frac{5st^4 \times 4s^3}{10st^5}$ $\frac{2s^3}{t}$
11. [Square Roots / Surds]
Expand and simplify $\sqrt{7}(4 - \sqrt{7})$ $4\sqrt{7} - 7$
12. [Order of Operations]
 $(5 \times 1)^3 + 2^2 =$ 129
13. [Exploring Number]
At 60 km/h a car can drive from the city to the coast in 3 hours. What average speed is required for the car to travel the same distance in 2 hours? 90 km/h
14. [Scientific Notation]
Estimate the order of magnitude of 19.5×510 10^4
15. [Number Patterns]
Write the first four terms of the sequence $t_n = \frac{n}{n+2}$ where $n \geq 1$ $\frac{1}{3}, \frac{1}{2}, \frac{3}{5}, \frac{2}{3}$
16. [Expressions]
Write algebraic expressions for each of the three consecutive odd numbers where the smallest of the three numbers is n . $n, n + 2, n + 4$
17. [Substitution]
If $a = \frac{2}{3}$ and $b = \frac{1}{4}$, find the value of $2a - 3b$ $\frac{7}{12}$
18. [Expansion]
Expand and simplify $(4x + 1)(x - 4)$ $4x^2 - 15x - 4$
19. [Factorisation]
Factorise $u^2 - 5u + 6$ $(u - 2)(u - 3)$
20. [Equations]
Solve for x : $\frac{3x}{2} - \frac{x}{3} = 7$ 6
21. [Graphs & Functions]
Solve $y = x - 2$ and $x + y = 2$ simultaneously by drawing the second graph. (2,0)



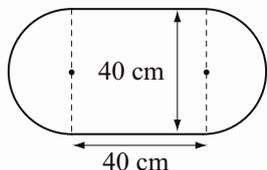
22. [Units of Measurement / Time]

Iron has a density of 7.874 g/cm^3 .
Express the density in kg/m^3 .

7874 kg/m^3

23. [Perimeter]

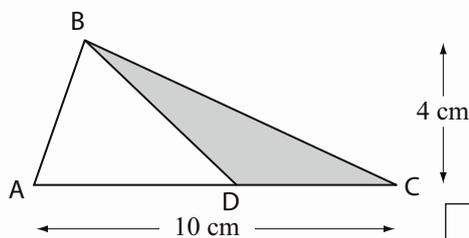
Using $\pi \approx 3.14$ find the perimeter of the shape.



205.6 cm

24. [Area]

Find the length AD such that triangle ABD has the same area as triangle BCD.



5 cm

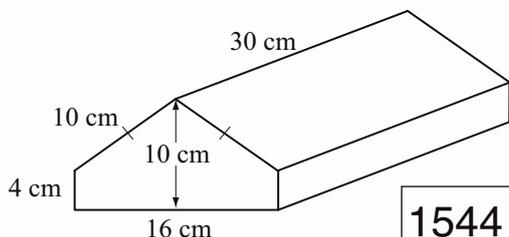
25. [Volume]

Using $V = \frac{1}{3}\pi r^2 h$ where $\pi \approx \frac{22}{7}$, find the volume of a cone of base radius 3.5 cm and height 6 cm.

77 cm^3

26. [Surface Area]

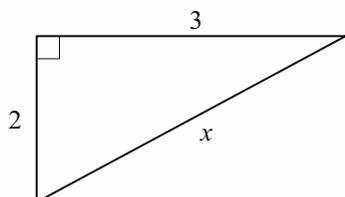
Find the total surface area of the solid.



1544 cm^2

27. [Pythagoras / Trigonometry]

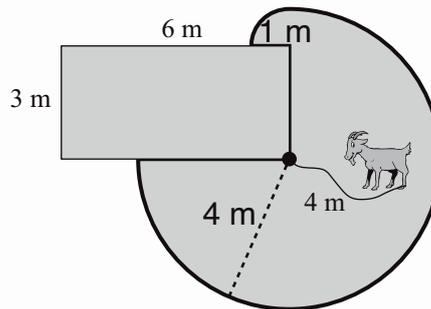
Find, in surd form, the value of x .



$\sqrt{13}$

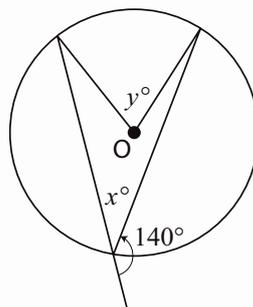
28. [Shape / Location]

A goat is tethered by a 4 m rope to the outside corner of a $6 \text{ m} \times 3 \text{ m}$ shed. Show the dimensions and the shape of the region over which the goat can graze.



29. [Angles]

Find the values of x° and y° .



$x^\circ = 40^\circ$ $y^\circ = 80^\circ$

30. [Statistics]

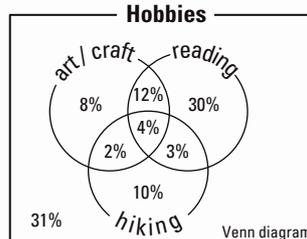
Find the interquartile range for the distribution.

Number of letters	3	4	5	6	7	8	9	10
Frequency	4	5	7	6	5	5	0	1

3

31. [Probability]

Find the probability that a surveyed person selected at random did not list reading as a hobby.



or 51%
 $\frac{51}{100}$

32. [Problem Solving 1]

Find the sum:

$$(-1)^1 - (-1)^2 + (-1)^3 - \dots + (-1)^{49} - (-1)^{50}$$

-50

33. [Problem Solving 2]

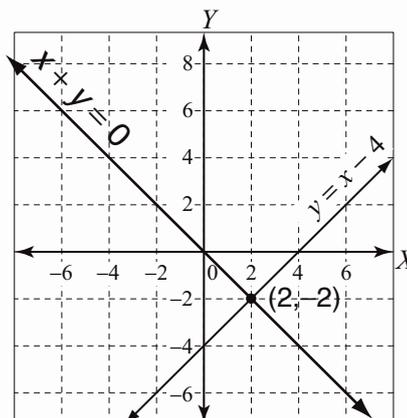
What are the last two digits in the expansion of 2^{222} ?

04



Name:

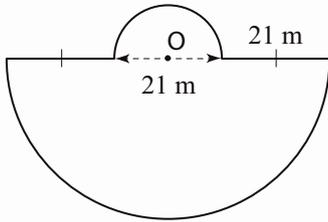
1. [Long \times , \div]
 $48.64 \div 8 =$ 6.08
2. [Decimal $+$, $-$]
 $7 - 0.0444 =$ 6.9556
3. [Decimal \times , \div]
 $7.48 \times 0.02 =$ 0.1496
4. [Fraction $+$, $-$]
 $1\frac{5}{6} + \frac{3}{10} =$ $2\frac{2}{15}$
5. [Fraction \times , \div]
 $\frac{1}{7}(14k + 56) =$ $2k + 8$
6. [Percentages]
 A 15% discount on books saved me \$24.
 How much did I pay? \$ 136
7. [Integer $+$, $-$]
 $(-2p) - (-p) =$ $-p$
8. [Integer \times , \div]
 $(5 - 8) \times (5 - 8) =$ 9
9. [Rates / Ratios]
 The Sun is approximately 150 000 000 km from Earth. How long does it take the light to travel from the Sun to Earth? [The speed of light is approximately 300 000 km/s.] 500 s
10. [Indices]
 Simplify $\frac{3a^4b \times 4a^3b^2}{6a^2b^3}$ $2a^5$
11. [Square Roots / Surds]
 Expand and simplify $\sqrt{2}(6 - \sqrt{2})$ $6\sqrt{2} - 2$
12. [Order of Operations]
 $2 \times 5 + 21 \div 7 =$ 13
13. [Exploring Number]
 Five assistants can count the local electoral votes in 4 days. How many assistants, working at the same rate, are needed to count the same number of votes in 2 days? 10
14. [Scientific Notation]
 Estimate the order of magnitude of 3.9×258 10^3
15. [Number Patterns]
 Write the first four terms of the sequence $t_n = \frac{3n+1}{n}$ where $n \geq 1$ $4, 3\frac{1}{2}, 3\frac{1}{3}, 3\frac{1}{4}$
16. [Expressions]
 Write a simple algebraic expression for the average of two consecutive odd numbers where the smaller of the two numbers is n . $n + 1$
17. [Substitution]
 If $d = \frac{1}{3}$ and $e = \frac{1}{6}$, find the value of $4d - 3e$ $\frac{5}{6}$
18. [Expansion]
 Expand and simplify $(3x - 2)(2x + 6)$ $6x^2 + 14x - 12$
19. [Factorisation]
 Factorise $z^2 - 15z + 56$ $(z - 7)(z - 8)$
20. [Equations]
 Solve for x : $\frac{2x}{5} - \frac{x}{3} = 2$ 30
21. [Graphs & Functions]
 Solve $y = x - 4$ and $x + y = 0$ simultaneously by drawing the second graph. $(2, -2)$



22. [Units of Measurement / Time]
Magnesium has a density of 1.737 g/cm^3 .
Express the density in kg/m^3 .

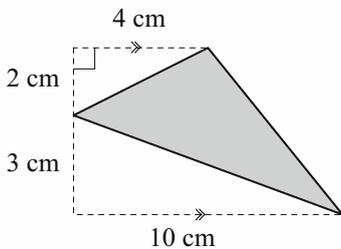
1737 kg/m^3

23. [Perimeter]
Using $\pi \approx \frac{22}{7}$ find the perimeter of the shape.



174 m

24. [Area]
Find the area of the shaded triangle.

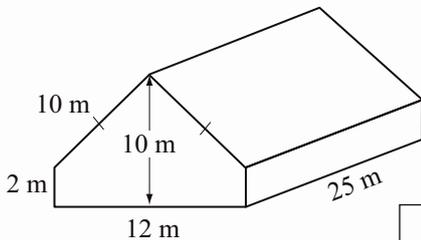


16 cm^2

25. [Volume]
Using $V = \pi r^2 h$ where $\pi \approx 3.14$, find the volume of a cylinder of base radius 5 cm and height 40 cm.

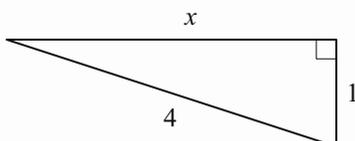
3140 cm^3

26. [Surface Area]
Find the total surface area of the solid.



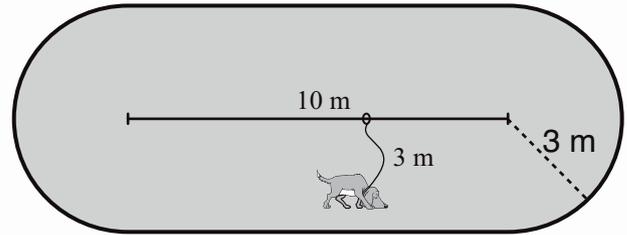
1044 m^2

27. [Pythagoras / Trigonometry]
Find, in surd form, the value of x .

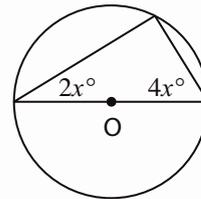


$\sqrt{15}$

28. [Shape / Location]
A dog is tethered by a 3 m rope to a ring which is free to slide along a straight rail 10 m long. Show the dimensions and the shape of the region over which the dog can wander.



29. [Angles]
Find the value of x° .



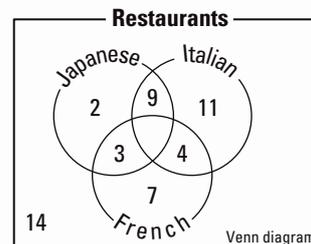
15°

30. [Statistics]
A die was rolled 30 times and the results recorded. Find the value of the interquartile range.

Score	1	2	3	4	5	6
Frequency	5	7	8	3	5	2

2

31. [Probability]
Fifty people were asked about the types of restaurants they had eaten at in the last 12 months. Find the probability that a person chosen at random from the surveyed group, had not eaten at an Italian restaurant in that time.



$\frac{13}{25}$

32. [Problem Solving 1]
Find the sum:
 $1 \times (-1)^1 + 2 \times (-1)^2 + 3 \times (-1)^3 + \dots + 100 \times (-1)^{100}$

50

33. [Problem Solving 2]
What are the last two digits in the expansion of 4^{444} ?

56



Name:

1. [Long \times ,+] $18 \times 2.9 =$ 52.2
2. [Decimal +,-] $x - 7.5 = 5.45$ $x = 12.95$
3. [Decimal \times ,+] $0.96 \div x = 96$ $x = 0.01$
4. [Fraction +,-] $\frac{1}{2} - \frac{1}{5} + \frac{1}{6} =$ $\frac{7}{15}$
5. [Fraction \times ,+] $1\frac{1}{2} \times 3\frac{1}{2} =$ $5\frac{1}{4}$
6. [Percentages] Paul bought a car 3 years ago for \$2500 and recently sold it for \$800. Express the loss as a percentage of the cost price. 68%
7. [Integer +,-] $(4 - 5) - (6 - 7) =$ 0
8. [Integer \times ,+] $\frac{12xy}{-4y} =$ $-3x$
9. [Rates / Ratios] On average, one person in the world dies every six seconds from drinking water contaminated with water-borne diseases. How many people die every day from a lack of safe water to drink? 14 400
10. [Indices] Simplify and express using positive indices $\frac{4y^{-2}}{y^2}$ $\frac{4}{y^4}$
11. [Square Roots / Surds] Evaluate $\frac{7\sqrt{3} \times \sqrt{15}}{\sqrt{20}}$ $10\frac{1}{2}$
12. [Order of Operations] $6 \times 3 - (25 \div 5) =$ 13
13. [Exploring Number] Write the recurring decimal $0.\dot{4}$ as a fraction in simplest form. $\frac{4}{9}$
14. [Scientific Notation] Express 0.03×10^{-1} as a basic numeral. 0.003
15. [Number Patterns] Write the first four terms of the sequence $t_n = (n + 2)^2$ where $n \geq 1$ 9, 16, 25, 36
16. [Expressions] A cheetah moves 18 metres in 6 bounds. At this rate how many metres would it move in z bounds? $3z$ m
17. [Substitution] For what values of x is $\frac{-5}{x(x+5)}$ undefined? 0, -5
18. [Expansion] Expand and simplify $x(x+3)(x+2)$ $x^3 + 5x^2 + 6x$
19. [Factorisation] Factorise $4x^2 + 15x - 4$ $(4x - 1)(x + 4)$
20. [Equations] Solve for x : $x^2 + 10x = 0$ 0, -10
21. [Graphs & Functions] Complete the table of values for the parabola of equation $y = -2x^2 + 1$

x	-3	-2	-1	0	1	2	3
y	-17	-7	-1	1	-1	-7	-17

22. [Units of Measurement / Time]

How many metres in t millimetres?

$$\frac{t}{1000} \text{ m}$$

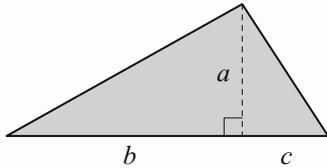
23. [Perimeter]

A rectangle has an area of 48 cm^2 . If its length is three times its width, find its perimeter.

$$32 \text{ cm}$$

24. [Area]

Write a formula for the area A of the triangle.



$$A = \frac{a(b+c)}{2}$$

25. [Volume]

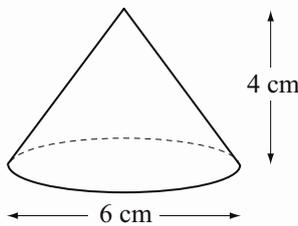
Plastic is used to make a hollow cube which has an outer edge length of 10 cm. Find the volume of plastic used if each wall has a thickness of 1 cm.

$$488 \text{ cm}^3$$

26. [Surface Area]

Find the total surface area of the cone.

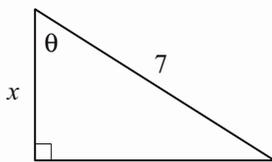
[Leave your answer as a multiple of π .]



$$24\pi \text{ cm}^2$$

27. [Pythagoras / Trigonometry]

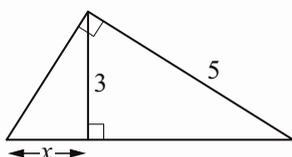
Find the value of x , given $\cos \theta = 0.6$



$$4.2$$

28. [Shape / Location]

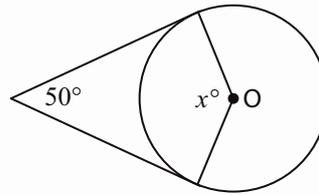
Using similarity, find the value of x .



$$2.25$$

29. [Angles]

Find the value of x° .



$$130^\circ$$

30. [Statistics]

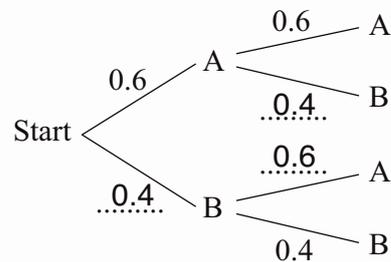
Find the difference between the medians of the two sets of data.

leaf	stem	leaf
4 0	13	3
4	14	1 3 4
9 5 2	15	2 4
1	16	5
6 3	17	1 3 5
7 7 5	18	2 5

$$0.5$$

31. [Probability]

Complete the probability tree diagram and find the probability that event A occurs first, then event B follows.



$$\Pr(AB) = 0.24$$

32. [Problem Solving 1]

Which is greater: 10^{100} or 1000^{10} ?

$$10^{100}$$

33. [Problem Solving 2]

Each letter stands for a different digit. What number does PLANETS represent?

[Need help? SOS = 525]

$$\begin{array}{r} \text{S A T U R N} \\ + \text{U R A N U S} \\ \hline \text{P L A N E T S} \end{array}$$

$$1\ 3\ 4\ 0\ 8\ 6\ 5$$



Name:

1. [Long \times ,+] $33 \times 1.4 =$ 46.2
2. [Decimal +,-] $x - 1.5 = 0.94$ $x = 2.44$
3. [Decimal \times ,+] $x \times 711 = 7.11$ $x = 0.01$
4. [Fraction +,-] $\frac{2}{3} + \frac{2}{4} - \frac{5}{6} =$ $\frac{1}{3}$
5. [Fraction \times ,+] $3\frac{1}{3} \div 1\frac{1}{9} =$ 3
6. [Percentages]
Lucy invested \$3200 on the stock market, and later sold out for \$4000. Express the profit as a percentage of the amount invested. 25%
7. [Integer +,-] $(6 - 8) + (10 - 12) =$ -4
8. [Integer \times ,+] $\frac{-15w}{-3} =$ +5w
9. [Rates / Ratios]
If, on average, two babies are born somewhere in the world every second, how many people are born every day? 172 800
10. [Indices]
Simplify and express using positive indices $\frac{5a^2b^{-7}}{a^{-2}b^{-7}}$ $5a^4$
11. [Square Roots / Surds]
Evaluate $\frac{3\sqrt{7} \times 4\sqrt{14}}{6\sqrt{2}}$ 14
12. [Order of Operations] $3 \times (8 + 7) =$ 45
13. [Exploring Number]
Change the recurring decimal $2.\bar{8}$ to a mixed number in simplest form. $2\frac{8}{9}$
14. [Scientific Notation]
Express 2.5×10^{-4} as a basic numeral. 0.00025
15. [Number Patterns]
Write the first four terms of the sequence $t_n = (-1)^n$ where $n \geq 1$ -1, 1, -1, 1
16. [Expressions]
If the cost of 5 kg of strawberries is \$6.00, what is the cost of m kg? \$ $\frac{6m}{5}$
or $1.2m$
17. [Substitution]
For what value of x is $\frac{-1}{3x-9}$ undefined? 3
18. [Expansion]
Expand and simplify $x(2x - 1)(x + 4)$ $2x^3 + 7x^2 - 4x$
19. [Factorisation]
Factorise $6y^2 - y - 15$ $(3y - 5)(2y + 3)$
20. [Equations]
Solve for x : $2x^2 - 6x = 0$ 0, 3
21. [Graphs & Functions]
Complete the table of values for the parabola of equation $y = -x^2 - 5$

x	-3	-2	-1	0	1	2	3
y	-14	-9	-6	-5	-6	-9	-14

22. [Units of Measurement / Time]

How many litres in c millilitres?

$$\frac{c}{1000} \text{ L}$$

23. [Perimeter]

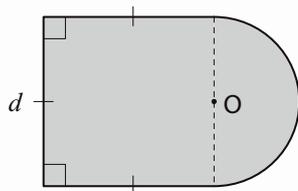
How many kilometres of fence are required to enclose a rectangular paddock with an area of 48 km^2 if its width is 4 km ?

$$32 \text{ km}$$

24. [Area]

Write a formula for the area A of the shape.

[Leave your answer as a multiple of π .]



$$A = d^2 + \frac{d^2\pi}{8}$$

25. [Volume]

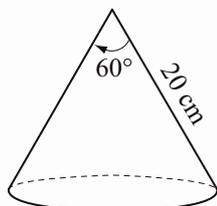
Rain water from the flat roof of a building 20 m by 11 m flows into a cylindrical tank of diameter 4 m . Find the increase in the depth of water in the tank after 20 mm of rain.

(Use $\pi \approx \frac{22}{7}$)

$$0.35 \text{ m}$$

26. [Surface Area]

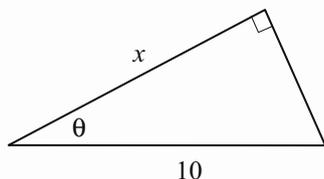
Using $\pi \approx 3.14$ find the total surface area of the cone.



$$942 \text{ cm}^2$$

27. [Pythagoras / Trigonometry]

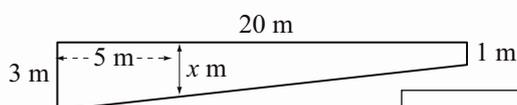
Find the value of x , given $\cos \theta = 0.81$



$$8.1$$

28. [Shape / Location]

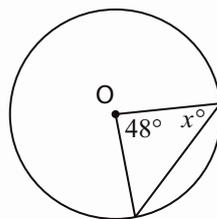
A side view from a plan of a swimming pool is shown. What is the depth of the pool 5 m from the deep end?



$$2.5 \text{ m}$$

29. [Angles]

Find the value of x° .



$$66^\circ$$

30. [Statistics]

Find the difference between the medians of the two sets of data.

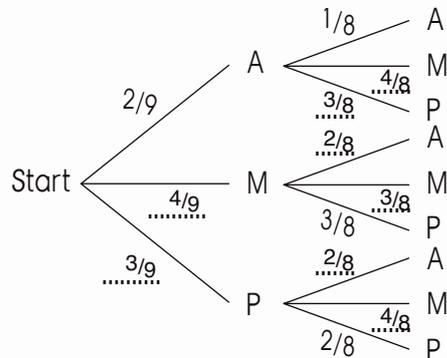
leaf	stem	leaf
3 1	7	1 4
5 2 0	8	3 5 5
4 0	9	2 7
3 1	10	1 4
3 1	11	1 8

$$2$$

31. [Probability]

A bowl of fruit contains 2 apples, 4 mandarins and 3 pears. If two pieces are picked randomly one after the other, find the probability of selecting two mandarins.

[Complete the tree diagram to help solve the problem.]



or $0.1\dot{6}$

$$\Pr(\text{MM}) = \frac{1}{6}$$

32. [Problem Solving 1]

Which is greater: 9^4 or 27^2 ?

$$9^4$$

33. [Problem Solving 2]

Each letter stands for a different digit. What number does CLAIM represent?

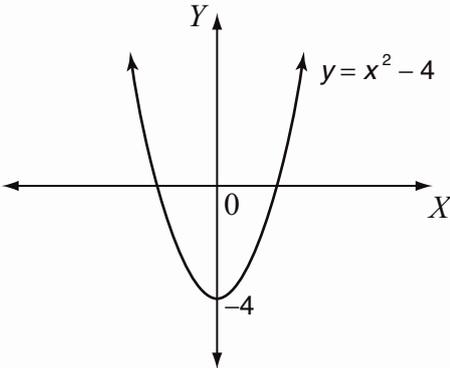
$$\begin{array}{r} \text{THIS} \\ \text{IS} \\ + \text{HIS} \\ \hline \end{array}$$

CLAIM (Henry V - Shakespeare)

$$10756$$



Name:

1. [Long \times, \div]
 $20.4 \div 3 =$ 6.8
2. [Decimal $+, -$]
 $1 - x = 0.062$ $x = 0.938$
3. [Decimal \times, \div]
 $x \times 0.3 = 30$ $x = 100$
4. [Fraction $+, -$]
 $\frac{t+1}{4} + \frac{t-2}{2} =$ $\frac{3t-3}{4}$
5. [Fraction \times, \div]
 $\frac{4x}{5xy} \times \frac{y}{10x} =$ $\frac{2}{25x}$
6. [Percentages]
At a weekend market, Marlon sold 64% of his mangoes on the first day and 50% of the remainder the next day. If he has 45 kg left, how much did he sell altogether? 250 kg
7. [Integer $+, -$]
 $(+25) + (-4) + (-12) =$ 9
8. [Integer \times, \div]
 $(-4) \times (+8) \div (-2) =$ 16
9. [Rates / Ratios]
Typically, high quality 18-carat white gold contains gold, silver, copper and palladium in the ratio 75 : 4 : 4 : 17. How many grams of copper would there be in a necklace made from 50 grams of this white gold? 2 g
10. [Indices]
Given $2^x = 1$, find the value of x . 0
11. [Square Roots / Surds]
Rationalise $\frac{2}{\sqrt{3}}$ $\frac{2\sqrt{3}}{3}$
12. [Order of Operations]
 $(5 \times 4)^2 =$ 400
13. [Exploring Number]
Place in descending order:
 $\frac{10}{9}, \sqrt{1.21}, \left(\frac{21}{20}\right)^2$ $\frac{10}{9}, \left(\frac{21}{20}\right)^2, \sqrt{1.21}$
14. [Scientific Notation]
Evaluate and express as a basic numeral
 $(0.16 \times 10^3) \times (4 \times 10^{-3})$ 0.64
15. [Number Patterns]
Find the rule of the sequence t_n where $n \geq 1$
3, 6, 9, 12, 15, $t_n = 3n$
16. [Expressions]
If n is an integer, which of the following must be an odd number?
 $2(n+1), 4n+1, 2n, n+1$ $4n+1$
17. [Substitution]
Does the ordered pair (5.4,4) satisfy the relation $3x < y^2$? no
18. [Expansion]
Expand and simplify
 $3x(x+2) - (x+1)(x-2)$ $2x^2 + 7x + 2$
19. [Factorisation]
Factorise and simplify
 $\frac{x^2 - 3x - 10}{x^2 - 25}$ $\frac{x+2}{x+5}$
20. [Equations]
Solve for x :
 $x(x^2 - 121) = 0$ 0, -11, 11
21. [Graphs & Functions]
Sketch the parabola of equation $y = x^2 - 4$ without plotting points.


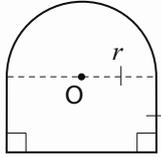
22. [Units of Measurement / Time]

A wolf can reach a speed of 12 m/s, while a giraffe can run 50 km/h. Which animal is faster?

giraffe

23. [Perimeter]

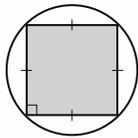
Write a formula for the perimeter P of the shape.



$$P = r(\pi + 4)$$

24. [Area]

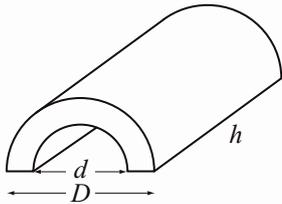
The area of the circle is $100\pi \text{ m}^2$. Find the area of the square inside the circle.



$$200 \text{ m}^2$$

25. [Volume]

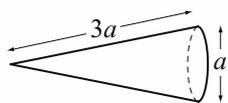
Write a simple formula for the volume V of the solid in terms of d , D , h and π .



$$V = \frac{\pi h}{8}(D^2 - d^2)$$

26. [Surface Area]

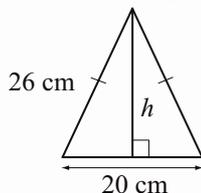
Write a formula for the total surface area TSA of the cone. [Leave your answer as a multiple of π .]



$$TSA = \frac{7\pi a^2}{4}$$

27. [Pythagoras / Trigonometry]

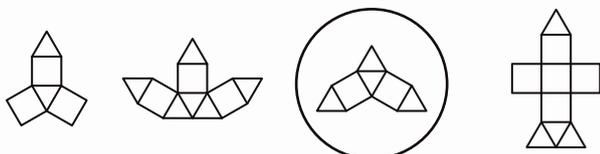
Find the height of the isosceles triangle.



$$24 \text{ cm}$$

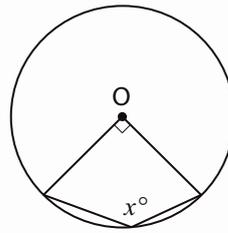
28. [Shape / Location]

Circle the net that **can not** be folded to form a model of a polyhedron.



29. [Angles]

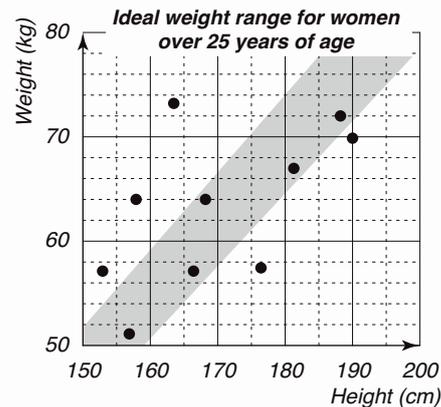
Find the value of x° .



$$135^\circ$$

30. [Statistics]

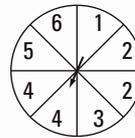
The scatter plot shows the weight and height of ten female staff at a local factory. How many are considered too thin?



2

31. [Probability]

How many times would you expect to spin an even number if the spinner is spun 200 times?



125

32. [Problem Solving 1]

I have \$100 to buy exactly 100 animals to feed to my snake. Tender succulent mice cost \$5, large juicy fresh cockroaches are \$1 and imported blowflies are only 5¢ each. If I spend every cent buying these delicacies, and I buy at least one of each, how many cockroaches will I buy?

1

33. [Problem Solving 2]

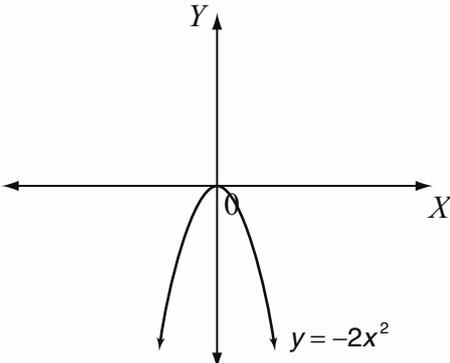
The lines of a multiplication table are shown below all jumbled. Which times table is it?

$F \times I = AB$
 $F \times A = BI$
 $F \times B = CH$
 $F \times E = GB$
 $F \times F = HI$
 $F \times J = ID$
 $F \times H = IF$
 $F \times G = JH$
 $F \times C = F$

8



Name:

1. [Long \times, \div]
 $13.56 \div 6 =$ 2.26
2. [Decimal $+, -$]
 $1 - x = 0.999$ $x = 0.001$
3. [Decimal \times, \div]
 $0.7 \div x = 0.007$ $x = 100$
4. [Fraction $+, -$]
 $\frac{2x+1}{4} - \frac{x}{2} =$ $\frac{1}{4}$
5. [Fraction \times, \div]
 $\frac{3xy}{x} \div \frac{6y}{4} =$ 2
6. [Percentages]
Boys make up 60% of a class. How many students are there in the class if there are 8 more boys than girls? 40
7. [Integer $+, -$]
 $(-5s) + (-s) + (-20s) =$ $-26s$
8. [Integer \times, \div]
 $(-20) \times (-2) \div (-5) =$ -8
9. [Rates / Ratios]
Typically, 18-carat gold is a combination of gold, silver and copper in the ratio 75 : 16 : 9. How many grams of silver would there be in a ring made from 25 grams of this 18 carat gold? 4 g
10. [Indices]
If $10^x = 0.01$, what is the value of x ? -2
11. [Square Roots / Surds]
Rationalise $\frac{1}{\sqrt{5}}$ $\frac{\sqrt{5}}{5}$
12. [Order of Operations]
 $7 \times 69 \div 23 =$ 21
13. [Exploring Number]
Place in descending order:
 $\sqrt{\frac{9}{4}}, 1\frac{5}{9}, \left(\frac{5}{4}\right)^2$ $\left(\frac{5}{4}\right)^2, 1\frac{5}{9}, \sqrt{\frac{9}{4}}$
14. [Scientific Notation]
Evaluate and express in scientific notation
 $(6.4 \times 10^6) \times (0.5 \times 10^{-1})$ 3.2×10^5
15. [Number Patterns]
Find the rule of the sequence t_n where $n \geq 1$
5, 6, 7, 8, 9, $t_n = n + 4$
16. [Expressions]
If n is a negative number, which of the following must be positive?
 $n - 3, 3n, n^3, n^4$ n^4
17. [Substitution]
Does the ordered pair $(-1, -2)$ satisfy the relation $5x - 2 > 4y$? yes
18. [Expansion]
Expand and simplify
 $(x + 3)(x - 3) - (3x - 2)^2$
 $-8x^2 + 12x - 13$
19. [Factorisation]
Factorise and simplify
 $\frac{x^2 + x - 12}{x^2 - 16}$ $\frac{x - 3}{x - 4}$
20. [Equations]
Solve for x :
 $x(x^2 - 36) = 0$ 0, -6, 6
21. [Graphs & Functions]
Sketch the parabola with equation $y = -x^2$ without plotting points.


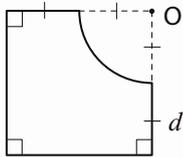
22. [Units of Measurement / Time]

A killer whale can swim at up to 55 km/h, while a sea lion can reach 11 m/s. Which animal is faster?

killer whale

23. [Perimeter]

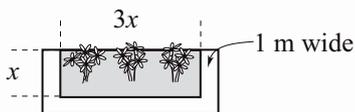
Write a formula for the perimeter P of the shape making use of the π symbol.



$$P = 6d + \frac{\pi d}{2}$$

24. [Area]

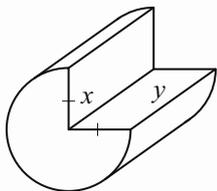
A garden bed has a 1 metre wide path around three sides as shown. The rectangular garden bed is 3 times as long as it is wide. Find the area of the garden bed given that it is exactly equal to the area of the paving around it.



$$12 \text{ m}^2$$

25. [Volume]

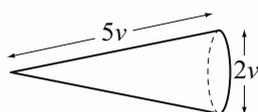
Write a simple formula for the volume V of the solid in terms of x , y and π .



$$V = \frac{3\pi x^2 y}{4}$$

26. [Surface Area]

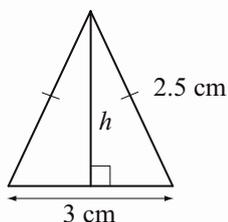
Write a formula for the total surface area TSA of the cone.



$$TSA = 6\pi v^2$$

27. [Pythagoras / Trigonometry]

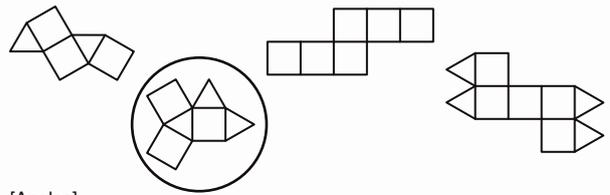
Find the height of the isosceles triangle.



$$2 \text{ cm}$$

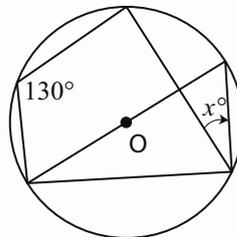
28. [Shape / Location]

Circle the net that **can not** be folded to form a model of a polyhedron.



29. [Angles]

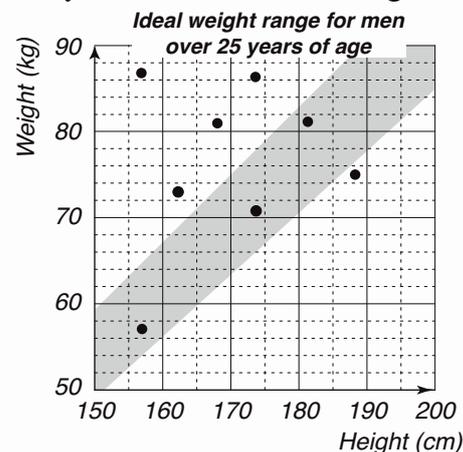
Find the value of x° .



$$40^\circ$$

30. [Statistics]

The scatter plot shows the weight and height of 8 male staff at the local bakery. How many are considered overweight?



4

31. [Probability]

How many times would you expect an odd number to occur when a fair six-sided die is rolled 100 times?

50

32. [Problem Solving 1]

Our fete stall sold all 120 items for a total of \$120. The cakes sold for \$5 each, the buns sold for \$2 each and the lollies for 10¢ each. How many cakes did we sell?

17

33. [Problem Solving 2]

The lines of a multiplication table are shown jumbled. Which times table is it?

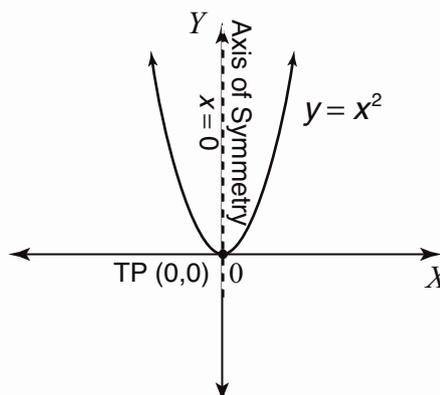
F × B = F
F × C = HD
F × D = BH
F × H = DG
F × I = CE
F × F = HI
F × E = DB
F × G = JC
F × J = EJ

7



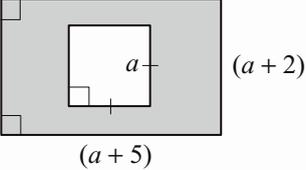
Name:

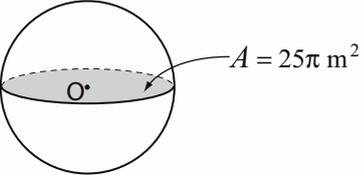
1. [Long \times ,+] $14.6 \times 11 =$ 160.6
2. [Decimal +,-] $12.5 - x = 8.75$ $x = 3.75$
3. [Decimal \times ,+] $x^2 = 0.04$ $x = \pm 0.2$
4. [Fraction +,-] $\frac{x-1}{5} + \frac{x+1}{2} =$ $\frac{7x+3}{10}$
5. [Fraction \times ,+] $\frac{5}{y+5} \times \frac{y+5}{10} =$ $\frac{1}{2}$
6. [Percentages] Tia invests \$500 at 8% per annum compound interest. What will Tia's investment be worth after 2 years? \$ 583.20
7. [Integer +,-] $6x - (x - 8x) =$ 13x
8. [Integer \times ,+] $\frac{4-9}{9-4} =$ -1
9. [Rates / Ratios] A butterfly beats its wings 300 times per minute. What is the rate per second? 5 times/s
10. [Indices] Simplify $\frac{4a^2b^2 \times (3ab)^{-2}}{27a^{-1}}$ $\frac{4a}{243}$
11. [Square Roots / Surds] Expand and simplify $(\sqrt{2} + \sqrt{3})(2\sqrt{2} + \sqrt{3})$ $7 + 3\sqrt{6}$
12. [Order of Operations] $37 \times 39 \times (6 - 6) + 24 =$ 24
13. [Exploring Number] $\frac{12}{13} < \frac{13}{14}$ True or false? true
14. [Scientific Notation] Evaluate and express in scientific notation $(6 \times 10^3)^2$ 3.6×10^7
15. [Number Patterns] Find the rule of the sequence t_n where $n \geq 1$
1, 4, 7, 10, $t_n = 3n - 2$
16. [Expressions] Find the difference between the polynomials:
 $(x^3 - 2x^2 + 6) - (x^3 + x^2 - 2x - 5)$ $-3x^2 + 2x + 11$
17. [Substitution] If $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$, find the solutions x_1 and x_2 , when $a = 2$, $b = 3$ and $c = -5$ $-\frac{5}{2}, 1$
18. [Expansion] Expand and simplify $(x + y + 1)^2$ $x^2 + y^2 + 1 + 2xy + 2x + 2y$
19. [Factorisation] Factorise $x^3 + 4x^2 + 4x$ $x(x + 2)^2$
20. [Equations] Solve the inequality: $x^2 + 2x - 8 < 0$ $-4 < x < 2$
21. [Graphs & Functions] Sketch the graph with equation $y = x^2$ labelling the intercepts, axis of symmetry and turning point.



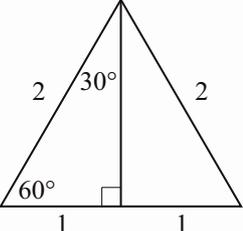
22. [Units of Measurement / Time]
How many square metres in h hectares?
10 000h m²

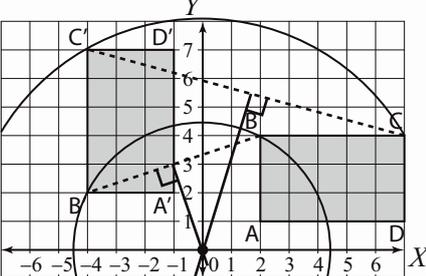
23. [Perimeter]
Find the perimeter of the triangle.
[Hint: Pythagoras' theorem will help.]
6 cm
8 cm
24 cm

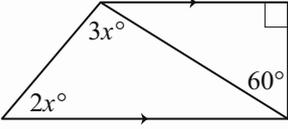
24. [Area]
Write a simple expression for the area A of the shaded region.

 $A = 7a + 10$

25. [Volume]
Find the volume of the sphere. [Express your answer as a multiple of π .]

 $\frac{500\pi}{3} \text{ m}^3$

26. [Surface Area]
The volume of cube A is 27 times that of cube B. Find the value of the ratio:
 $\frac{\text{surface area of A}}{\text{surface area of B}}$ or 9 : 1 **$\frac{9}{1}$**

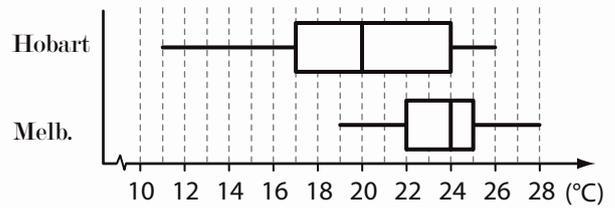
27. [Pythagoras / Trigonometry]
Use the triangle to find the value of $\sin 60^\circ$.
[Leave your answer in surd form.]

 $\frac{\sqrt{3}}{2}$

28. [Shape / Location]
What are the coordinates of the centre of rotation used to rotate the quadrilateral ABCD to its new position A'B'C'D'?

(0,0)

29. [Angles]
Find the value of x° .

30°

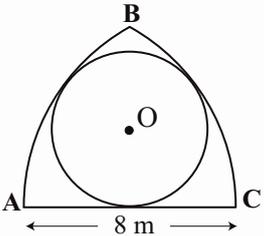
30. [Statistics]
The maximum temperatures reached on 10 consecutive days in October are recorded for Hobart and Melbourne. Draw two comparative box plots to compare the data.

Hobart	20	15	11	17	22	26	24	24	20	18
Melbourne	24	22	19	21	25	28	27	25	23	24



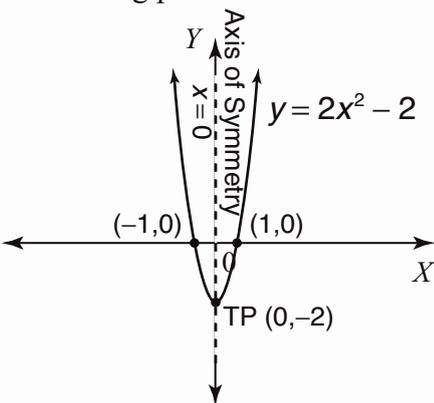
31. [Probability]
How many different post codes can be made that have four digits and start with 3? [Note: All 10 digits can be used and can be repeated, e.g. 3500.]
1000

32. [Problem Solving 1]
If it takes 12 convicts 2 days to dig a garden, how long would it take 4 convicts to do the same job?
6 days

33. [Problem Solving 2]
In this diagram, the arc AB is centred at C and the arc BC is centred at A. What is the radius of the circle centred at O?

3 m



Name:

1. [Long \times ,+] $33.4 \times 18 =$ 601.2
2. [Decimal +,-] $4.8 - x = 0.035$ $x = 4.765$
3. [Decimal \times ,+] $\sqrt{x} = 0.16$ $x = 0.0256$
4. [Fraction +,-] $\frac{t+2}{3} + \frac{t+2}{4} =$ $\frac{7t+14}{12}$
5. [Fraction \times ,+] $\frac{4t}{t+2} \div \frac{2}{t+2} =$ $2t$
6. [Percentages] Marcus invests \$2000 at 4% per annum compound interest. What will Marcus' investment be worth after 2 years? \$ 2163.20
7. [Integer +,-] $12s + (2s - 15s) =$ $-s$
8. [Integer \times ,+] $\frac{3-12}{3-12} =$ 1
9. [Rates / Ratios] The human heart beat can vary from 40 to 200 beats per minute. Express the maximum heart rate in beats per second. 3.3 beats/s
10. [Indices] Simplify $\frac{6xy \times (x^2y)^{-1}}{2x^{-2}y^{-3}}$ $3xy^3$
11. [Square Roots / Surds] Expand and simplify $(2 + \sqrt{3})(2 - \sqrt{3})$ 1
12. [Order of Operations] $(8 - 8)^7 \div 2012 =$ 0
13. [Exploring Number] $\frac{74}{73} > \frac{75}{74}$ True or false? true
14. [Scientific Notation] Evaluate and express in scientific notation $(5 \times 10^{-1})^2$ 2.5×10^{-1}
15. [Number Patterns] Find the rule of the sequence t_n where $n \geq 1$
3, 8, 13, 18, 23, $t_n = 5n - 2$
16. [Expressions] Add the following polynomials:
 $(2x^3 + x^2 - 2x + 2) + (x^3 + 4x - 6)$ $3x^3 + x^2 + 2x - 4$
17. [Substitution] If $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$, find the solutions x_1 and x_2 , when $a = 1$, $b = 2$ and $c = -15$ 3, -5
18. [Expansion] Expand and simplify $(a - b + c)^2$ $a^2 + b^2 + c^2 - 2ab - 2bc + 2ac$
19. [Factorisation] Factorise $2x^4 - 12x^3 + 18x^2$ $2x^2(x - 3)^2$
20. [Equations] Solve the inequality:
 $x^2 + 2x - 15 < 0$ $-5 < x < 3$
21. [Graphs & Functions] Sketch the graph with equation $y = 2x^2 - 2$ labelling the intercepts, axis of symmetry and turning point.


22. [Units of Measurement / Time]
How many dollars/hour are equivalent to p dollars/week if you work 40 hours per week?

$$\frac{p}{40} \text{ \$/h}$$

23. [Perimeter]
Find the perimeter of the trapezium.
[Hint: Pythagoras' theorem will help.]

$$72 \text{ cm}$$

24. [Area]
Write a simple formula for the area A of the shaded triangle.

$$A = \frac{ab}{4}$$

25. [Volume]
Find the volume of the solid. [Express your answer as a multiple of π .]

$$\frac{1000\pi}{3} \text{ cm}^3$$

26. [Surface Area]
A triangular prism, with all its edges of equal length, a cone, with a height equal to its diameter, and a sphere all have exactly the same surface area. Which of the three solids will have the greatest volume?

$$\text{sphere}$$

27. [Pythagoras / Trigonometry]
Use the triangle to find the value of $\tan 60^\circ$.
[Leave your answer in surd form.]

$$\sqrt{3}$$

28. [Shape / Location]
What are the coordinates of the centre of rotation used to rotate the triangle ABC to its new position A'B'C'?

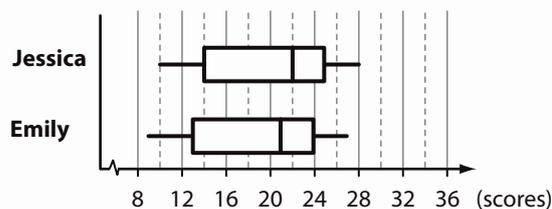
$$(7,7)$$

29. [Angles]
Through how many degrees does the big hand of a clock move in 25 minutes?

$$150^\circ$$

30. [Statistics]
The number of points scored by Jessica and Emily in the first 9 games of the basketball season are shown in this table. Draw two comparative box plots to illustrate the data.

Jessica	22	13	26	15	22	24	28	10	15
Emily	21	13	9	21	23	25	13	23	27



31. [Probability]
There are 900 different three-digit numbers. How many of these do not contain any odd digit?

$$100$$

32. [Problem Solving 1]
If it takes Loretta three minutes to chop a log into three pieces, how long would it take her to chop a log into five pieces?

$$6 \text{ min}$$

33. [Problem Solving 2]
In this diagram, the arc AB is centred at C and the arc BC is centred at A. What is the radius of the circle centred at O?

$$1.5 \text{ m}$$



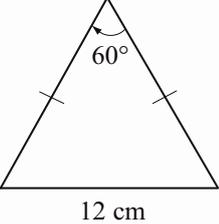
Name:

1. [Long \times ,+] $3024 \div 27 =$ 112
2. [Decimal +,-] $0.071 + x = 0.1$ $x = 0.029$
3. [Decimal \times ,+] $x^2 = 0.0049$ $x = \pm 0.07$
4. [Fraction +,-] $\frac{1}{t} - \frac{1}{2t} =$ $\frac{1}{2t}$
5. [Fraction \times ,+] $\frac{15x+3}{5x+1} =$ 3
6. [Percentages] After 1 year a computer has lost 25% of its value and is now worth only \$1950. What did it cost new? \$ 2600
7. [Integer +,-] $(p - 2p) - (2p - p) =$ $-2p$
8. [Integer \times ,+] $\frac{-60}{-5} \times \frac{-12}{8} =$ -18
9. [Rates / Ratios] Linda has \$10, James has 40% more than Linda, and Paul has three times as much as James. Express the amount of money held by Linda, James and Paul as a ratio in simplest form. 5 : 7 : 21
10. [Indices] Evaluate $(-1)^0 \times 1 + (-1)^1 \times 2 + (-1)^2 \times 3$ 2
11. [Square Roots / Surds] Rationalise $\frac{2}{\sqrt{7} - \sqrt{5}}$ $\sqrt{7} + \sqrt{5}$
12. [Order of Operations] $(7 - 10) \times 4^2 - 22 =$ -70
13. [Exploring Number] If X is $66\frac{1}{3}\%$ of Y , express Y as a percentage of X . 150%
14. [Scientific Notation] Evaluate and express in scientific notation $\sqrt{6.4 \times 10^{-7}}$ 8×10^{-4}
15. [Number Patterns] If $t_1 = 8$ and $t_{n+1} = \frac{t_n}{2}$, find the first four terms of the pattern. 8, 4, 2, 1
16. [Expressions] A piano was bought for x dollars, then resold at a 20% profit. In terms of x , what was the selling price? \$ $\frac{6x}{5}$
17. [Substitution] If $t = 2x$ and $y = t^3 + 8$, express y in terms of x . $y = 8x^3 + 8$
18. [Expansion] Expand and simplify $(a + 1)(a + 1)(a + 1)$ $a^3 + 3a^2 + 3a + 1$
19. [Factorisation] Factorise $x^4 - 1$ $(x - 1)(x + 1)(x^2 + 1)$
20. [Equations] Solve for x : $2x^2 + x - 3 = 0$ $-\frac{3}{2}, 1$
21. [Graphs & Functions] Sketch the graph of equation $y = x^2 - 6x + 5$ labelling the intercepts, axis of symmetry and turning point.

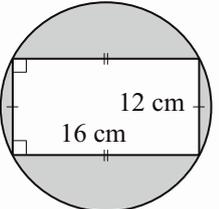
The graph shows a parabola $y = x^2 - 6x + 5$ on a Cartesian coordinate system. The x-axis and y-axis are labeled. The parabola has a y-intercept at $(0, 5)$ and x-intercepts at $(1, 0)$ and $(5, 0)$. The vertex (turning point) is labeled as TP $(3, -4)$. A vertical dashed line through the vertex is labeled 'Axis of Symmetry' and $x = 3$.

22. [Units of Measurement / Time]
What does the prefix 'centi' represent?
A) 10^{-2} B) 10^{-1} C) 10^1 D) 10^2

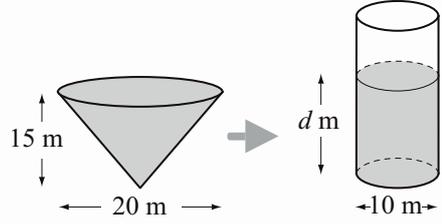
A

23. [Perimeter]
Find the perimeter of the triangle.
- 

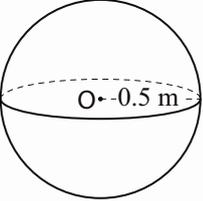
36 cm

24. [Area]
Using $\pi \approx 3.14$ find the shaded area.
- 

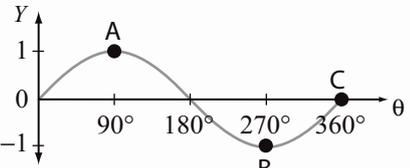
122 cm²

25. [Volume]
A cone full of water has been emptied into a cylinder as shown in the diagram. What is the depth of the water in the cylinder?
- 

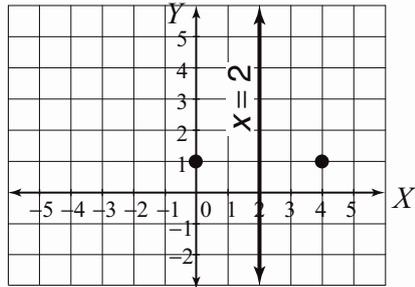
20 m

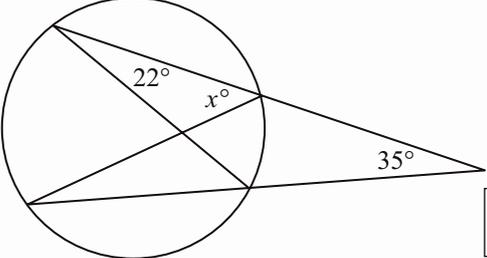
26. [Surface Area]
Using $\pi \approx 3.14$ find the surface area of the sphere.
- 

3.14 m²

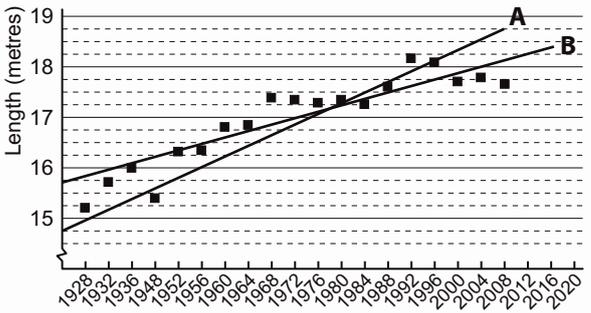
27. [Pythagoras / Trigonometry]
Complete the missing coordinates using the graph of $y = \sin \theta$.
A(90° , 1) B(270° , -1) C(360^o, 0)
- 

28. [Shape / Location]
Draw the shape formed by all the points that are equally distanced from the points (0,1) and (4,1).



29. [Angles]
Find the value of x° .
- 

57°

30. [Statistics]
Select the most appropriate 'line of best fit' for the scatter plot.
- Olympic Triple Jump - Winning distances for men**
- 

B

31. [Probability]
A pair of dice are rolled. What is the probability of rolling a total of 10 or more, given that the first die landed on 6?

$\frac{1}{2}$

32. [Problem Solving 1]
I reduced an image on my computer using a scale factor of 75%. What scale factor is required to return the image to its original size?

$133\frac{1}{3}$

33. [Problem Solving 2]
 $50! = 50 \times 49 \times 48 \times 47 \times \dots \times 2 \times 1$
If you were to multiply all these terms together, how many zeros would there be on the end of your answer?

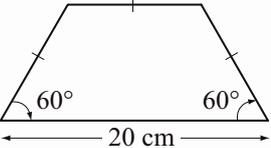
12

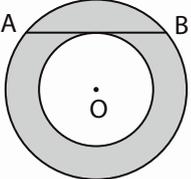


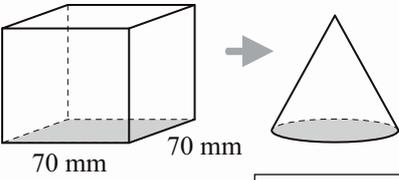
Name:

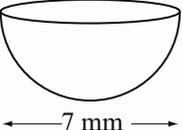
1. [Long \times ,+] $546 \div 42 =$ 13
2. [Decimal +,-] $1.9 + x = 11.03$ $x = 9.13$
3. [Decimal \times ,+] $\sqrt{x} = 0.5$ $x = 0.25$
4. [Fraction +,-] $\frac{1}{2w} - \frac{1}{4w} =$ $\frac{1}{4w}$
5. [Fraction \times ,+] $\frac{y^2 + y}{y} =$ $y + 1$
6. [Percentages] A new computer is bought for \$3900. What is the value of the computer after 1 year if it has depreciated by 30%? \$ 2730
7. [Integer +,-] $(3t - 4t) - (5t - 6t) =$ 0
8. [Integer \times ,+] $\frac{-7}{2} \times \frac{-8}{14} =$ +2
9. [Rates / Ratios] John has \$12, Maria has 25% more than John and Victor has three times as much as Maria. Express the amount of money held by John, Maria and Victor as a ratio in simplest form. 4 : 5 : 15
10. [Indices] Which is greater 2^{34} or 8^{11} ? 2^{34}
11. [Square Roots / Surds] Rationalise $\frac{2}{\sqrt{3} + 2}$ $4 - 2\sqrt{3}$
12. [Order of Operations] $(10001 - 10^4) \times 1998 =$ 1998
13. [Exploring Number] If X is 125% of Y , express Y as a percentage of X . 80%
14. [Scientific Notation] Evaluate and express in scientific notation $\sqrt{1.6 \times 10^{-5}}$ 4×10^{-3}
15. [Number Patterns] If $t_1 = \frac{1}{2}$ and $t_{n+1} = \frac{1}{t_n}$, find the first four terms of the pattern. $\frac{1}{2}, 2, \frac{1}{2}, 2$
16. [Expressions] To make a litre of apple juice n apples are squashed. How many apples are required to make t litres of apple juice? nt apples
17. [Substitution] If $t = 2x - 1$ and $y = 3t + 3$, use substitution to find y in terms of x . $y = 6x$
18. [Expansion] Expand and simplify $(x + 1)(x + 2)(x + 3)$ $x^3 + 6x^2 + 11x + 6$
19. [Factorisation] Factorise $50x^2 + 20x + 2$ $2(5x + 1)^2$
20. [Equations] Solve for x : $2x^2 - 5x + 3 = 0$ $1, \frac{3}{2}$
21. [Graphs & Functions] Sketch the graph of equation $y = x^2 + 8x + 12$ labelling the intercepts, axis of symmetry and turning point.

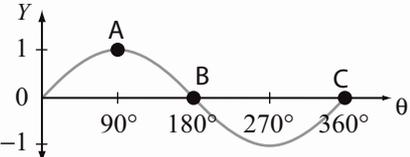
22. [Units of Measurement / Time]
What does the prefix 'milli' represent?
A) 10^{-4} B) 10^{-3} C) 10^{-2} D) 10^{-1} **B**

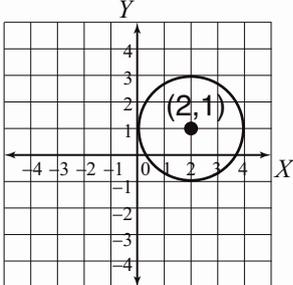
23. [Perimeter]
Find the perimeter of the trapezium.
 **50 cm**

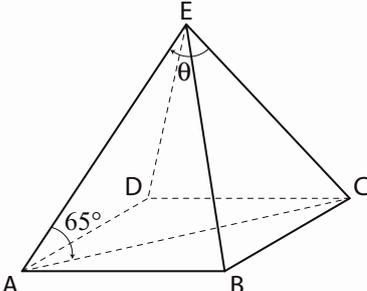
24. [Area]
AB is tangent to the smaller circle and its length is 14 cm. Using $\pi \approx \frac{22}{7}$ find the area of the shaded region. [Hint: Pythagoras' theorem will help!]
 **154 cm²**

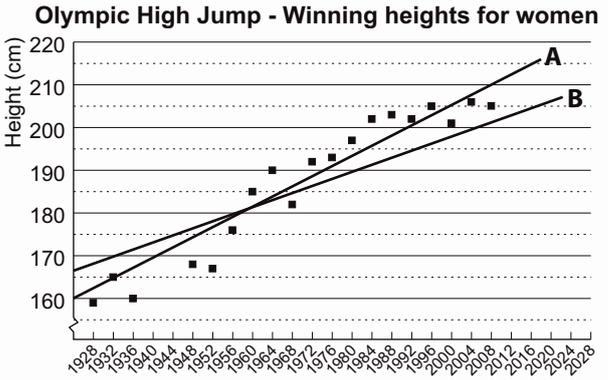
25. [Volume]
A rectangular block of wood is to be turned into a cone. What is the greatest volume the cone can have? (Use $\pi \approx \frac{22}{7}$)
 **77 000 mm³**

26. [Surface Area]
Using $\pi \approx \frac{22}{7}$ find the total surface area of the solid hemisphere.
 **115.5 mm²**

27. [Pythagoras / Trigonometry]
Complete the missing coordinates using the graph of $y = \sin \theta$.
A(90° , 1) B(180° , 0) C(360° , 0)


28. [Shape / Location]
Draw the shape formed by all the points that are at a distance of 2 units from the point (2,1).


29. [Angles]
Find the value of $\angle AEC$, marked θ , in the regular square pyramid.
 **50°**

30. [Statistics]
Select the most appropriate 'line of best fit' for the scatter plot.
Olympic High Jump - Winning heights for women
 **A**

31. [Probability]
A die is rolled and then a second die is rolled. What is the probability that the total of the two throws is less than 5, given the first throw was a 2?
 $\frac{1}{3}$

32. [Problem Solving 1]
I previously set the photocopier to a scale factor of 150%. What scale factor is required to copy the enlarged picture so that it returns to its original size?
 $66\frac{2}{3}$

33. [Problem Solving 2]
 $60! = 60 \times 59 \times 58 \times 57 \times \dots \times 2 \times 1$
If you were to multiply all these terms together how many zeros would there be on the end of your answer?
14

MATHS MATE



Teacher Resource



Teacher's Guide to the Use of Maths Mate

pages i - viii



Student Workbook Answers

pages 3 - 72



Student Workbook Short Answers

pages 1 - 8



Problem Solving Hints & Solutions

pages 1 - 18



Test Masters

pages 1 - 32



Test Answers

pages 1 - 32



Record Keeping Sheets

pages 1 - 10

MATHS MATE



Name:

Class:

Teacher:

Worksheet Results

Term 1

Sheet 1

Sheet 2

Sheet 3

Sheet 4

Sheet 5

Sheet 6

Sheet 7

Sheet 8

NUMBER & ALGEBRA

1. [Long \times, \div]
2. [Decimal $+, -$]
3. [Decimal \times, \div]
4. [Fraction $+, -$]
5. [Fraction \times, \div]
6. [Percentages]
7. [Integer $+, -$]
8. [Integer \times, \div]
9. [Rates / Ratios]
10. [Indices]
11. [Square Roots / Surds]
12. [Order of Operations]
13. [Exploring Number]
14. [Scientific Notation]
15. [Number Patterns]

MEASUREMENT & GEOMETRY

16. [Expressions]
17. [Substitution]
18. [Expansion]
19. [Factorisation]
20. [Equations]
21. [Graphs & Functions]
22. [Units of Measurement / Time]
23. [Perimeter]
24. [Area]
25. [Volume]
26. [Surface Area]
27. [Pythagoras / Trigonometry]
28. [Shape / Location]
29. [Angles]

STATISTICS & PROBLEM SOLVING

30. [Statistics]
31. [Probability]
32. [Problem Solving 1]
33. [Problem Solving 2]

1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9
10	10	10	10
11	11	11	11
12	12	12	12
13	13	13	13
14	14	14	14
15	15	15	15
16	16	16	16
17	17	17	17
18	18	18	18
19	19	19	19
20	20	20	20
21	21	21	21
22	22	22	22
23	23	23	23
24	24	24	24
25	25	25	25
26	26	26	26
27	27	27	27
28	28	28	28
29	29	29	29
30	30	30	30
31	31	31	31
32	32	32	32
33	33	33	33

1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9
10	10	10	10
11	11	11	11
12	12	12	12
13	13	13	13
14	14	14	14
15	15	15	15
16	16	16	16
17	17	17	17
18	18	18	18
19	19	19	19
20	20	20	20
21	21	21	21
22	22	22	22
23	23	23	23
24	24	24	24
25	25	25	25
26	26	26	26
27	27	27	27
28	28	28	28
29	29	29	29
30	30	30	30
31	31	31	31
32	32	32	32
33	33	33	33

Total Correct

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MATHS MATE



Name:

Class:

Teacher:

Worksheet Results

Term 2

Sheet 1 **Sheet 2** **Sheet 3** **Sheet 4**

Sheet 5 **Sheet 6** **Sheet 7** **Sheet 8**

NUMBER & ALGEBRA

1. [Long \times, \div]
2. [Decimal $+, -$]
3. [Decimal \times, \div]
4. [Fraction $+, -$]
5. [Fraction \times, \div]
6. [Percentages]
7. [Integer $+, -$]
8. [Integer \times, \div]
9. [Rates / Ratios]
10. [Indices]
11. [Square Roots / Surds]
12. [Order of Operations]
13. [Exploring Number]
14. [Scientific Notation]
15. [Number Patterns]

1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9
10	10	10	10
11	11	11	11
12	12	12	12
13	13	13	13
14	14	14	14
15	15	15	15

1	1	1	1
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10	10	10	10
11	11	11	11
12	12	12	12
13	13	13	13
14	14	14	14
15	15	15	15

MEASUREMENT & GEOMETRY

16. [Expressions]
17. [Substitution]
18. [Expansion]
19. [Factorisation]
20. [Equations]
21. [Graphs & Functions]
22. [Units of Measurement / Time]
23. [Perimeter]
24. [Area]
25. [Volume]
26. [Surface Area]
27. [Pythagoras / Trigonometry]
28. [Shape / Location]
29. [Angles]

16	16	16	16
17	17	17	17
18	18	18	18
19	19	19	19
20	20	20	20
21	21	21	21
22	22	22	22
23	23	23	23
24	24	24	24
25	25	25	25
26	26	26	26
27	27	27	27
28	28	28	28
29	29	29	29

16	16	16	16
17	17	17	17
18	18	18	18
19	19	19	19
20	20	20	20
21	21	21	21
22	22	22	22
23	23	23	23
24	24	24	24
25	25	25	25
26	26	26	26
27	27	27	27
28	28	28	28
29	29	29	29

STATISTICS & PROBABILITY
PROBLEM SOLVING

30. [Statistics]
31. [Probability]
32. [Problem Solving 1]
33. [Problem Solving 2]

30	30	30	30
31	31	31	31
32	32	32	32
33	33	33	33

30	30	30	30
31	31	31	31
32	32	32	32
33	33	33	33

Total Correct

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MATHS MATE



Name:

Class:

Teacher:

Worksheet Results

Term 3

Sheet 1

Sheet 2

Sheet 3

Sheet 4

Sheet 5

Sheet 6

Sheet 7

Sheet 8

NUMBER & ALGEBRA

1. [Long \times, \div]
2. [Decimal $+, -$]
3. [Decimal \times, \div]
4. [Fraction $+, -$]
5. [Fraction \times, \div]
6. [Percentages]
7. [Integer $+, -$]
8. [Integer \times, \div]
9. [Rates / Ratios]
10. [Indices]
11. [Square Roots / Surds]
12. [Order of Operations]
13. [Exploring Number]
14. [Scientific Notation]
15. [Number Patterns]

MEASUREMENT & GEOMETRY

16. [Expressions]
17. [Substitution]
18. [Expansion]
19. [Factorisation]
20. [Equations]
21. [Graphs & Functions]
22. [Units of Measurement / Time]
23. [Perimeter]
24. [Area]
25. [Volume]
26. [Surface Area]
27. [Pythagoras / Trigonometry]
28. [Shape / Location]
29. [Angles]

STATISTICS & PROBLEM SOLVING

30. [Statistics]
31. [Probability]
32. [Problem Solving 1]
33. [Problem Solving 2]

1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
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6	6	6	6
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18	18	18	18
19	19	19	19
20	20	20	20
21	21	21	21
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26	26	26	26
27	27	27	27
28	28	28	28
29	29	29	29
30	30	30	30
31	31	31	31
32	32	32	32
33	33	33	33

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15	15	15	15
16	16	16	16
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18	18	18	18
19	19	19	19
20	20	20	20
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31	31	31	31
32	32	32	32
33	33	33	33

Total Correct

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MATHS MATE



Name:

Class:

Teacher:

Worksheet Results

Term 4

Sheet 1
Sheet 2
Sheet 3
Sheet 4

Sheet 5
Sheet 6
Sheet 7
Sheet 8

NUMBER & ALGEBRA

1. [Long \times, \div]
2. [Decimal $+, -$]
3. [Decimal \times, \div]
4. [Fraction $+, -$]
5. [Fraction \times, \div]
6. [Percentages]
7. [Integer $+, -$]
8. [Integer \times, \div]
9. [Rates / Ratios]
10. [Indices]
11. [Square Roots / Surds]
12. [Order of Operations]
13. [Exploring Number]
14. [Scientific Notation]
15. [Number Patterns]

1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
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10	10	10	10
11	11	11	11
12	12	12	12
13	13	13	13
14	14	14	14
15	15	15	15

1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
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11	11	11	11
12	12	12	12
13	13	13	13
14	14	14	14
15	15	15	15

MEASUREMENT & GEOMETRY

16. [Expressions]
17. [Substitution]
18. [Expansion]
19. [Factorisation]
20. [Equations]
21. [Graphs & Functions]
22. [Units of Measurement / Time]
23. [Perimeter]
24. [Area]
25. [Volume]
26. [Surface Area]
27. [Pythagoras / Trigonometry]
28. [Shape / Location]
29. [Angles]

16	16	16	16
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26	26	26	26
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29	29	29	29

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19	19	19	19
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21	21	21	21
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26	26	26	26
27	27	27	27
28	28	28	28
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STATISTICS & PROBABILITY
PROBLEM SOLVING

30. [Statistics]
31. [Probability]
32. [Problem Solving 1]
33. [Problem Solving 2]

30	30	30	30
31	31	31	31
32	32	32	32
33	33	33	33

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31	31	31	31
32	32	32	32
33	33	33	33

Total Correct

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MATHS MATE



Name:

Class:

Teacher:

Test Results

Test 1

Test 2

Test 3

Test 4

Test 5

Test 6

Test 7

Test 8

NUMBER & ALGEBRA

1. [Long \times, \div]
2. [Decimal $+, -$]
3. [Decimal \times, \div]
4. [Fraction $+, -$]
5. [Fraction \times, \div]
6. [Percentages]
7. [Integer $+, -$]
8. [Integer \times, \div]
9. [Rates / Ratios]
10. [Indices]
11. [Square Roots / Surds]
12. [Order of Operations]
13. [Exploring Number]
14. [Scientific Notation]
15. [Number Patterns]

MEASUREMENT & GEOMETRY

16. [Expressions]
17. [Substitution]
18. [Expansion]
19. [Factorisation]
20. [Equations]
21. [Graphs & Functions]
22. [Units of Measurement / Time]
23. [Perimeter]
24. [Area]
25. [Volume]
26. [Surface Area]
27. [Pythagoras / Trigonometry]
28. [Shape / Location]
29. [Angles]

STATISTICS & PROBLEM SOLVING

30. [Statistics]
31. [Probability]
32. [Problem Solving 1]
33. [Problem Solving 2]

Total Correct

1	1	1	1
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Class:

Teacher:

Worksheet Number	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8
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✓ - Signed by parent L - Work handed in late x - Not signed by parent



Class:

Teacher:

Worksheet Number	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8
1								
2								
3								
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✓ - Signed by parent

L - Work handed in late

✗ - Not signed by parent



Class:

Teacher:

Worksheet Number	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8
1								
2								
3								
4								
5								
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✓ - Signed by parent L - Work handed in late x - Not signed by parent



Class:

Teacher:

Worksheet Number	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.8
1								
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✓ - Signed by parent

L - Work handed in late

✗ - Not signed by parent