Foundation Mathematics
Senior Secondary Course

Unit 1

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Note to Teachers

About This Book

The book is designed to help students to learn to become more numerate in their daily lives; in their personal life and in work, education and community aspects of their lives. It is the first in a series of four books designed to help older students to learn the mathematics content that they may have missed before.

The writers of this book believe that all students can learn mathematics provided they are supported to move from practical examples which connect with what they currently know and understand, through to more abstract examples. This book is designed to provide this practical support.
This book is broken into sections, with each linked to a content area from the Foundation Mathematics Course and the Australian Curriculum. Each section consists of several topics which vary in length, depending on how much mathematics there is to learn. Each topic includes the following:

- **Mathematics Discussion**: a brief outline of the mathematics in the topic.
- **Whole Class Activities**: designed to introduce the mathematics in the topic, and/or to encourage disussion and sharing of mathematics learning.
- **Practice Exercises**: students work individually through these exercises to learn the mathematics and to consolidate learning.
- **Reflection and Discussion**: designed to support students to reflect on what they are learning during the topic, allowing a deeper understanding and consolidation of the maths.
- **Reflection on Learning**: designed to encourage students to reflect on all of the mathematics presented within the topic.
- **OLNA Practice Questions**: examples of the types of questions included within the OLNA test.

Planning Across the Semester

This book is designed to be used for one school semester. Some students may need to move more slowly through the content, and some might need to move faster. The schedule below is a guide only, and should be modified to suit the needs of your students.
One semester consisting of 20 weeks of classes, with 5 lessons per week = 100 lessons. Ten of these may be allocated to assessment or other activities. Therefore this schedule is based on 90 lessons (of 45-60 minutes).

Section	Number of lessons allocated
1 Whole numbers and money	15
2 Data graphs and tables	10
3 Addition and subtraction with whole numbers and money	40
4 Time	10
5 Length, mass and capacity	15

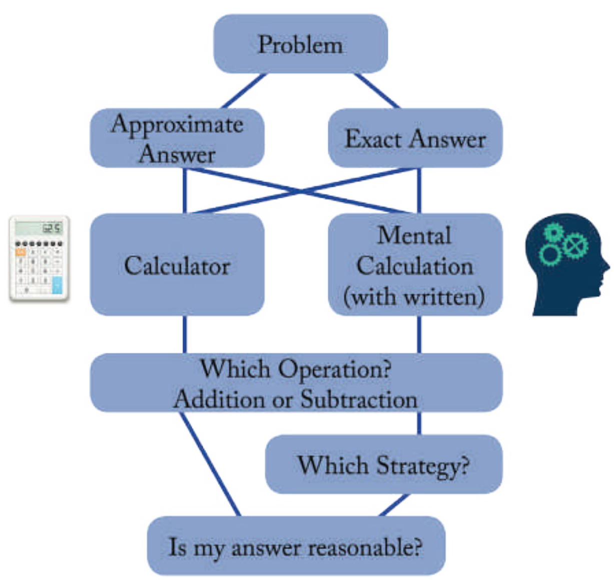
The content is arranged in order and builds from one section to the next, and from one topic to the next. Therefore it is suggested that students work through the book in the order of presentation. However, some sections could, and should be revisited throughout the semester. For example, the topics on time, and the topics on basic addition and subtraction facts. Section three is the largest section, as it focusses on developing addition and subtraction strategies. This section could be broken up into two; one on addition and one on subtraction, with one of the other sections placed in between, eg, time.

The Foundation Mathematics Course

The Foundation Mathematics Course consists of the following four units. This book supports the first unit.

Unit One	Unit Two	Unit Three	Unit Four
1.1: Whole numbers and money	2.1: Understanding fractions and decimals	3.2: Percentages linked with fractions and decimals	4.1: Rates and ratios
1.2: Addition and subtraction with whole numbers and money	2.2: Multiplication and division with whole numbers and money	3.1: The four operations: whole numbers and money 3.3: The four operations: fractions and decimals	
1.3: Length, mass and capacity 1.4: Time	2.3: Metric relationships 2.4: Perimeter, area and volume	3.4: Location, time and temperature 3.5: Space and design	
1.5: Data, graphs and tables	2.5: The probability of everyday events		4.2: Statistics and probability
			4.3: Application of the Mathematical Thinking Process

The course is designed to support students to learn, not only the mathematics content, but the mathematical thinking and decision making processes they will need as adults. This is integrated into this book and throughout the course as demonstrated by the following flow diagram.



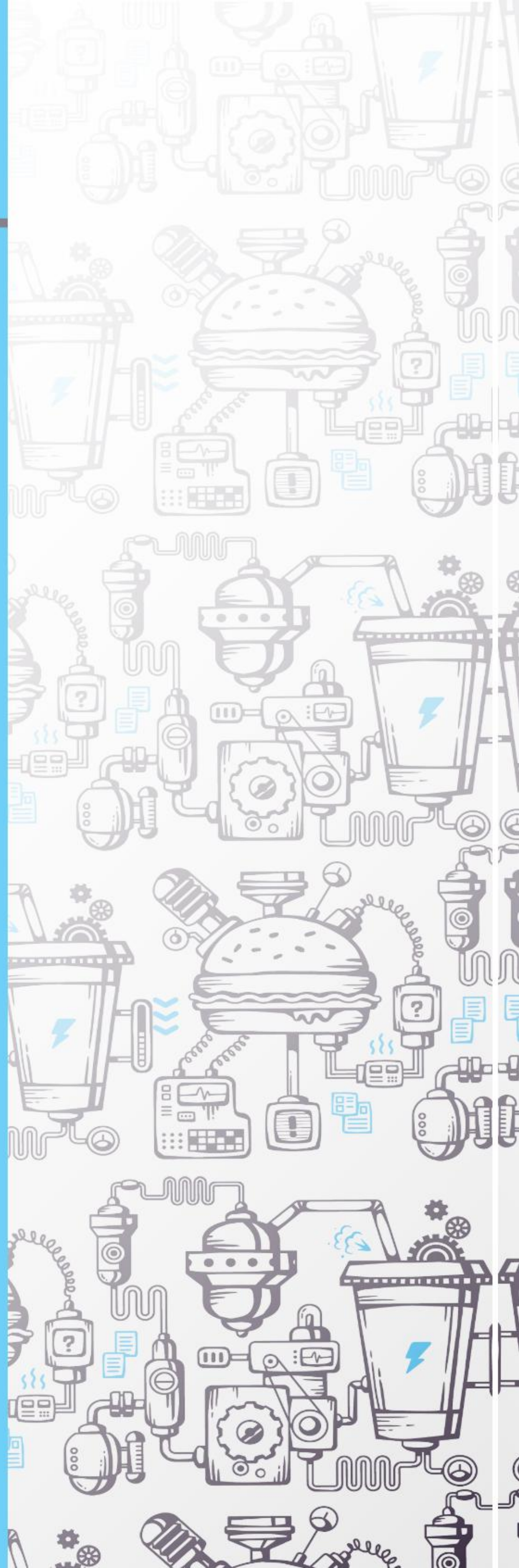
For more information about the WACE Foundation Mathematic Couse and Assessment ideas go to:

http://wace1516.scsa.wa.edu.au/mathematics/
http://wace1516.scsa.wa.edu.au/assets/Mathematics_Foundation_Externally_set_task.pdf
http://wace1516.scsa.wa.edu.au/assets/Mathematics_Foundation_Marking_key_for_the_Externally_set_task.pdf

Contents

Section One

Whole Numbers and Money



Content Focus

Foundation Mathematics	Australian Curriculum
1.1.1 Identify and describe the purpose of numbers in various texts and media from everyday life 1.1.2 Use Place value to understand the meaning and magnitude of whole numbers into the millions 1.1.3 Apply place value to read, write, say and compare whole numbers into the millions 1.1.4 read, write, say and compare amounts of money recognising that the decimal point in money separates the whole dollars from parts of dollars 1.1.5 Recognise and use patterns in the number system 1.1.6 Understand and use simple negative numbers on a number line (whole numbers and money) 1.1.7 Understand and explain whether the magnitude of a number is reasonable within everyday contexts	ACMNA 059 ACMNA 072 ACMNA 073 ACMNA079 ACMNA124 ACMNA280

Topic 1

The Purpose of Numbers

Mathematics Discussion

There are 3 purposes for using numbers in everyday life:

- as a quantity ($67 in the bank, 36 Smarties in a packet)
- for describing the order in which something occurred (700th page in a book, finishing 8th in a relay)
- for labelling (numbers on the jumpers of AFL players, postcodes)

Most school maths, and maths done in personal, work and community life, is related to numbers as quantities.

Whole Class Activity 1

Describe the different purposes of the number 10 in the following cases:

- Channel 10
- $10
- Tenth wedding anniversary

Whole Class Activity 2

Look through newspapers and magazines to find pictures, diagrams or charts that use numbers to show:

1. Quantity, i.e., how much or how many of something
2. Order, i.e., first, second, last
3. Label, i.e., phone numbers, postcodes

Cut them out and make a chart, labelling each picture with its number purpose.
Are there more numbers used to show quantity, to show order, or as labels? Why?

Whole Class Activity 3

In daily life, what sort of numbers are used more frequently, those that show quantity, those that show order, or those that are used as labels? Think about how you and your family have used numbers over the last 48 hours. List examples for each category.

1. Quantity
2. Order
3. Label

Whole Class Activity 4

Research the use of numbers on food items by looking at a variety of different food packets.
Complete the table:

NUMBER	DESCRIPTION	PURPOSE
150	Found in 'Ingredients' on a vegemite jar	Label for colour additive

Practice Exercise 1

1. In the space below, write an ordered list of the steps for sending a text message to a new contact on your mobile phone.

   a) What step happens first?

   b) What is the 4th step?

   c) What is the step that is performed last?

2. Look at the 'Contacts' List on your mobile phone. Record the telephone numbers of the following people or places:
   Friend
   Relative
   School
   a) Read these phone numbers aloud. How is reading a phone number different to reading the number if it represents an amount?

   b) How can you 'break' up the phone numbers so that they can be easily remembered?

   c) Do phone numbers represent a quantity, order or label?

3. Here is a list of the finalists with their times in the 100m women's hurdles at the 2014 Commonwealth Games.

COMPETITOR		TIME
1	M Jenneke	13.60
2	K Beckles	13.38
3	A Whyte	13.02
4	S Pearson	12.67
5	D William	13.06
6	T Porter	12.80
7	S McCann	13.60
8	J Lucas	13.41

a) Do the numbers near each of competitors in the event represent a quantity, order or label?

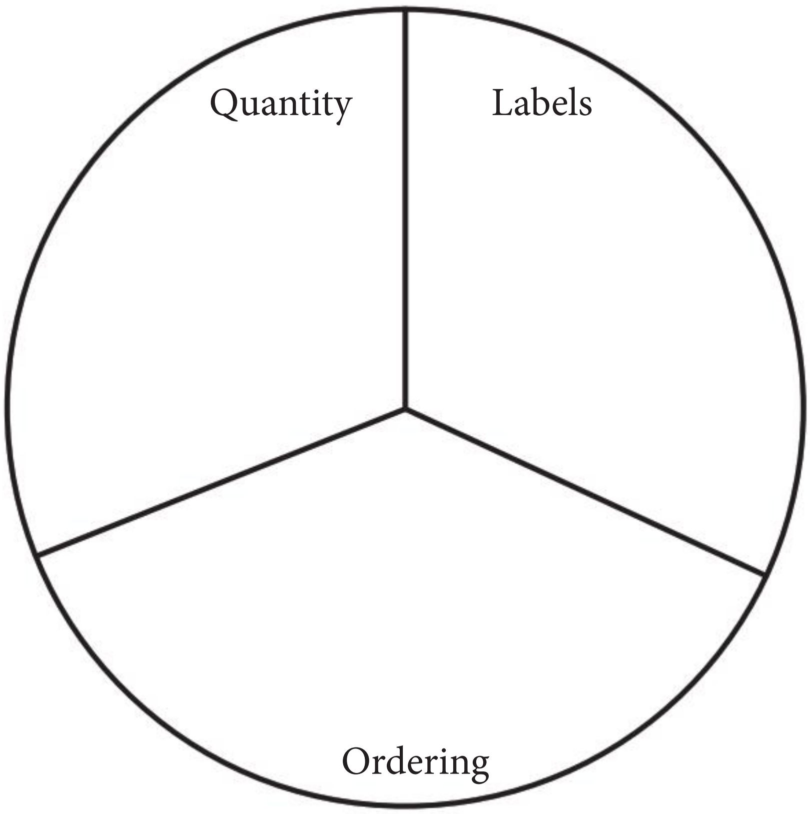
b) Who won the event? How do you know?

c) Who was the Bronze Medallist winner?

d) Sally Pearson wore the number '1098' in the final. Does this number represent a quantity, order or label?

Reflection on Learning

Copy the diagram below in the centre of a piece of blank A4 paper.
In groups of 3, each student writes one example of number in the appropriate category (for example place 'Football Jumpers' underneath 'Labelling'). The other 2 students will each place an example in the 2 other categories.
Rotate the piece of paper in a clockwise direction and write an example in the next category.
Continue rotating the piece of paper until no further examples can be thought of.
When the task is completed, choose the best 3 examples in each category and place them in the appropriate section of the chart below.



OLNA Practice Question

The table shows the scores of 6 golfers who have just played an 18-hole course.
Rank the golfers in order from first to sixth in the table below. (Lowest score wins in golf)

Score	64	71	69	75	63	72
Ranking						

Topic 2

Using Place Value to Read, Write, Say and Compare Whole Numbers

Mathematics Discussion

There are patterns built into our number system that help us to read and write numbers, to compare and order numbers and to say number sequences forwards and backwards. An understanding of the meaning, order and size of whole numbers into the millions is necessary as we deal with increasingly large amounts in our daily lives. Cars typically cost tens of thousands of dollars and houses typically cost many hundreds of thousands.

Our number system is based on place value, with the places being named in a cyclical way, according to their value. The first 3 places of whole numbers, from the right are ones, tens, and hundreds. This is followed by the second set of 3 places; ones of thousands, tens of thousands and hundreds of thousands. Next, follows the third set of 3 places; ones of millions, tens of millions and hundreds of millions.

Our whole number place value system up to millions is represented in the table below:

MILLIONS			THOUSDANDS			ONES		
Hundreds	Tens	Ones	Hundreds	Tens	Ones	Hundreds	Tens	Ones

In order to read large numbers we work from right to left to decide which place name the digit on the left represents, and then we can read left to right. For example, to read the number 4 537 162 we have to work out that the 4 is in the millions place, then we can read it as 'four million, five hundred and thirty seven thousand, one hundred and forty two'. This number is composed of 4 000 000 + 500 000 + 30 000 + 7 000 + 100 + 60 + 2.

When writing numbers we can use the names of the places as we say the number from left to right to decide how many places are required and whether we need to use zero as a place holder. We use a space between the sets of three digits to show the ones, tens, hundreds clusters. This helps others to read what we have written. For example, it is easier to read 100 106 than 100106. We can use the place names to give us an understanding of the size of numbers and hence to compare and order them. 1 000 002 is smaller than 1 000 200 as the 2 is in the ones place in the first number and in the hundreds place in the second number.

We can also use the patterns in the number sequence to move forwards and backwards between numbers. For example, to add 174 and 23, we can simply say the number sequence forwards by tens, 184, 194 in order to add the 20. To do this, we need to be able to count forwards and backwards through the number sequence by ones, tens, hundreds, thousands, tens of thousands, hundreds of thousands and millions.

Whole Class Activity 1

Think - How big is a million?

Work together as a class using grid paper to create a display of one million squares.
Before you start, estimate how much space this will take up on the wall.
Decide what size grid paper would be most appropriate for completing the display.
Discuss – how can you allocate parts of the number to groups of people to make the display in a quick and easy way? Record your answer below.

(HINT: 10 x 10 = 100, 100 x 10 = 1 000, 1 000 x 10 = 10 000 etc.)

On the display find a way of showing the size of each of the following:
One, ten, one hundred, one thousand, ten thousand, one hundred thousand, one million.
Reflect on the question 'How big is a Million?' What would the display look like if the squares were $1 coins?

Whole Class Activity 2

Select 8 different sized whole numbers from brochures, newspaper articles, pamphlets and textbooks (from other subject areas such as Science).
Record them in the table below:
Classify the 8 numbers according to the following place values:

MILLIONS THOUSANDS HUNDREDS TENS ONES

Number	Context	Place Value Classification
100 106	E.g. Number of people at an AFL Grand Final	Thousands

We can then refine the place value classification system of whole numbers that we used in the table above, as follows:

MILLIONS			THOUSDANDS			ONES		
Hundreds	Tens	Ones	Hundreds	Tens	Ones	Hundreds	Tens	Ones

Using the 8 different sized numbers from the previous table, group the digits in these numbers into clusters of three, in order to work out which column to start writing the number in the table below. Write the number from left to right, saying the names of the places as you go.

MILLIONS			THOUSDANDS			ONES		
Hundreds	Tens	Ones	Hundreds	Tens	Ones	Hundreds	Tens	Ones
			1	0	0	1	0	6

In pairs, read aloud the numbers in the grid to each other.
Write the numbers in words in the space below.

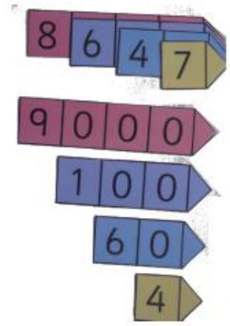
Practice Exercise 1

1. Write the following numbers in the grid below, then read them to your partner.

a) 8 794
b) 30 009
c) 25 070
d) 105 934
e) 1 490 800
f) 320 006 004

MILLIONS			THOUSDANDS			ONES		
Hundreds	Tens	Ones	Hundreds	Tens	Ones	Hundreds	Tens	Ones

2. Make each of these numbers using place value 'arrow cards' which can be found on the internet. Write each number then say them to your partner.



a) 4 000 + 300 + 20 + 7 = 4 327

b) 60 000 + 5 000 + 700 + 10

c) 18 000 + 800 + 8

d) 200 000 + 40 000 + 500 + 40 + 2

e) 6 000 000 + 500 000 + 700 + 60 + 4

f) 20 000 000 + 4 000 000 + 800 000 + 4 000 + 500 + 30 + 8

3. In 2013, 24 108 Nissan Navara cars were sold. The 2 is in the ten thousands column so its value is 20 000. Next to each car brand, write down the value of each of the 2's (if it appears) in the total number of cars sold.

The following list shows the top selling car brands in 2013

1. Toyota	214,630
2. Holden	112,059
3. Mazda	103,144
4. Hyundai	97,006
5. Ford	87,236
6. Nissan	76,733
7. Mitsubishi	71,528
8. Volkswagen	54,892
9. Subaru	40,200
10. Honda	39,258

Reflection and Discussion

Some students were writing numbers in words. What errors did they make? Identify the flaw in their thinking.

a) 200 005 was written as two million and five.

b) 30 000 546 was written as thirty thousand, five hundred and forty six.

c) 56 709 was written as five million, six thousand, seven hundred and nine.

d) 500 6000 432 was written as five hundred and six thousand, four hundred and thirty two.

4. Write the following numbers in words.

a) 419

b) 502

c) 8 712

d) 603 702

e) 785 009

f) 203 006 070

5. Write the following numbers as digits.

a) Three hundred and seventeen

b) Eight hundred and six

c) Five thousand and thirty

d) Eighteen thousand and ten

e) One million seven hundred and seven thousand

f) Fifty million and four thousand, three hundred and eight

6. The following statements were taken from the website: www.en.wikipedia.org/wiki/agriculture/malaysia

- Read the statement aloud to your partner.
- Write the numbers in the statements in words in the space provided.

a) 'The average Malaysian citizen consumes 82 300 grams of rice per year'

b) 'Malaysia contains 7 605 000 hectares of arable cropland'.

c) 'There are over 1 425 square kilometres of mangroves in Malaysia'.

d) 'Malaysia is the 67th largest country in the world with an area of 329 847 square kilometres'.

e) 'In 1999 Malaysia produced 10.55 million tons of palm oil'.

Whole Class Activity 3

Casey was counting the boxes of tins of tuna in a major supermarket warehouse for stock take. The tins of tuna come in boxes of 10. Complete the sequence Casey was counting forward with:

. . . . . 9 960, 9 970, 9 980 , ________, ________, ________, ________, ________.

Use the constant function on your calculator to check your sequence.
Read the sequence aloud. What patterns can you hear and see?

How do the digits in the place values change when you get to the next number after 9 990?

Use the place value chart on page 12 to help with your explanation.

Casey then had to load a truck with boxes for delivery to the south- west. Complete the sequence Casey was counting backwards with:

100 030, 100 020, 100 010, _______, _______, _______, _______, _______.

Use the constant function on your calculator to check your sequence..
Read the sequence aloud. What patterns can you hear and see?

How do the digits in the place values change when you get to the next number after 100 000? Use the place value chart on to help with your explanation.

Practice Exercise 2

1. Complete the following tables using the place value chart. Use the constant function on your calculator to check your numbers.

Counting Forwards And Backwards			
Start at 985 and count forward by 5	Start at 2 020 and count backward by 5	Start at 10 035 and count backward by 10	Start at 9 720 and count forward by 100
985	2 020	10 035	9 720

Counting Forwards And Backwards			
Start at 99 770 and count forward by 100	Start at 100 210 and count backward by 100	Start at 399 970 and count forward by 10	Start at 10 300 350 and count backward by 100 000
99 770	100 210	399 970	10 300 350

Whole Class Activity 4

The original 'The Hunger Games' book written by Suzanne Collins in 2012 sold 903 000 copies in hard cover, 6 200 000 in paperback and 4 600 000 digitally.
Which format of the book sold the most copies?

How can you determine whether one number is larger than another?
Explain your thinking

Summarise the thinking of the whole class.

Practice Exercise 3

1. Use the place value chart on page 12 to decide which number is larger. Place a <, > symbol between the pairs of numbers.

a) 504   540

b) 70 004   7004

c) 32 700   31 900

d) 60 500   600 005

e) 2 300 050   2 030 500

f) 50 050 050   500 005 500

2. Place the following numbers in order from smallest to largest.

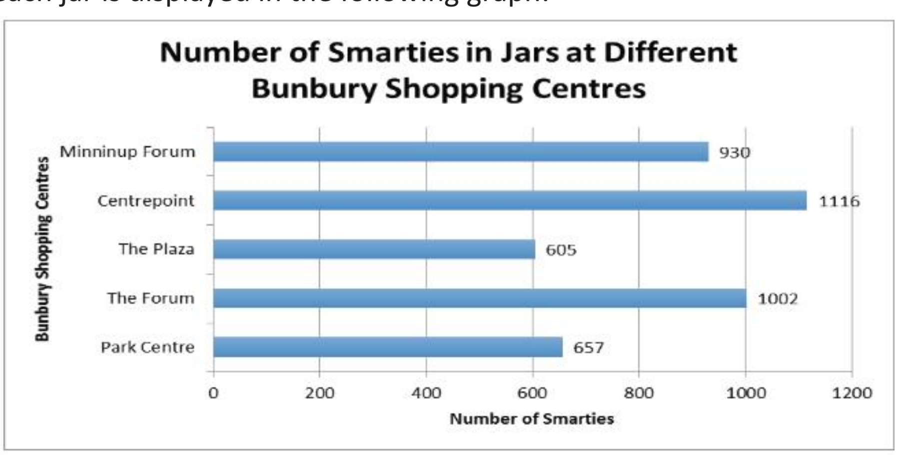
a) 8 400, 8 040, 4 080, 8 004

b) 200 040, 2 400, 20 004, 20 400

c) 3 700 000, 37 000, 307 000, 3 070 000

d) 50 030 000, 53 005 000, 50 350 000, 50 003 005

3. The Year 11's at Bunbury SHS were holding a 'Guess the Number of Smarties in a Jar' competition to raise money for Country Week. They had different jars at 5 different shopping centres. The number of smarties in each jar is displayed in the following graph:



a) Order the number of smarties from smallest to largest.

b) How does the graph help you to decide the order that the numbers should be written?

4. Use the website www.mapsofworld.com/country-profile to research and write in the table, the populations of the following Asian countries.
   a) Read the populations aloud to your partner
   b) Rank the countries in order from the largest population (1) to the smallest population (8)

Country	Population	Ranking
Japan		
China		
South Korea		
Lebanon		
Israel		
Iran		
India		

5. Use the website www.mapsofworld.com/country-profile to research and write in the table, the areas in square kilometres of the following Asian countries.
   a) Read the areas aloud to your partner
   b) Rank the countries in order from the largest area (1) to the smallest area (8)

Country	Area In Square Kilometres (Numbers)	Ranking
Japan		
China		
South Korea		
Lebanon		
Israel		
Iran		
India		

6. How do the rankings in question 10 compare with those in question 11?

7. The following statements were found in newspapers and magazines. Decide whether the number in the statement is correct or a misprint, given the context. Justify your answer.

a) 'The average weight of a baby born at Geraldton Hospital is 36 500 grams.'

b) 'The population of London in 2014 was 8173.'

c) 'The number of people attending the AFL Grand Final at the MCG was 10 078.'

d) 'The oldest living tree is a conifer in Sweden. It is estimated to be 955 000 years old'.

Practice Exercise 4

BIGGEST NUMBERS: A dice game
NUMBER OF PLAYERS: 2 - 4

AIM
To produce the largest number from rolling a dice 7 times

EQUIPMENT
One ten sided dice for each player
Scrap paper for playing the game several times

RULES OF THE GAME
1. Roll the dice seven times and record the seven digits in the spaces provided in A below. Repeat, recording your results in B and C.
2. Make the largest number possible with each set of seven digits and record it in the LARGEST NUMBER TABLE below.
3. Using a calculator, add the three, seven digit numbers and write the total in the space provided.
4. Read your total to the others in the playing group. The player with the highest total wins.
5. Repeat the game as many times as possible in a 10- minute time frame

Variations: The person with the smallest number wins. Or, closest to 15 million wins

Roll the die seven times and record the numbers in the spaces below.

A. ________, ________, ________, ________, ________, ________, ________.

B. ________, ________, ________, ________, ________, ________, ________.

C. ________, ________, ________, ________, ________, ________, ________.

Use the seven digits in each set to write the LARGEST numbers possible in the grid below:

LARGEST NUMBER TABLE

A							
B							
C							
Total							

a) What strategy did you use to determine the LARGEST number from the dice rolls?

b) What strategy would you use if you were asked to determine the SMALLEST number from the dice rolls?

c) What strategy would you use if you were asked to determine a number as close to 15 million as possible?

CALCULATOR FISH: A calculator game
NUMBER OF PLAYERS: 2

AIM
To use place value to add and subtract numbers to a starting number on a calculator. The aim is to get a result above 99 999 before the other player.

EQUIPMENT:
A calculator per player

RULES OF THE GAME
1. Each player enters a five-digit number into their calculator with no digits the same. Players do not show each other their calculator displays.
2. Player 1 asks for a digit, e.g. 4. If player 2 has a 4 in their display, they must 'give it' to their partner, e.g. if 4 is in the hundreds column, player 2 subtracts 400 and gives it to player 1, who adds 400. The same number cannot be asked for consecutively.
3. Player 2 then asks for a digit, e.g.5. If player 1 has a 5 in their display, they must 'give it' to their partner, e.g. if 5 is in the tens column, player 1 subtracts 50 and player 2 adds 50.
4. The game continues until one player gets their display over 99 999
5. Repeat the game as many times as possible in a 10-minute time frame

Variations: 6 digit numbers could be used with the target being 999 999.

Reflection on Learning

Use the website www.wikipedia.org/wiki/List_of_cities_in_Australia_by_population to research the populations of the capital cities of states and territories in Australia.
Complete the following table by listing the capitals in descending population order (largest to smallest)

CAPITAL	POPULATION	POPULATION IN WORDS

If you were to complete this activity in ten years time, do you think the order that you have written the Capitals in would remain the same? Discuss.

OLNA Practice Question

1.

6	1	3	7	3	0

What is the smallest number bigger than 10 000, that can be made from these cards?
Write your answer in the blank space below:

Topic 3

Using Place Value to Read, Write, Say and Compare Money

Mathematics Discussion

We read, write, compare and say whole dollar amounts in the same way as other whole numbers, using the cyclical patterns built into our number system. We can place $24 700 212 into our number system as follows and use the place names to read it as twenty four million, seven hundred thousand, two hundred and twelve dollars.

MILLIONS			THOUSDANDS			ONES		
Hundreds	Tens	Ones	Hundreds	Tens	Ones	Hundreds	Tens	Ones
	2	4	7	0	0	2	1	2

When we write money amounts involving combinations of dollars and cents we use a decimal point to separate the whole dollars from the parts of dollars, i.e., the cents. For example, in $32 465.75, there are 32 465 whole dollars and 75 cents. The 75 cents are part of the next dollar. There are 100 cents in each dollar, so when 25 cents is added to $32 465.75, there will be another full dollar, making the amount $32 466.00.

We can extend our number system into tenths and hundredths in order to be able to read, write, compare and say money amounts that have cents. The tenths tell us the number of 10 cents in the money amount and the hundredths tell us the number of one cents in the money amount. Thus $32 465.75 has 32 465 whole dollars, 7 lots of 10 cents and 5 lots of 1 cent. We can place $32 465.75 in our place value system as follows:

MILLIONS of dollars			THOUSDANDS of dollars			ONES of dollars			CENTS	
Hundreds	Tens	Ones	Hundreds	Tens	Ones	Hundreds	Tens	Ones	Tenths	Hundredths
				3	2	4	6	5	7	5

We read and say the decimal part of money amounts differently from other decimal numbers, such as measurements. We read $32 465.75 as thirty two thousand, four hundred and sixty five dollars and seventy five cents. We read 32 465.75 metres as thirty two thousand, four hundred and sixty five point seven five metres.

We use zeros when we write amounts of money in a similar way to when we write other numbers, that is, we write a zero to show that we do not have an amount. For example, the zero in $465.05 shows there is nothing in the tenths column, or no ten cent pieces.

When comparing money amounts, such as $465.75 and $465.05, we compare each of the place values of the two numbers from left to right. Both of these numbers have $465, however the first one has 75 cents whereas the second amount has 5 cents, so $65.75 is larger. We can write this as $465.75 > $465.05.

Whole Class Activity 1

Think - How do we use place value to order money amounts?

Select 8 different sized money amount items from brochures, newspapers and pamphlets. Record them on the table below:

Rank the items in ascending order of price (smallest to largest)

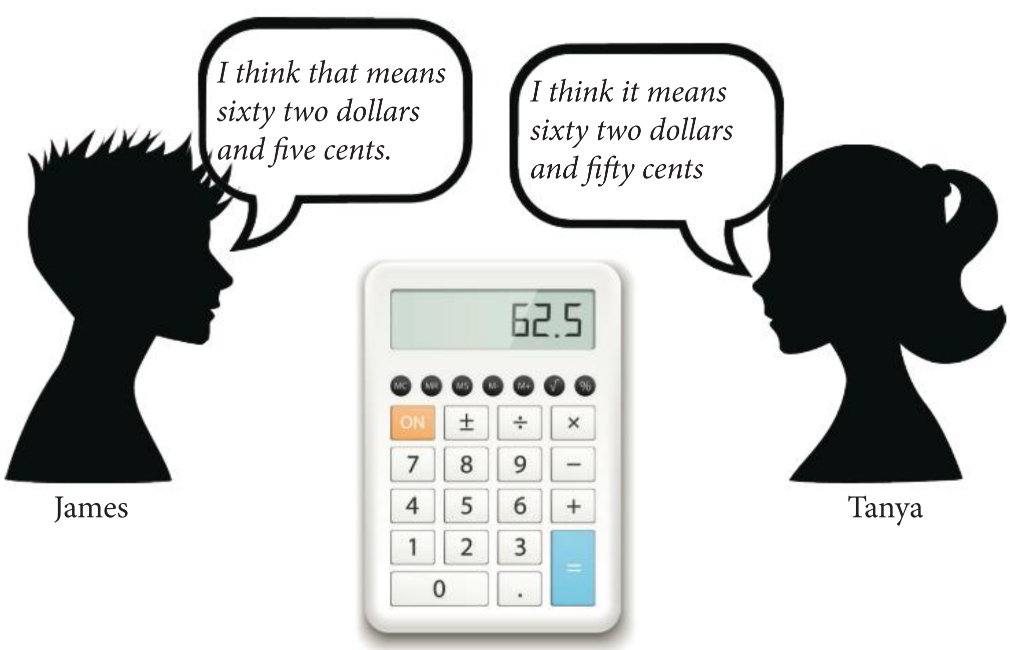
ITEM	PRICE	RANKING

Read the prices to your partner.

Write the smallest priced item and the largest priced item in words in the space below.

Whole Class Activity 2

Two students were using a calculator to solve some problems involving money.



Who is right James or Tanya? Write an explanation below and then discuss with your group.

Who is right James or Tanya? Write an explanation below and then discuss with your group.

Practice Exercise 1

1. Write the following money amounts in the grid below, then read them to your partner.

a) $21.08
b) $7 200.90
c) 0.60c
d) $35 607.75
e) $504 060.04
f) $12 030 000.05

MILLIONS of dollars			THOUSDANDS of dollars			ONES of dollars			CENTS	
Hundreds	Tens	Ones	Hundreds	Tens	Ones	Hundreds	Tens	Ones	Tenths	Hundredths

2. Make each of these numbers using 'arrow cards'. Write the money amount then say to your partner.

a) $2.00 + 0.08c = $2.08

b) $400 + $70 + $1.00 + 0.50c + 0.09c

c) $50 000 + $40 + $3 + 0.80c + 0.03c

d) $100 000 + $30 000 + $500 + $30 + $2 + 0.90c + 0.06c

e) $900 000 + $80 000 + $600 + $20 + 0.40c

f) $3 000 000 +$500 + $9 + 0.06c

Reflection and Discussion

Ms Brown, a teacher at Warwick Senior High School, observed the following errors in her students work when they were asked to write the following money amounts in words. What errors did they make? Why?

a) $40.86 – 'Forty dollars, point eight six cents'

b) $62 350.90 - 'Six two three, five, zero dollars and nine cents'

c) $100 520.08 - 'One hundred thousand, five hundred and twenty dollars and zero eight cents'

d) $2 305 520.70 - 'Two million, three hundred and five thousand, five hundred and twenty point seven dollars'

3. Write the following money amounts in words.

a) 0.60c

b) $102.35

c) $6 309.08

d) $34 650.90

e) $180 651.17

f) $1 789 005.80

4. Write the following amounts as numbers.

a) Sixty two cents

b) Seventy cents

c) Eight cents

d) Seventy six dollars and twenty five cents

e) One thousand, two hundred and nine dollars and forty cents

f) Sixty million, one hundred and forty seven thousand, one hundred and ten dollars and five cents

Reflection and Discussion

Would you prefer to win:

$1 010 000.60;
$106 006.06;
$1 600 000.10 or
$1 006 000.01?

How can you determine whether one money amount is larger than another?

Enter each amount of money in the place value number table below and use it to explain your thinking.

MILLIONS of dollars			THOUSDANDS of dollars			ONES of dollars			CENTS	
Hundreds	Tens	Ones	Hundreds	Tens	Ones	Hundreds	Tens	Ones	Tenths	Hundredths

Summarize the thinking of the whole class

Practice Exercise 2

1. Use the place value chart above to decide which of the following money amounts is the larger. Place a <, > symbol between the following two money amounts.

a) $4.70	$4.50	d) $21 706.72	$20 906.27
b) $632.90	$732.09	e) $305 900.12	$353 009.10
c) $1 752.00	$1 725.80	f) $2 009 899.97	$9 899.99

2. Place the following numbers in order from smallest to largest.

a) $34.90, $34.09, $34.99, $35.19

b) $1 345.06, $1 365, $1 315.63, $1 344.60

c) $211 052, $211 520, $211 250, $211 205

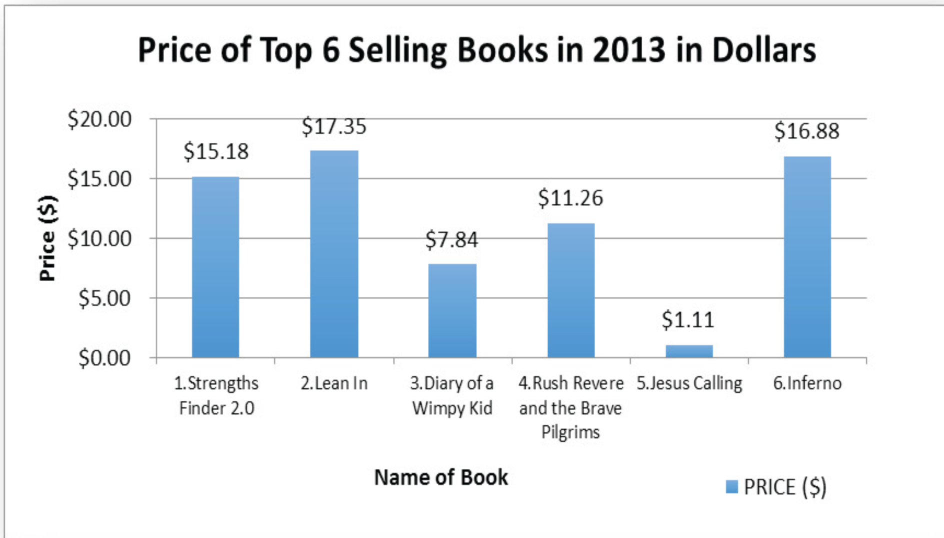
d) $1 450 632.16, $1 450 631.97, $1 450 632.01, $1 450 632.10

Reflection and Discussion

Prices of goods or services can often be compared using the internet.
Compare the prices of flying from Perth to Bali, one way, in a week's time. Record the prices of at least 6 flights from different airlines and times in the space below:

What was the cheapest flight you could find? What was the most expensive? Why did the prices vary? Discuss

3. The following graph shows the price of the Top 6 Selling Books of 2013.



a) Place the price of the books in order from smallest to largest.

b) How does the graph help to order the books?

c) One of the prices of the books was entered incorrectly. Which is this most likely to be? Why?

d) The price of the book that was entered incorrectly was $9.11. How does this change the order of the books in price from smallest to largest?

4. Ryan works at the local deli scanning items at the checkout. He noticed someone had made mistakes entering prices onto the computer system, so when the items were scanned, the prices were wrong. For each till docket:

- Circle the item most likely to be incorrect.
- Change the amount of the incorrect item to the correct amount.
- Using your calculator, work out the correct the 'TOTAL' on each docket.

a)

Item	Price
Biscuits	$2.35
Eggs	$0.3
Flour	$2.10
Castor Sugar	$3.15
Total $7.63	

b)

Item	Price
Hamburger	$540
Chips	$2.35
Milkshake	$5
Icecream	$2.90
Total $550.25	

c)

Item	Price
Bread	$2.29
Carrots	$1.99
Milk	$200
Chocolate	$3.99
Total $208.27	

d)

Item	Price
Chips	$3.99
Soft drink	$2.50
Lollies	$1.99
Coffee	$43.50
Juice	$3.70
Total $55.68	

Reflection on Learning

Complete the following table.

MONEY AS A NUMBER	MONEY IN WORDS	RANKING 1 - smallest 2- largest
$824.99		
	Seven hundred and two thousand, two hundred dollars and sixty cents	
$72 004 620.40		
	Four hundred thousand and sixteen dollars and five cents	
undo cap	Six thousand and twenty dollars and thirty five cents	
$1 600 425.01		
	Eighty million, seven thousand and seventy eight dollars and seventy cents	
$50 709.95		

If one of the numbers in the table above was the price of a second hand car, which is it most likely to be? Why?

OLNA Practice Question

Which list has the amounts of money in order from smallest to largest?

A $10 900, $11 200, $3 999, $18 011

B $15 700, $132 000, $14 900, $14 500

C $127 000, $138 000, $10 500 000, $14 100 000

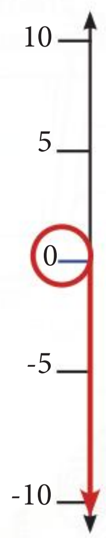
D $138.76, $138.67, $138.70, $138

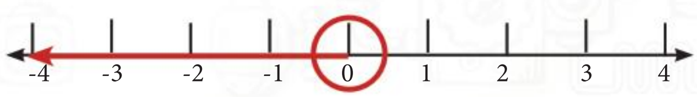
Topic 4

Negative Numbers

Mathematics Discussion

Negative numbers are numbers that are less than zero. On a vertical number line this means they are below zero and on a horizontal number line this means they are to the left of zero.





There are many situations in which negative numbers are used. For example, negative numbers are used to tell how much money is owed on an account, how far below the level of the sea the land is and how far below zero the temperature is.

Whole Class Activity 1

Think - What do negative numbers mean?

Lauren has a bank account on an overdraft system. An overdraft occurs when money can be withdrawn from her account when she doesn't have any money left in it. The balance goes below zero, which means the bank has lent her money and she needs to pay this back. When the balance goes below zero, the account is said to be overdrawn. You might have heard people say they are 'in the red'. This means the same as overdrawn. The overdrawn amount is represented by a negative number (e.g. -30).

Scenario:
Lauren and her family members all have accounts that allow an overdraft.
These are the account balances:

Joey $50; Cohen -$20; Dylan -$60; Danielle $30; Jordan $0 and Lauren -$10.

Add a zero to the empty number line above. Write the name of each family member and their account balance at the correct place on the number line.

Which members of Lauren's family have money in the bank?

Who has an overdrawn account?

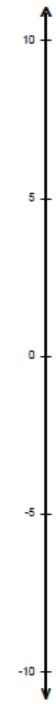
Choose two account balances and place a >, < or = sign between them.

Write the account balances in ascending order. What do you notice?

Choose two accounts and calculate the difference between their balances.

What is the sum of the account balances?

1. On Mt Fuji in Japan, temperatures in any given week fluctuate.
Place the following temperatures on the vertical scale provided.



DAY	TEMPERATURE
Monday	7 °
Tuesday	-4 °
Wednesday	2 °
Thursday	0 °
Friday	-3 °
Saturday	-5 °
Sunday	-8 °

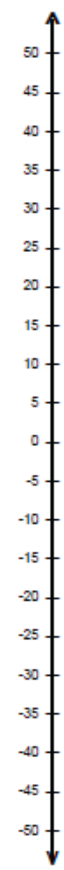
a) What is the lowest temperature?

b) What is the highest temperature?

c) How many degrees did the temperature drop between Friday and Sunday?

d) How many degrees did the temperature increase between Tuesday and Wednesday?

2. Write the following distances above or below sea level as a number in the space provided (eg 5m below is -5). Place the letter next to the appropriate spot on the vertical number line to the right.



A 10 m below sea level ___________

B 30 m above sea level ___________

C 40 m below sea level ___________

D 15 m above sea level ___________

E at sea level ___________

F 25 m below sea level ___________

G 35 m below sea level ___________

H 5 m above sea level ___________

3. Mrs Garrett has 6 children, all of which either have money in the bank or owe her money.
Place the bank balance for each child on the horizontal number line:

Dan owes $30

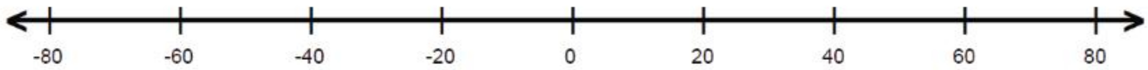
Kaitlyn owes $65

Joey has $70

Maddie has $50

Peter has no money

Shannon owes $15



a) Who owes the most money? Who has the most money? Write the names in order; from owes the most to has the most.

b) Use <, > or = to place between each of the children's names

Maddie Dan   Shannon Peter

Kaitlyn Joey   Peter Dan

4. Write the following numbers in ascending order

a) 5, -7, 0, -12, 15, 3.

b) $34, -$21, $65, -$7, -$9, $25, -$67, $1.

c) -5, 200, 4 850, -725 000, -24, 3 200 000, -876.

d) $12.50, -$11.20, -$14.75, $12, -$12.55, -$13, $13.20.

Practice Exercise 2

1. The town of Lyon in France has a multi level shopping Centre. The store directory is shown in the table to the right.

a) What level is the butchery/bakery is on?

b) What do the negative numbers in the Levels column represent?

c) If you park in the car park and travel on the lift to Homewares, how many floors do you go up?

d) If you leave the Fashion floor and travel 5 floors down, are you in the car park?

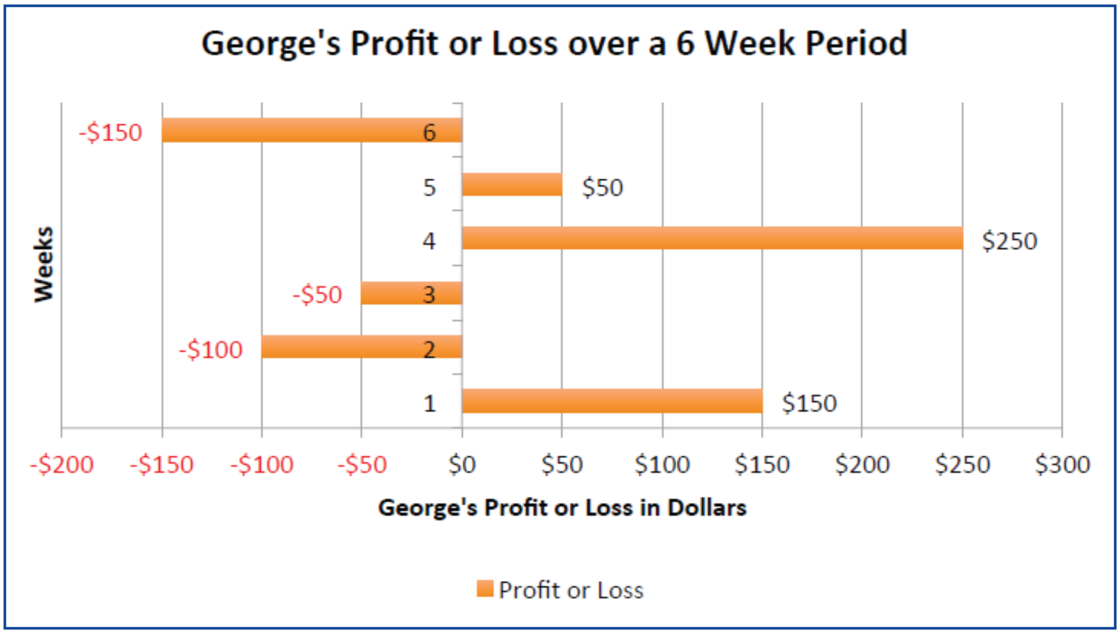
e) Kaleb parks his car and travels 4 floors up, then goes up 3 more floors, down 1, up 2 and then down 8. Write down all the floors he visited.

LYON SHOPPING CENTRE	
STORE	LEVEL
Appliances	5
Homewares	4
Fashion	3
Greengrocer	2
Supermarket	1
Butcher/Baker	G
Food Court	-1
Laundromat	-2
Car Park	-3

2. Use negative and positive numbers to complete the table below:

	2 more than	2 less than	5 more than	5 less than	10 more than	10 less than
6						
1						
0						
-3						
-8						

3. George has a small online comic book store business that he operates from home. His profit and loss margin for each week over 6 weeks is shown in the chart below. George's profit is shown in black text and his loss is shown in red text.



a) How much money did George's lose in Week 3?

b) In which week did George make a loss of $150?

c) How much did the profitability of George's business increase between weeks 3 and 4?

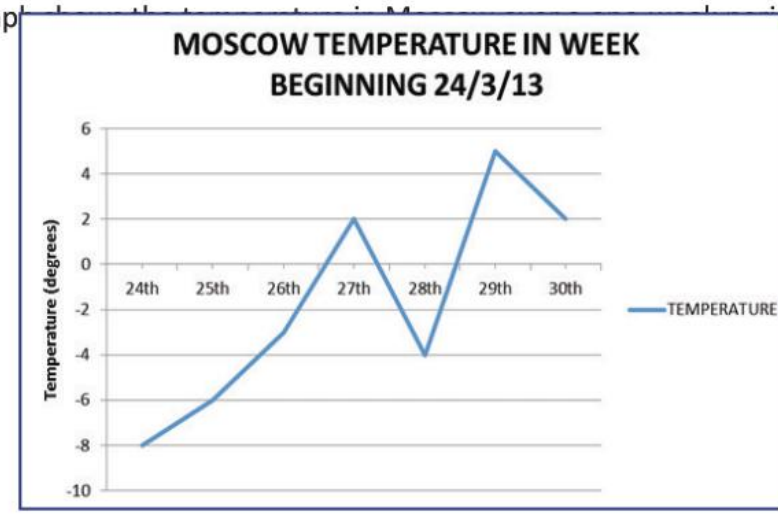
d) Did George make a profit or loss in the first two weeks? How much?

e) After 4 weeks, what was George's combined profit or loss?

f) What was the change in how much money George made between weeks 5 and 6?

g) After the first 6 weeks of trading, what was George's overall profit?

4. The following grap… od in March 2013.



a) On what date was the temperature the lowest?

b) On what date(s) was the temperature above 0°?

c) How many degrees did the temperature increase between the 24th and the 30th?

d) What was the temperature on March 23rd if it was two degrees colder than on March 24th?

e) Rank the dates in order from coldest to hottest.

f) Predict the temperature for March 31st 2013.

Reflection on Learning 1

1. Bethany works casually as a basketball umpire. Her income varies each week depending on how many games she umpires. Her bank account has an overdraft facility. Complete the following table:

Week	Balance At Start	Income	Expenditure	Balance
1	$10	$60	$40	$30
2	$30	$80	$90	
3	$20	$50	$80	
4		$10	$20	
5	-$20	$10	$30	
6		$50	$30	
7		$20	$2	

2. Write a paragraph in the space below about positive and negative numbers in relation to bank accounts. Your paragraph must include the words positive, negative, deposit, overdraft, transaction, horizontal number line and balance.

Reflection on Learning 2

To review your learning about negative numbers, view the following YouTube videos from LearnZillion:
Understand How positive and Negative Numbers Describe Quantities Lessons 1 to 4
www.youtube.com/watch?v=BfAStLWOR-I
www.youtube.com/watch?v=vnyLaXjFGd8
www.youtube.com/watch?v=oLEQejxDyNc
www.youtube.com/watch?v=ulGEGEly2UM

OLNA Practice Questions

1. Which list has the numbers in order from largest to smallest?

A 9, -7, -1,10, 0, -2

B 89, 72, -45, -1, -3, -10

C 17, 13, -2, -8, 0, -9

D 230, 105, 4, 0, -5, -90, -92

2. One day in February, the minimum temperatures of four cities were:

London: 1°c Paris: -2° c Moscow: -6° c Oslo: 0°c

The order of the cities, from the coldest minimum temperature to the warmest minimum temperature, is;

A. Oslo, London, Paris, Moscow

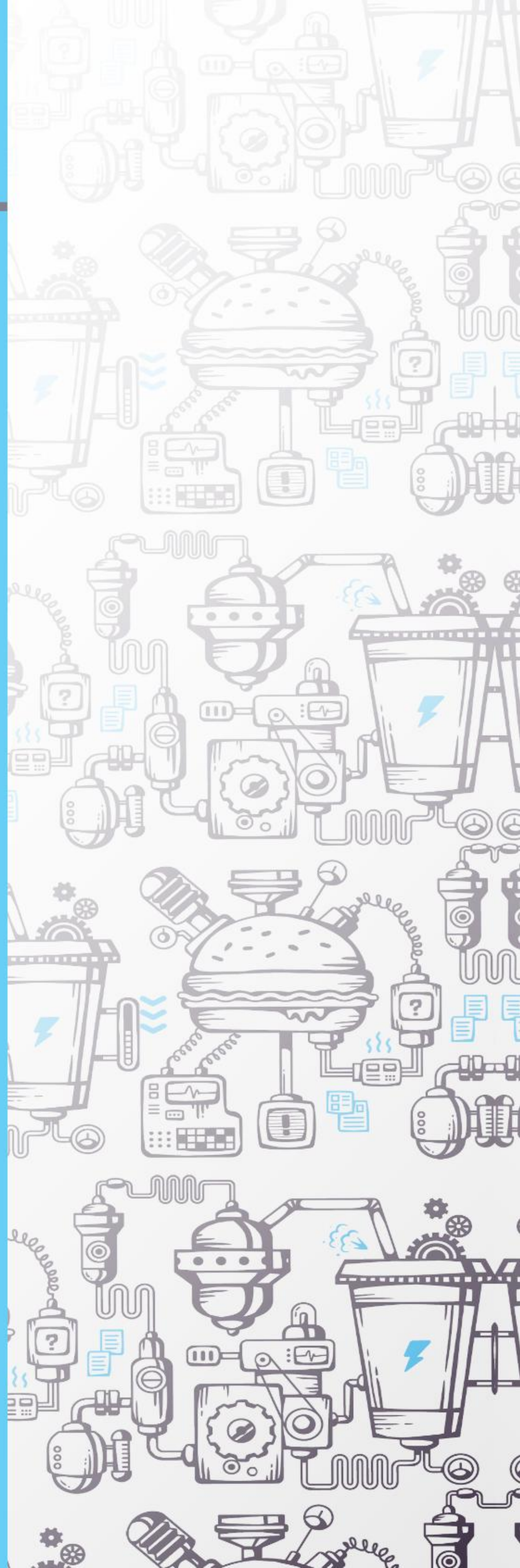
B. Paris, Moscow, Oslo, London

C. Moscow, Paris, Oslo, London

D. Moscow, Paris, London, Oslo

Section Two

Data, Graphs and Tables



Content Focus

Foundation Mathematics	Australian Curriculum
1.4.1 Identify and describe the purpose of simple tables and graphs involving whole numbers in everyday contexts. 1.4.2 describe the purpose of the key features, conventions and symbols of tables and graphs found in various texts and media from everyday life and work. 1.4.3 read and interpret information from a range of simple data displays from real life contexts including lists, one and two way tables, column/bar and line graphs, venn and arrow/network diagrams. 1.4.4 collect and record data in one and two way tables. 1.4.5 construct vertical and horizontal column/bar graphs and line graphs (including both measurement and frequency graphs), using simple scales labelled with whole numbers. 1.4.6 determine whether interpretations from tables and graphs are reasonable for the context. 1.4.7 communicate information and conclusions from graphs and tables consistent with the language of the text.	ACMSP 068 ACMSP 095 ACMSP 096 ACMSP 119 ACMSP 148 ACMSP 149

Topic 1

Collecting, Representing and Interpreting Data

Mathematics Discussion

Data simply means information and it is usually in the form of numbers. Data is gathered in order to answer questions such as; 'Are diabetes rates in our community improving?' After the data is collected, it is then structured into **tables, graphs** and **diagrams**.

Tables involve reading down columns or across rows, comparing one number to another, usually one pair at a time. Tables work best when the data representation:

- Is used to look up or compare individual values
- Requires precise values
- Involves multiple columns or rows of data using different forms of measurement

Graphs are displays showing a connection between two or more sets of data using dots, columns, bars or lines on a pair of axes. Graphs work best when the data representation:

- Is used to communicate a message that is in the shape of the data
- Is used to show a relationship between values (e.g. pairs of columns in a clustered column graph).

Diagrams are graphic organizers, with the two most common being Venn Diagrams and Arrow Diagrams. Diagrams work best when the data representation needs to show a relationship between two or more categories or things.

Whole Class Activity 1

Use a search engine on the class computer to view 'Census At School Data Time Series' to find tables of data concerning Australian students.
From your viewing, choose two tables that make sense to you.
Discuss:

What are the key features of clear tables?

How do tables work? Explain using examples from the tables you have selected.

Practice Exercise 1

1. The following table shows the statistics of the players who played for the Perth Wildcats Basketball team in the 2013/14 Season.

PLAYER N°	NAME	FGM/A %	3PM/A %	FTM/A %	AVERAGE REBOUNDS P/G	AVERAGE POINTS P/G
8	Ennis, James	53	36	77	7.2	21
0	Beal, Jermaine	41	43	82	2.4	16
42	Redhage, Shawn	51	39	79	4.5	14
24	Wagstaff, Jesse	49	43	83	3.7	11
53	Martin, Damian	46	42	61	4.7	8
13	Jervis, Tom	46	0	63	4.8	6
4	Hire, Greg	46	21	78	4.8	5

Key : FGM/A – Field goals made from attempts; 3PM/A – Three pointers made from attempts;
FTM/A – Free throws made from attempts; P/G – Per Game

a) What was the average number of points per game Shawn Redhage scored in the season?

b) Who scored the highest percentage of 3PM/A?

c) Who scored the lowest percentage of FTM/A?

d) Which players scored the same FGM/A percentage?

e) Who averaged 2.4 rebounds per game?

2. The following two-way table shows the number of people visiting a pet shop who like cats or dogs:

	Like cats	Don't like cats	Total
Like dogs	24	30	54
Don't like dogs	45	1	46
Total	69	31	100

a) How many people liked cats but not dogs?

b) How many people liked both cats and dogs?

c) How many liked dogs?

d) How many didn't like cats?

e) How many people were surveyed?

f) How many people didn't like cats or dogs? Comment on this number in relation to where the survey took place.

3. The following two-way table shows the number and type of 'Leavers Jackets' sold at a high school. Use addition or subtraction to complete the table.

	Class names printed	Class names not printed	Total
Hood	16	19	
No hood			70
Total		65	

a) How many jackets had hoods?

b) How many jackets had class names printed on them?

c) How many jackets had no hood and no names printed on the jackets?

d) How many jackets were sold?

Whole Class Activity 2

Column Graphs use vertical columns to compare data. Bar graphs use horizontal bars to compare data.

Using a search engine on the class computer view:
aihw.gov.au/australias-health/2014/life-stages and
aihw.gov.au/australias-health/2014/behind-the-scenes

Focus on the column graphs and bar graphs within the reports. Discuss:
What are the key features of all clear graphs?

Focus on two clear graphs, one column and one bar, and write their titles in the space below.

How are the axes labelled in these graphs? How does the axes labelling differ between column and bar graph?

What is the scale used on the axes of each of these graphs?

Using a search engine on the class computer view:
aihw.gov.au/australias-health/2014/life-stages and
aihw.gov.au/australias-health/2014/behind-the-scenes

Focus on the clustered column and clustered bar graphs within the reports.
Discuss.
What are the key features of clear clustered column or bar graphs?

Compare the axes of a clustered column or bar graph to a normal column or bar graph.
How are they the same? How are they different?

Whole Class Activity 3

A University lecturer, made the following statement during a Lecture on types and use of phones:

'The average number of in-use mobile phones in the typical Australian household is 4'.

From your class, list the number of mobile phones in your homes in the space below:

Place the information from the list in the following one-way table:

N° of mobiles	Tally	Total
0		
1		
2		
3		
4		
5		
6		
7		
8		

On a blank sheet of paper, draw an axis and create a column graph of the results ensuring all key features are included.

You need to decide:

- What is the title of the graph?
- What is the title on the horizontal axis?
- What is the title on the vertical axis?
- What numbers go on the horizontal axis?
- What numbers go on the vertical axis?
- What is the largest number that needs to be included on the graph?

Use a ruler to mark off the numbers needed for your axes.
Draw and label each of your columns.

Do you think the results from your class support the Lecturer's claim regarding the number of mobile phones in Australian households? Is your class a good sample to base your conclusions on?

'A half of all Australian mobile phone owners used the Internet via their mobile phone in 2013. This represents an increase of a third from 2012'. ACMA Communications Report 2012-13

Which of your family members use their mobile phone to access the Internet? Discuss with a partner.

Collect information from members of your class regarding their family members that do or do not use their mobile phones to access the Internet. Record your results using a tally system (𝍸 shows 5) in the two-way table below:

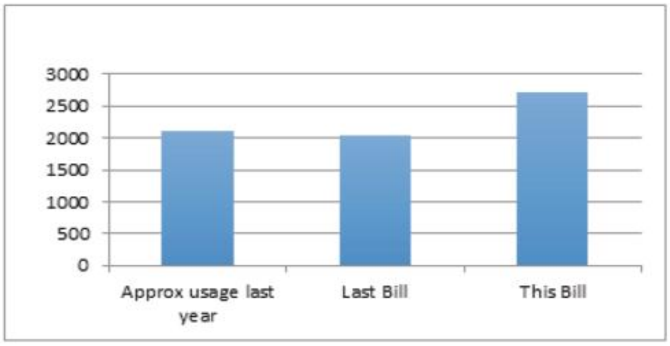
N° of mobiles	Use internet from their mobile?		Total
	Yes	No	
0			
1			
2			
3			
4			
5			
6			
7			
Total			

Refer to your data. Do more people access the Internet with their phone or do more people use their phone without accessing the Internet? Why? Why not? Predict the fraction of Australians that would access the Internet via their mobile this year. Discuss.

Why is the table in Whole Class Activity 1 called a one-way table and the table in Whole Class Activity 2 called a two-way table? Discuss.

Practice Exercise 2

1. The following graph on Nikita's Electricity Account invoice is missing key features.



a) Insert the key features onto the graph.
b) Are these the only possibilities for missing key features? Write your thoughts in the space below:

c) What does the graph show about Nikita's electricity usage?

d) Is the data on Nikita's electricity usage best displayed in a graph or table? Discuss.

2. Below is a table showing the number of hours Kaleb spent on studying his Year 11 subjects in a week.

Subject	Time	Subject	Time
Manufacturing Industry Studies	30 min	Accounting	100 min
Business Studies	80 min	English	1 hour and 15 minutes
Geography	I hour	Maths	150 min

a) Using a scale of 1cm = 10 min on the vertical axis, draw a column graph of this information on grid paper.
b) How much time was spent on homework during the week?

c) Between which two subjects did Kaleb have the biggest difference in homework time? Was this question easiest to answer by looking at the table or the graph?

3.

Pos	Team	P	W	L	D	Pts
1	Geelong	20	16	4	0	64
2	Hawthorn	19	15	4	0	60
3	Sydney	19	15	4	0	60
4	Fremantle	19	13	6	0	52
5	Port	19	12	7	0	48
6	North Melb	19	11	8	0	44
7	Adelaide	19	10	9	0	40
8	Essendon	19	10	9	0	40

a) What is the purpose of this table?

b) What key feature is missing from the table? How can this missing feature distort the information given?

c) Produce a clustered bar graph on grid paper comparing Wins (W) with Losses (L) for each team. Use the correct title, 'Top 8 AFL Clubs on August 16th 2014', for the graph.

d) How does the graph change as the ranking in the team moves from highest to lowest?

e) Is the data in this table best interpreted using the table or the graph? Discuss.

Whole Class Activity 4

Using a search engine on the class computer view:
aihw.gov.au/australias-health/2014/life-stages and
aihw.gov.au/australias-health/2014/behind-the-scenes
Focus on the line graphs within the reports.
What are the key features of all clear line graphs?

Focus on two clear line graphs and write their titles in the space below:

How are the axes labelled in each of these graphs?

What is the scale used on the axes in each of these graphs?

Whole Class Activity 5

Predict: How many minutes will it take for a birthday candle to burn completely?

AIM: To measure and record every 3 minutes, to the nearest millimetre, the height of a small birthday candle as it burns during the maths session.

METHOD:

1. Measure a small birthday candle from the base to the start of the wick. Record this height in the table, when t = 0. The 't' means time and starts at zero, as the candle is yet to commence burning.
2. One class member is to set their mobile phone to an alarm every 3 minutes.
3. Light the candle and commence the lesson.
4. When the alarm sounds at 3 minute intervals, measure the height of the candle and record it in the table below.

5. Continue measuring and recording, working in the meantime on **Practice Exercise 3**, until the candle is fully burnt.
6. Use a blank sheet of paper to create a graph. Plot time (t) on the horizontal axis (1cm = 3 mins) against height (h) on the vertical axis (1cm = 10 mm). Ensure all scale markers have the number NEXT to the marker.
7. Connect the points plotted on the graph.
8. Ensure all the features of a line graph are placed on the graph.

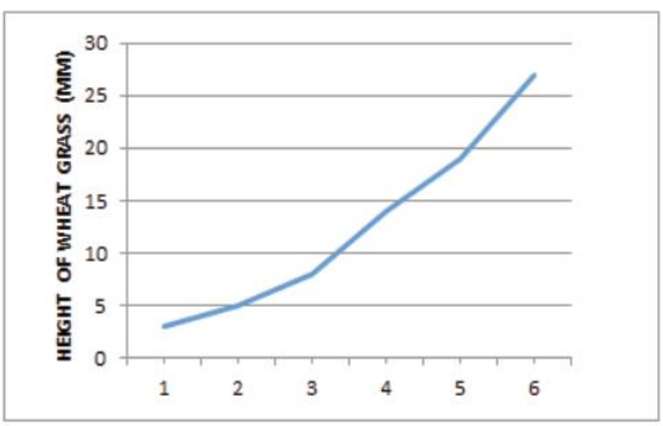
Height of a Burning Candle											
Time(mins)	0	3	6	9	12	15	18	21	24	27	30
Height(h)											

The instructions for this experiment included connecting the plotted points. Why does it make sense to connect the points plotted from the table?

Was your prediction correct? What factors could impact on the time taken for the candle to burn?

Practice Exercise 3

1. The following graph is missing two key features.
   a) Insert the key features onto the graph
   b) Are these the only possibilities for missing key features? Explain.



c) The graph shows the height of commercial wheat grass grown over a 6 day period in northern NSW. Did your responses to (a) and (b) reflect this information?

d) What was the height of the wheat grass on day 4?

e) Which day was the wheat grass 5mm high?

f) How many millimetres did the wheat grass grow between days 1 and 6?

g) Predict the height of the wheat grass on the 7th day.

2. The temperature in Karratha on the 10th August 2014, is represented in the table below.

a) Why is a line graph the best way to representing this information?

b) Construct a line graph on 1 cm grid paper. Use 1cm = 1 hour on the horizontal axis and 1cm = 2° on the vertical axis.

c) From the graph predict the temperature at
- midday
- 7pm

d) At what time was the temperature the hottest? How do you know?

e) Is it easier to interpret the information using the table or the graph? Discuss.

Time	Temperature
5am	15 °
7am	14 °
9am	25 °
11am	27 °
1pm	31 °
3pm	30 °
5pm	26 °

3. The following table shows the approximate sales of a magazine for teenage girls called 'Molly,' over an eight week period.

Week	1	2	3	4	5	6	7	8
Sales	95 000	15 000	10 000	5 000	100 000	25 000	5 000	5 000

a) Construct a line graph on grid paper use a scale of 1cm = 1 week on the horizontal axis and 1 cm = 5 000 copies on the vertical axis.

b) What is the approximate number of sales in week 6?

c) Which week did sales of 5 000 copies occur?

d) Describe the trend of sales over the 8-week period.

e) Why is a line graph the best way of representing this information graphically?

Whole Class Activity 6

Using a search engine on the class computer, view 'Images for Venn Diagrams in the Real World'. Discuss:

What are the key features of all clear Venn diagrams?

Focus on two clear Venn diagrams and write their titles in the space below:

What do the intersecting circles on these Venn diagrams represent?

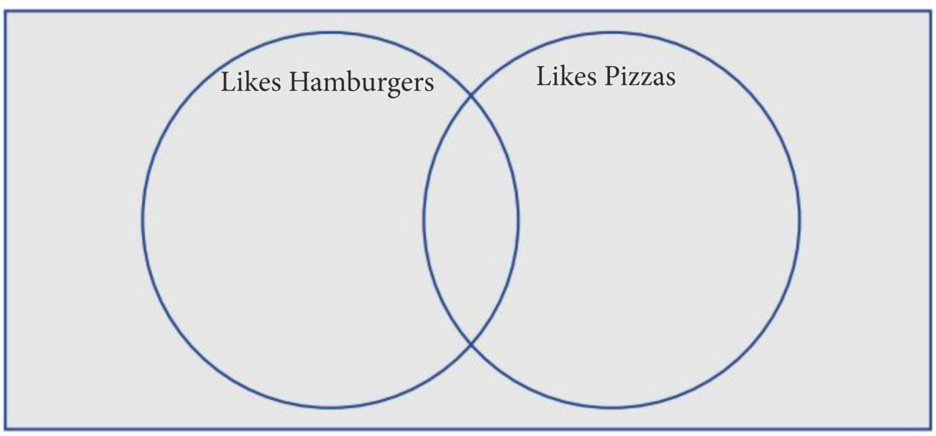
What do any numbers outside the intersecting circles on a Venn diagram represent?

Whole Class Activity 7

The Canteen Manager at your school was deciding whether to offer pizza or hamburgers as a menu choice for lunch. She asked your class to decide the best menu options. Ask students in your class whether they like pizzas or hamburgers and record the results using a tally in the two-way table below:

	Likes Pizza	Doesn't Like Pizza	Total
Likes Hamburgers			
Doesn't Like			
Hamburgers			
Total			

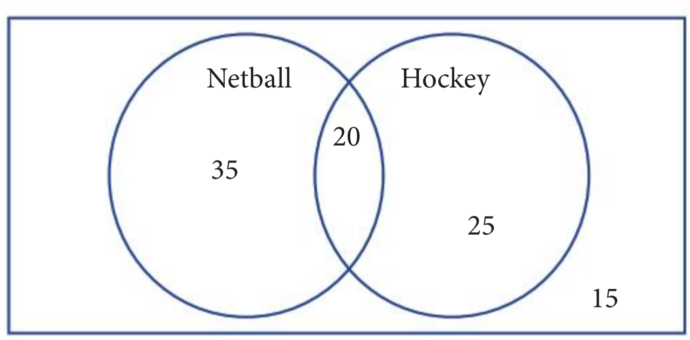
Display the results of the survey in the Venn diagram below.



Write a short letter to the Canteen Manager explaining your findings and providing a recommendation.

Practice Exercise 4

1. The girls in Year 11 at Santa Maria were surveyed as to which winter sport they played. The results are shown in this Venn diagram:



a) How many girls played both sports?

b) How many girls in total played netball?

c) What was the total number of girls surveyed?

2. One hundred people on a flight home from Europe were surveyed on the countries they had visited. The survey found;

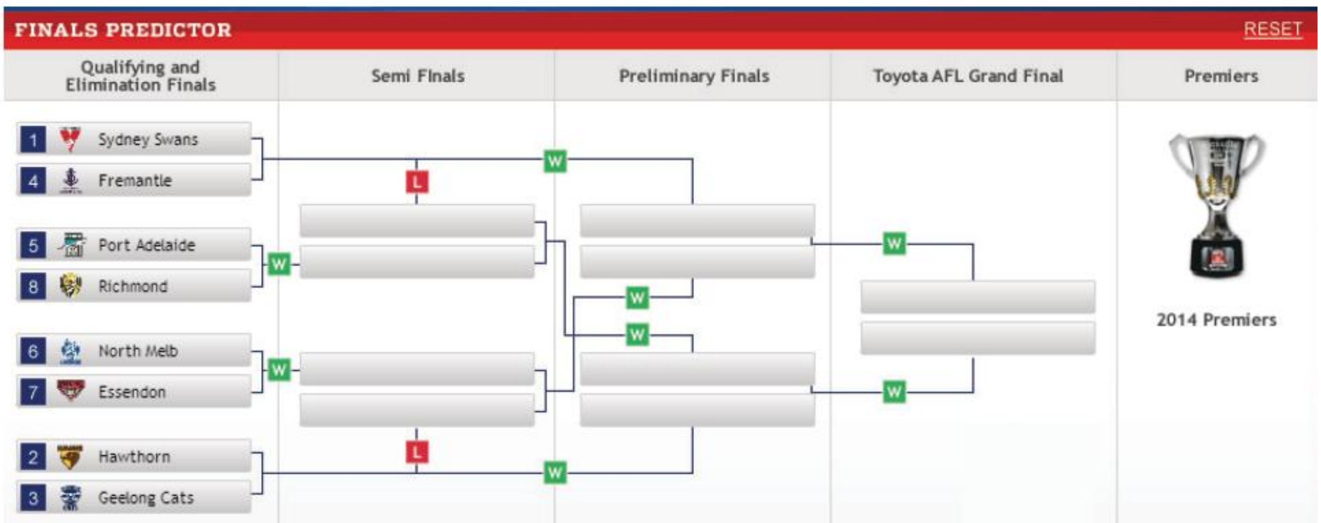
- 12 people had visited both Spain and Italy
- 18 had visited Italy only
- 20 had visited Spain only
- 50 had visited neither Spain nor Italy

Display the information in a Venn diagram and a Two-way table. Decide which is best.

a) Venn Diagram b) Two-way table

Whole Class Activity 8

Arrow diagrams are used to connect and organise information to show a relationship between things. The following diagram shows the finals fixtures for the AFL in 2014. W means win and L means loss.



(From http://www.afl.com.au/ladder/ladder-predictor)

Which final does Geelong miss if the team wins the first game in the final series?

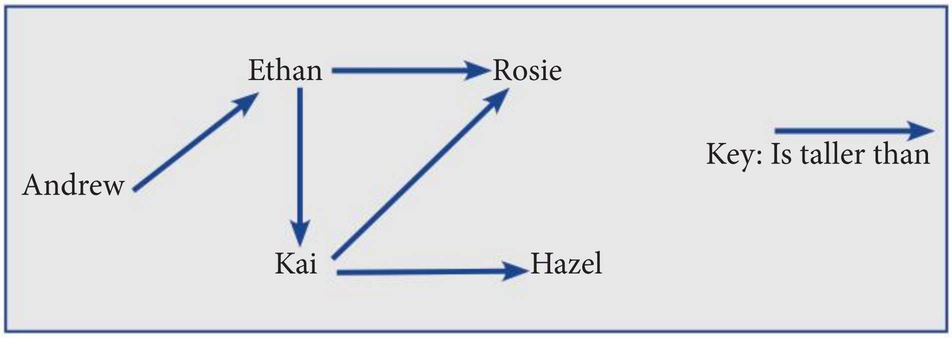
How many games will Fremantle have to play to get to the Grand Final if they win the first game in the final series? Lose the first game in the final series?

If North Melbourne win the first round of the final series, which teams could they then compete against in the Semi Final?

If Hawthorn win the first round of the final series, which teams could they then compete against in the Preliminary Final?

Practice Exercise 5

1. Five students compare their heights.
   This Arrow diagram shows the results.



   a) Which students are taller than Kai?

   b) Which students are shorter than Ethan?

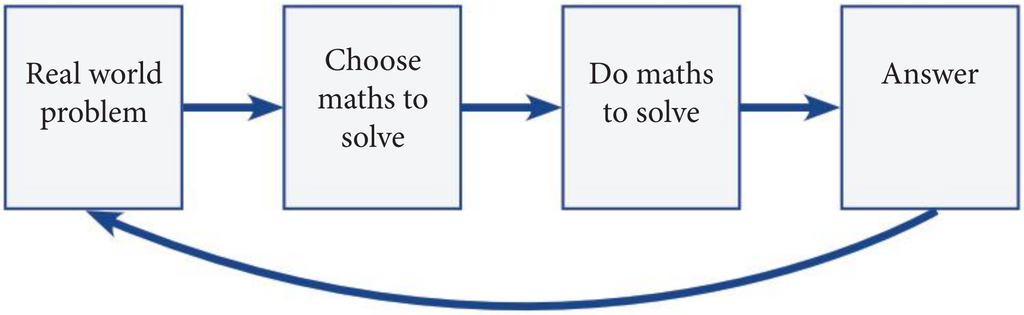
   c) Which student is the tallest?

   d) Which student is the shortest? Is this the only possible solution? Explain.

2. Choose four or five family members, and draw an Arrow Diagram on a blank sheet of paper, to show who is older than who. The arrow will mean *is older than*.

With a partner, read each other's Arrow Diagram to work out who is the oldest and who is the youngest in each family.

3. Write a paragraph to explain the following Arrow Diagram



Practice Exercise 6

1. The following two-way table shows the price of a Litre of unleaded petrol and a Litre of milk, written in cents, in each of the Australian capital cities in August 2014.

Draw a graph of this data.

Item	Brisbane	Melbourne	Perth	Sydney	Adelaide	Hobart	Darwin
Petrol	155	151	151	151	147	160	170
Milk	157	143	165	147	141	147	207

a) Which city had the cheapest milk?

b) Which city was the most expensive based on these two items?

c) Is it easier to answer these questions using the table or the graph? Explain.

d) Does this two-way table require a TOTAL at the end of the rows? Why? Why not?

2. A block of ice weighing 250grams is placed on a bench to melt. At 30 minute intervals, the melted water is discarded and the ice re-weighed. The following table represents the weight of the ice, over a 2 hour period.

Time (mins)	Weight (g)
0	250
30	240
60	220
90	170
120	100

Draw a graph of this data.

a) Predict the weight of the ice after:
- 45 mins
- 105 mins

b) At what time will the ice be completely melted? How do you know?

c) Is it easier to answer these questions using the table or the graph? Explain.

3. Shelly thought that most students used both Facebook and Instagram as their social media choices. She collected information from her group of friends and displayed it in the following table. Complete the totals in the table and then draw a diagram of this data

	Uses Facebook	Doesn't Use Facebook	Total
Uses Instagram	25	14	
Doesn't Use Instagram	9	2	
Total			

a) How many friends didn't use either Facebook or Instagram?

b) How many students use Facebook?

c) How many students do not use Instagram?

d) Were Shelly's thoughts on social media usage correct? Is it easier to answer these questions using the table or the diagram? Explain.

Reflection on Learning

The Secondary School Principal of a Perth boy's school was quoted at a Principal's Conference as saying:

"The favourite winter sport of all 16 and 17 year olds in WA is AFL"

Discuss this statement and record class responses in the space below.

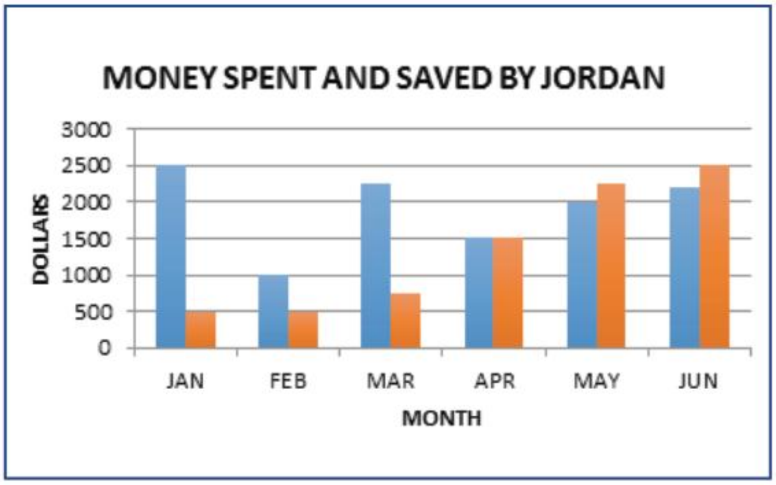
On a blank sheet of paper, design a table, with all key features, to record information about the favourite winter sports of 16 and 17 year olds in WA.

Using your class as a sample, record student's favourite winter sport in the table above.
Produce a column or bar graph with all key features, of the class results. Paste your graph in the space below.

Reflect on the statement made by the school Principal. Did your results support this statement? Why? Why not?

OLNA Practice Questions

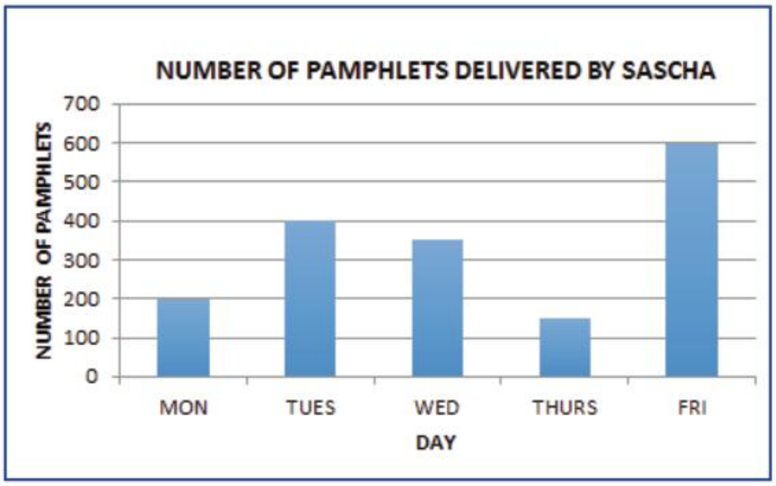
1. Jordan has made a chart of her spending/saving in the first six months of 2014



What is missing from her chart?

A A title
B A legend or key
C A label on the vertical axis
D A label on the horizontal axis

2. Sascha has a casual job delivering pamphlets to letter boxes. The graph shows the number of pamphlets she delivered each day for 5 days



On which two consecutive days did she deliver 500 pamphlets in total?

A Monday and Tuesday
B Tuesday and Wednesday
C Wednesday and Thursday
D Thursday and Friday

Section Three

Addition and Subtraction of Whole Numbers and Money

Content Focus

Foundation Mathematics	Australian Curriculum
1.2.1 Determine whether an estimation or an accurate answer is needed in everyday situations 1.2.2 Choose when it is appropriate to use addition or subtraction to solve a range of everyday problems e.g combining quantities, comparing the difference 1.2.3 Understand and use the inverse relationship between addition and subtraction to assist in calculations 1.2.4 Understand, recall, use and extend basic addition and subtraction facts to facilitate mental calculation 1.2.5 Apply place value, partitioning and basic facts to mentally solve everyday problems involving addition and subtraction 1.2.6 Use a calculator efficiently and appropriately when more complex numbers are involved 1.2.7 Use estimation strategies, including rounding, when an accurate answer is not required 1.2.8 Determine whether an answer is reasonable by using the context of the problem 1.2.9 Communicate solutions (oral and written), using language and symbols consistent with the context	ACMNA029 ACMNA 030 ACMNA053 ACMNA054 ACMNA 055 ACMNA073 ACMNA080 ACMNA083 ACMNA099 ACMNA123 ACMNA291

Topic 1

Understanding and Recalling Basic Addition facts

Mathematics Discussion

Maths is easier if you can remember and recall basic facts. The basic addition facts are all of the single digit additions from 0 + 0 through to 10 + 10.

We use basic addition facts to mentally solve both addition and subtraction problems.
For example, knowing 6 + 6 can be used when solving 12 – 6.
It also helps with 60 + 60 and 120 – 60.

There are 3 main strategies for learning and remembering the basic facts:

1. Combinations to Ten. Learning the pairs of numbers that add to ten can be used to answer other basic facts. Such as 8 + 5 is the same as 8 + 2 + 3.
2. Commutativity. Changing the order of an addition can help.
   Eg, 3 + 8 is the same as 8 + 3.
3. Doubles and near doubles. Using doubles facts such as 6 + 6 to work out facts that are near them.
   Eg, 6 + 7 is double 6 + 1 and 6 + 8 is double 6 + 2.

Learning basic facts takes time, and after they are learnt, you need to practise them so that they are not forgotten. The brain is like any other muscle in the body, it gets better with practise.

Learn then practise.
Then after that, practise, practise, practise….

Whole Class Activity 1 - Adding Combinations

Record all of the addition combinations up to ten in the table below.

Number	Combinations	Number of Combinations
2	1 + 1	1
3	1+2, 2+1	2
4	1+3, 3 +1, 2+2	3
5	1+4, 4+1, 2+3, 3+2	4
6		
7		
8		
9		
10		

a) What patterns did you use when you were working out the combinations?

b) What is the connection between the 'NUMBER' and the 'NUMBER OF COMBINATIONS'?

c) Predict the 'NUMBER OF ADDITION COMBINATIONS' for:

- 13
- 16
- 20

d) List all the combinations for the numbers in (c) above to check if your prediction was correct.

Whole Class Activity 2 - Using Combinations to 10

Addition facts can be depicted using two ten frames.
For example 7 + 9 can be shown as:

●	●	●	●	
●	●	●		

★	★	★	★	★
★	★	★	★	

Three of the stars can be moved into the frame of 7, to make 10 and then the remaining 6 added as follows.

●	●	●	●	★
●	●	●	★	★

★	★	★		
★	★	★		

We can use the following number sentence to show our thinking; 7 + 9 = 7 + 3 + 6 = 16.

We can similarly show 9 + 7 using the same method.

●	●	●	●	●
●	●	●	●	

★	★	★	★	
★	★	★		

One of the stars can be moved into the frame of 9 to make 10 and the remaining 6 added as follows;

●	●	●	●	●
●	●	●	●	★

★	★	★		
★	★	★		

We can use the following number sentence to show our thinking; 9 + 7 = 9 + 1 + 6 = 16.

The above frames show how 7 + 9 = 9 + 7, as both parts of the problem equal 16.

This is called the *Commutative Property of Addition* and is true for all addition problems.

They also show that it is much easier to start at the larger number and add up to 10 and then add the remaining numbers. That is, 7 + 9 should be thought of as 9 + 7 and calculated by 9 + 1 + 6 = 16

This is a valuable strategy for learning the addition facts up to 10 + 10 that we cannot recall instantly.

Practice Exercise 1

1. Use combinations that add to ten and commutativity on the tens frames below. The first has been done for you:

a) 9 + 3

●	●	●	●	●
●	●	●	●	★

★				
★				

Number sentence:
9 + 3 = 9 + 1 + 2 = 10 + 2 = 12

b) 8 + 4

Number sentence:

c) 4 + 7

Number sentence:

d) 5 + 9

Number sentence:

2 . Use your knowledge of combinations to ten to extend your basic facts and solve harder problems:

a)	b)	c)	d)
7 + 3	7 + 4	8 + 2	3 + 8
70 + 30	70 + 40	80 + 20	30 + 80
17 + 3	7 + 14	18 + 12	3 + 18
700 + 300	700 + 400	800 + 200	300 + 800

Reflection and Discussion

How could the ‘combinations to ten strategy’ be applied to solving problems such as 90 000 + 70 000?

Could it be used for 800 000 + 400 000? Write down your thinking.

Whole Class Activity 3 - The Doubles

The basic addition facts up to 20 can be represented in a two- way table.
Complete the following table. The first few have been completed for you.

+	1	2	3	4	5	6	7	8	9	10
1	2	3								
2	3	4								
3			6							
4										
5										
6										
7										
8										
9										
10										

What patterns can you see in the table? Discuss.

An important pattern that should be noticed is the 'doubles' such as 3+3.

Use a highlighter on the table to show the 'doubles'.

Practice Exercise 2

Knowing the 'doubles' can help us with our calculations. For example 6 + 7 can be thought of as double 6 plus 1. That is 6 + 6 + 1. Facts such as 6 + 7 are called 'near doubles'. Highlight the 'near doubles' using a different coloured highlighter on your table

1 . Use your knowledge of 'doubles' to calculate these 'near doubles.'

a) 4 + 5 b) 7 + 8 c) 6 + 8 d) 9 + 8

2 . Use your knowledge of doubles and near doubles to extend your basic facts.

a)	b)	c)	d)
40 + 50	70 + 80	60 + 80	90 + 80
14 + 15	17 + 8	6 + 28	190 + 80
400 + 500	700 + 800	600 + 800	900 + 800
4000 + 5000	7000 + 8000	6000 + 8000	9000 + 8000

Reflection and Discussion

How could the strategy of ‘Doubles’ be applied to solving problems such as
40 000 + 50 000?

Could it be used for 900 000 + 800 000? Write down your thinking.

An Approach to Learning and Remembering Basic Addition Facts

In the table in Whole Class Activity 3, we can see that there are 100 different facts. We can halve the number we have to remember, by using the commutative property of addition (that is, if we can remember 4 + 5, we can also remember 5 + 4). Use a highlighter on the table to show which facts can be thought of as a ‘turn around’ of another fact.

What other facts are easy to remember? Discuss.

On the table, place a line through all the facts you can recall instantly (within 3 seconds).

Circle the facts on the table that are not automatic.
Write them in the space below:

Circle each of the above facts into groups of 3.

Develop a strategy for learning each of the facts in the circled group of 3, using either combinations to ten, commutativity or doubles and near doubles. Use tens frames or grid paper to form a mental image of each fact.

Discuss these strategies with your partner or teacher.

Ask your partner to ‘test’ you on these 3 facts. The 3 facts will then be tested on a regular basis until you are ready to work on a new group of 3 unlearned facts.

The testing by your partner of the targeted questions should always include some of the facts from the previous group of unlearned facts.

When you are confident that the fact you are working on can be recalled quickly, it can then be crossed off on the two-way table.

Practice Exercise 3

1. Add the numbers in each of the columns and the rows mentally. Try to calculate the number in the bottom right hand corner mentally, or by using jottings. If this is difficult, use a calculator.

a)

+				TOTAL
	2	4	3	
	5	8	7	
	1	3	4	
TOTAL				

b)

+				TOTAL
	6	5	7	
	8	6	3	
	4	2	9	
TOTAL				

c)

+				TOTAL
	60	40	30	
	80	80	70	
	40	30	40	
TOTAL				

d)

+				TOTAL
	20	50	90	
	50	60	30	
	60	20	70	
TOTAL				

e)

+				TOTAL
	700	400	300	
	500	800	500	
	800	200	300	
TOTAL				

f)

+				TOTAL
	$7	$6	$7	
	$2	$9	$2	
	$3	$1	$7	
TOTAL				

g)

+						TOTAL
	2	3	4	7	8	
	3	5	1	9	7	
	4	3	6	1	6	
	8	5	9	2	2	
	7	3	4	3	3	
TOTAL						

Practice Exercise 4

Games to Assist in Practising and Retaining Basic Addition Facts

ADD TO 16

This game is based on the familiar game for two players, of 'Noughts and Crosses' but numbers are used instead of noughts and crosses.

AIM

To complete a row, column or diagonal that adds to 16

EQUIPMENT

- 2 different coloured pens. Player A has one colour pen and Player B another.
- A piece of scrap paper to draw extra grids on.

RULES OF THE GAME

1. Players are to alternately insert the numbers 1 – 9 in each of the cells in grids such as the ones below. Each digit can be used only once.
2. The winner is the first player to complete a row, column or diagonal that adds to 16.

c) Play the game for 15 minutes and record the results of each game in the table below, to determine an overall winner.

	Tally	Total
Player A		
Player B		

THREE DICE GAME

AIM

To place a counter on a number formed by adding three rolls of a 6 sided dice, on the board below.

EQUIPMENT

1 dice, 2 different coloured counters; one colour for Player A, the other for Player B

RULES OF THE GAME

1. Roll one die three times and add the numbers together
2. If the total has not already had a counter placed over it, place one of your counters on top of the total
3. The winner is the player with the most counters on the board

3	4	5	6
7	8	9	10
11	12	13	14
15	16	17	18

21 or BUST!

AIM
To add a series of playing cards to reach the exact total of 21

EQUIPMENT
A pack of well - shuffled playing cards divided equally between two players. The Ace is counted as 1, the Jack as 11, the Queen 12 and the King 13

RULES OF THE GAME
1. Each player has their pile of cards placed face down beside them.
2. Player A draws a series of cards, one by one, from his/her pile adding the cards together as the cards are turned.
3. If the total, after several cards are drawn, is exactly 21, a point is recorded for Player A in the table below and they then are allowed another turn.
4. If the total goes above 21 (i.e. BUST!) then no point is recorded and it becomes Player B's turn.
5. The winner is the player with the most number of points after the designated time period.

Player	Tally	Total
Player A		
Player B		

Practice Exercise 5

PHONE/TABLET APPS
Download one of the following free Apps onto your phone or tablet to practise your basic addition facts.

Basic Math with Smarty; Otto App Studio
Simple Sums V1.0; Sygem; IwGame
King of Maths 1.3.4; Oddrobo Software AB
Basic Math V3.30; ExplorerTechnologies
Adding Numbers Funbrain MathGame; Arkadiusz Adach

Reflection on Learning 1

A maths class at Dongara District High School was asked:
'If you know 6 + 7 = 13, what other facts do you know?'

The class responded as follows;

6 + 7 = 13
600+ 700 = 1300
6 000 + 7 000 = 13 000
6 tens + 7 tens = 13 tens
6 million + 7 million = 13 million
6cents + 7 cents = 13 cents

Complete a similar activity with the following facts on a blank sheet of paper. Share your responses.

8 + 7 = 15   *9 + 5 = 14*   *4 + 7 = 11*   *3 + 9 = 12*

Reflection on Learning 2

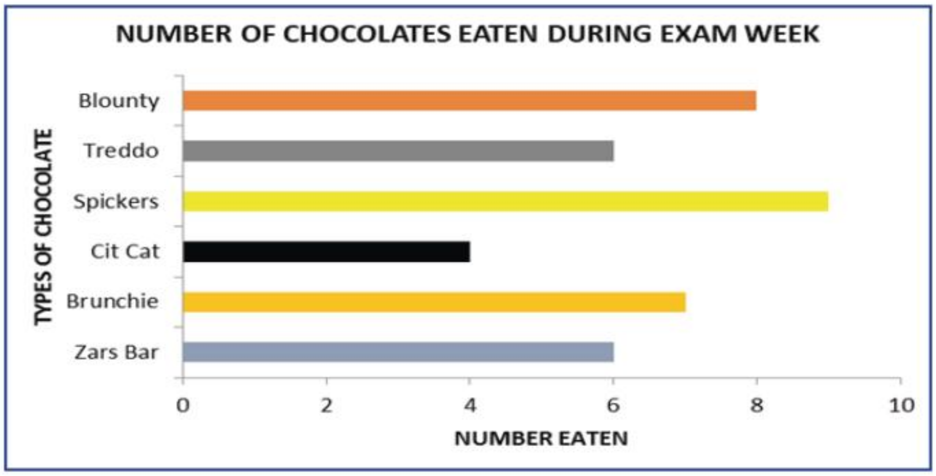
Complete the following two-way table as quickly as possible, using combinations to ten, commutativity, doubles and near doubles to make it easier.

+	7	2	9	1	3	5	4	6	8	10
4										
7										
6										
1										
3										
9										
10										
2										
8										
5										

Reflect on your learning in this topic.
Have your basic addition number skills improved? Discuss.

OLNA Practice Questions

1. Jye ate the following chocolates over the two-week exam period in Year 11.



On Monday, Jye ate the Treddo's and Brunchies.

On Tuesday, she ate Spickers and Cit Cat's.

How many more chocolates did she eat on Tuesday than Monday?

A. 1 B. 2 C. 0 D. 3

2. Harry earned $300 in 5 days.

After the first day, he earned $10 more each day than the day before.

How much did Harry earn on the first day?

A. $30 B. $40 C. $50 D. $60

REMEMBER: Learning basic facts takes time, and after they are learnt, you need to practise them so that they are not forgotten. The brain is like any other muscle in the body, it gets better with practice.

Learn then practise.
Then after that, practise, practise, practise...

Topic 2

Addition of Whole Numbers and Money

Mathematics Discussion

We can break up numbers to help make mental addition easier.
For example, we can think of 58 + 24 as

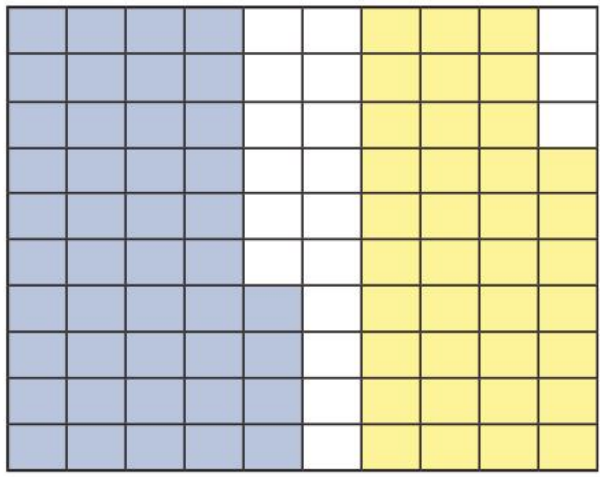
	50 + 20 + 8 + 4
OR	58 + 10 + 10 + 2 + 2
OR	58 + 20 + 2 + 2
OR	60 + 22.

We can use written jottings or diagrams to help keep track of calculations that cannot be completely stored in our heads.

Whole Class Activity

Think: How can we break up two numbers to make adding them easier?

On a sheet of 1cm grid paper, make a 100 square grid by drawing a 10 by 10 square.
Using the 100 square grid, shade and cut out 44 squares and 37 squares as indicated in the diagram below.



44 + 37

Using the cut-out pieces, find a way to break up the two numbers to make the addition easier. You can perform more cuts if necessary.

Record the steps that you took to do the addition.

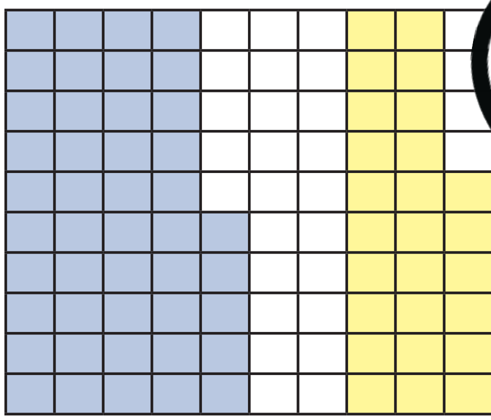
Share your thinking with your partner. Did you break up the numbers in the same way? What other strategies were used in the class?

Decide as a class, what the best strategy for this particular problem would be.

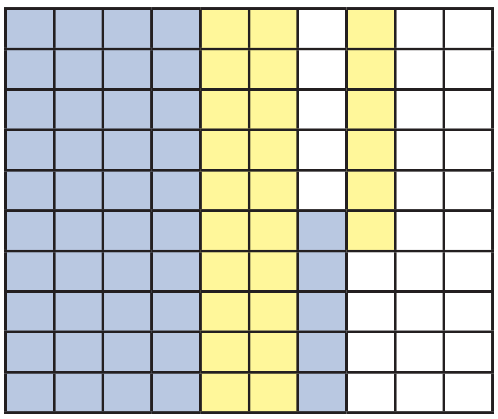
Jalen's Strategy for Adding Numbers

Jalen used grid paper to solve 45 + 26
He used place value to partition both of the numbers.
He adds the tens first and then the ones.

45 is the same as 40 + 5
26 is the same as 20 + 6
40 add 20 is 60
5 and 6 is 11
60 add 11 is 71



45 + 26



40 + 20 + 6 + 5

1.Use Jalen's thinking and grid paper to solve the following problems.

a) 37 + 12
b) 22 + 47
c) 56 + 35
d) 29 + 37
e) 83 + 34
f) 76 + 45

Jalen decided he could solve problems like these mentally, by visualizing the grid paper. However, he found he needed to write down a few numbers to keep track of where he was up to. To add 28 and 67 he wrote down 80 and 15.

28 is the same as 20 + 8
67 is the same as 60 + 7
20 add 60 is 80
8 and 7 is 15
80 add 15 is 95

2. Use Jalen's method to mentally solve the following problems by visualizing the grid paper.
Use jottings to help if necessary.

a) 33 + 42
b) 162 + 223
c) 57 + 62
d) 63 + 97
e) 76 + 48
f) 88 + 67

Reflection and Discussion

Jalen wondered whether the same method would work with money.
Can you add $45 + $78 by adding the tens first and then the ones?

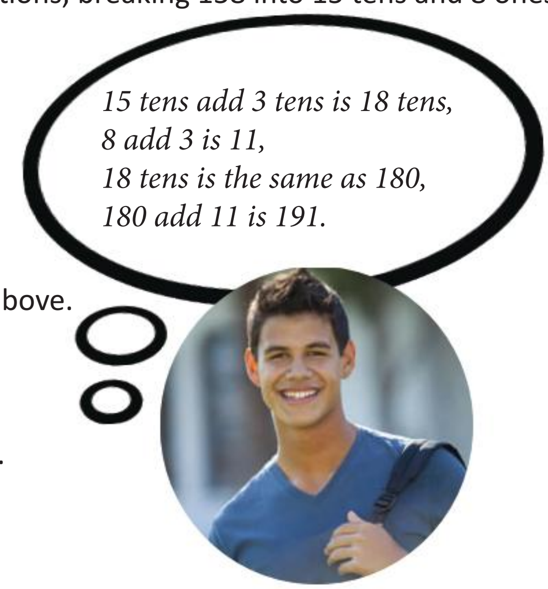
Does this work when you have to add dollars and cents; $45.50 + $63.70?
What do you think?

3. Use a mental calculation, jottings or grid paper to solve the following problems.

a) $41 + $36
b) $68 + $71
c) $236 + $122
d) $25.80 + $32.70
e) $28.50 + $17.50
f) $35.70 + $46.50

Jalen's Strategy for Adding Larger Numbers

To solve 158 + 33, Jalen used non-standard place value partitions, breaking 158 into 15 tens and 8 ones. He adds the tens first and then the ones.



Use grid paper to show how Jalen added the two numbers above.
Explain Jalen's thinking to a partner.

4. Use Jalen's method to mentally solve the following by visualising the grid paper. Use jottings to help if necessary.

a) 125 + 43
b) 536 + 22
c) 146 + 34
d) 57 + 438
e) 358 + 57
f) 423 + 168

5. Revision: Use Jalen's thinking to mentally solve the following problems. Use jottings or grid paper if necessary

a) 56 + 31

b) 27 + 43

c) 64 + 27

d) 76 + 94

e) 138 + 26

f) 53 + 261

g) 288 + 76

h) 326 + 157

i) $116 + $55

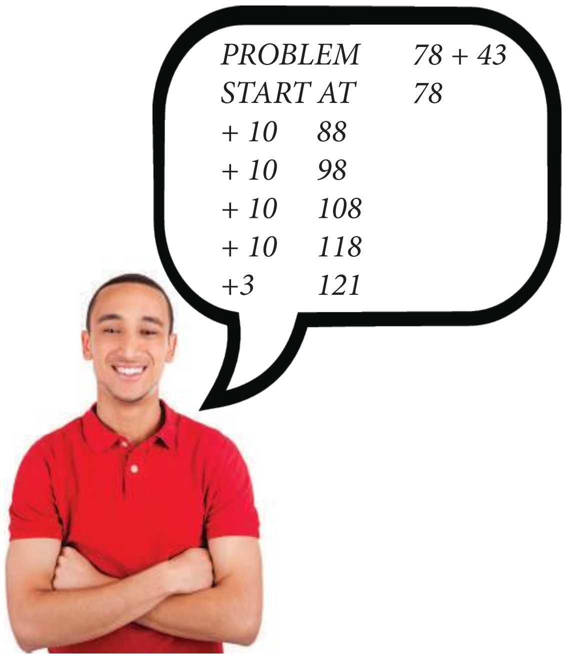
j) $3.50 + $18.50

k) $8.75 + $3.75

l) $27.90 + $8.60

Casey's Strategy for Adding Numbers

Casey used the patterns in the number system to count forward to solve addition problems. To solve 78 + 43 he partitioned 43 and counted forward from 78 by tens first and then ones. Casey thought of this as follows:



1. Use Casey's thinking and the grids below to solve the following problems

a)

PROBLEM	52 + 25
START AT	

b)

PROBLEM	63 + 24
START AT	

c)

PROBLEM	54 + 37
START AT	

a)

PROBLEM	78 + 31
START AT	

b)

PROBLEM	284 + 35
START AT	

c)

PROBLEM	178 + 44
START AT	

2. Use Casey's method to solve the following problems. Use jottings or diagrams to help if necessary.

a) 42 + 26

b) 56 + 34

c) 68 + 24

d) 77 + 52

e) 183 + 65

f) 365 + 46

Reflection and Discussion

Casey was given the problem 57 + 274. He knows that addition is commutative, so the answer to 57 + 274 is the same as 274 + 57.
He wondered whether it was easier to solve 57 + 274 OR 274 + 57.
What do you think?

3. Start with the biggest number to mentally solve the following.

a) 24 + 52

b) 36 + 71

c) 55 + 76

d) 25 + 183

e) 50 + 584

f) 37 + 480

Reflection and Discussion

Casey wondered whether his strategy would work with money.
For example, $1.85 + 0.50c and $52 + $270. What do you think?

4. Use forward counting to add the following.

a) 0.80c + 0.45c

b) $1.60 + 0.50c

c) $2.70 + 0.40

d) $3.80 + $1.50

e) $36 + $55

f) $35 + $182

5. Revision - Use Casey's thinking to solve the following problems.

a) 61 + 32

b) 27 + 55

c) 73 + 46

d) 45 + 86

e) 34 + 191

f) 368 + 62

g) 0.50c + 0.70c

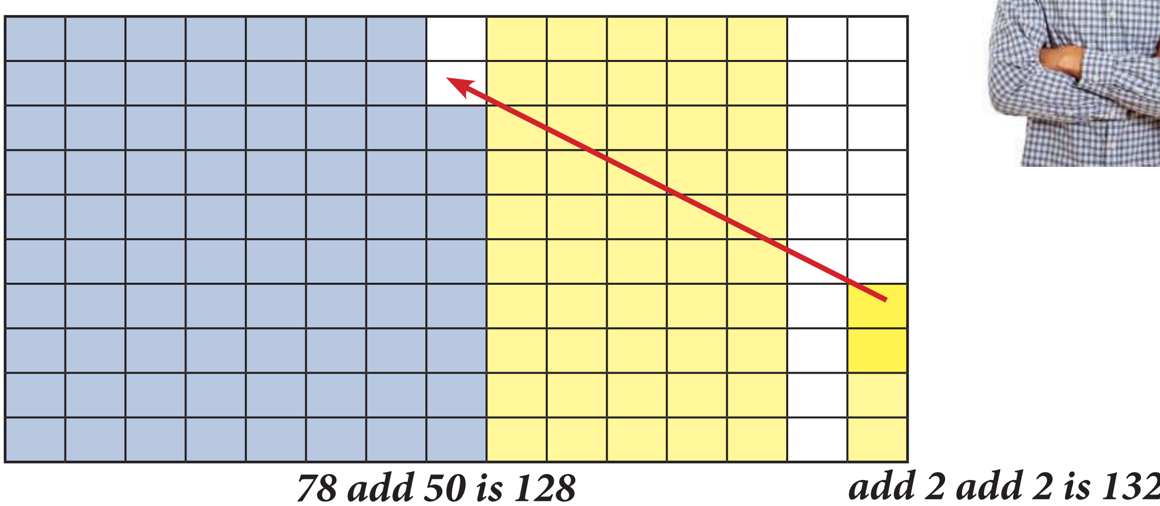
h) $1.80 + 0.55c

i) $9.65 + 0.75c

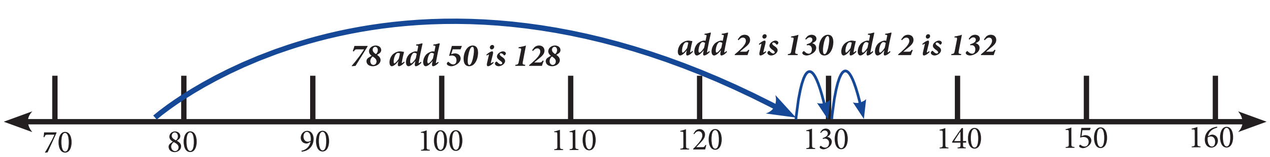
j) $62 + $480

Paddo's Strategy for Adding Numbers

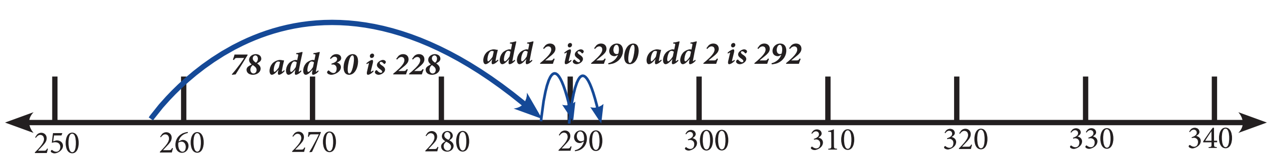
Paddo also partitioned only one of the numbers. To solve 78 + 54 he partitioned 54 into 50 + 2 + 2. When he coloured these numbers on grid paper, he started with 78, and then added the tens of the next number and then the ones. 78 + 50 + 2 + 2 = 132



He also realised that he could visualise the problem as leaping along a number line.



Paddo used the number line to add larger numbers in the same way.
He thought of 258 + 34 as being 258 + 30 + 2 + 2 = 292 and imagined leaping along a number line.



1. Use Paddo’s thinking and ‘Leaping along a Number Line’ to solve the following problems.

a) 28 + 9	
b) 37 + 8	
c) 39 + 12	
d) 45 + 26	
e) 67 + 53	
f) 86 + 55	

2. Use Paddo’s method to solve the following problems by visualising leaping along a number line.
Use jottings or diagrams to help if necessary.

a) 38 + 8

b) 64 + 17

c) 35 + 46

d) 323 + 47

e) 185 + 43

f) 178 + 54

Reflection and Discussion

Paddo was given the problem 25 + 186. Paddo knows that addition is commutative, so the answer to 25 + 186 is the same as 186 + 25.
He wondered whether it was easier to solve 25 + 186 OR 186 + 25
What do you think?

3. Use a mental calculation, grid paper or a number line to add the following.

a) 74 + 121

b) 86 + 105

c) 29 + 156

d) 51 + 168

e) 36 + 175

f) 57 + 261

Reflection and Discussion

Paddo wondered whether his strategy would work with money.
For example, $7.50 + $24.75. What do you think?

4. Use a mental calculation, grid paper or a number line to add the following.

a) $7 + $36

b) $55 + $734

c) $15 + $227

d) $4.50 + $17.50

e) $84.50 + $1.70

f) $6.80 + $13.80

5. Revision: Use Paddo's thinking to solve the following problems.

a) 38 + 6

b) 5 + 48

c) 154 + 62

d) 85 + 36

e) 46 + 87

f) 75 + 153

g) $225 + $46

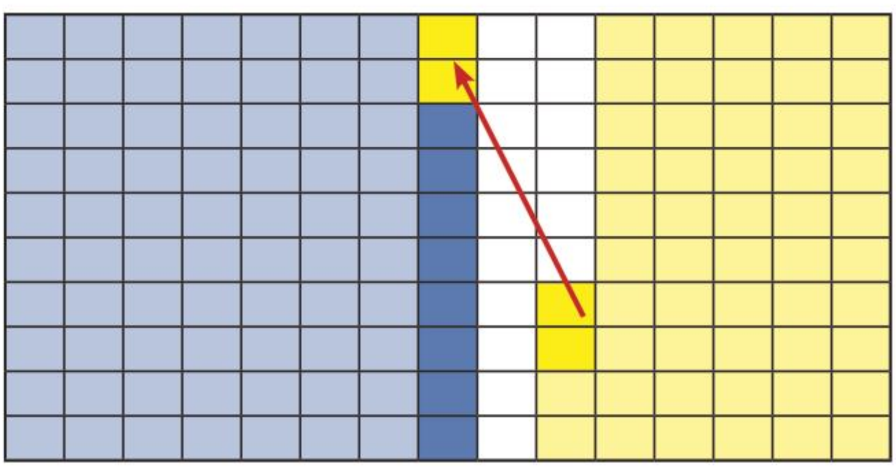
h) $52 + $384

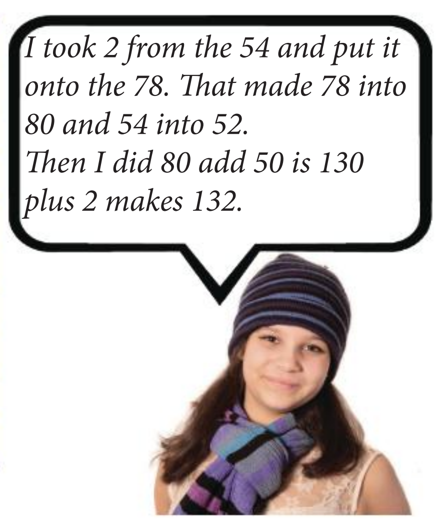
i) 0.50c + $4.60

j) $2.25 + $8.75

Sarah's Strategy for Adding Numbers

Sarah thought of 78 + 54 as being 80 + 52 = 132. When she coloured in 78 on the grid paper, she took off 2 from the 54 and attached it to the 78 to make 80 add 52.





She subtracted an amount from one quantity and added the same amount to the other quantity; in this case 2.

Similarly, she thinks of 258 + 39 as being 257 + 40 = 297
Can you see what Sarah did to these two numbers? Explain her thinking.

1. Use grid paper and Sarah's thinking to help solve the following problems.

a) 19 + 9

b) 58 + 24

c) 67 + 35

d) 29 + 153

e) 89 + 32

f) 187 + 39

2. Use Sarah's method to mentally solve the following by visualizing the grid paper. Use jottings and diagrams to help if necessary

a) 98 + 6

b) 297 + 19

c) 27 + 49

d) 86 + 28

e) 445 + 139

f) 328 + 133

Reflection and Discussion

Sarah wondered whether the same method would work with money.
For example, $45.90 + $3.70. What do you think?

3. Use a mental calculation, jottings or grid paper to add the following.

a) $7.99 + 0.05

b) $8.50 + 0.90c

c) $1.95 + $2.15

d) $342 + $149

e) $8.90 + $2.60

f) $23.50 + $4.80

4. Revision: Use Sarah's thinking to solve the following problems.

a) 46 + 19

b) 39 + 55

c) 127 + 58

d) 52 + 188

e) 368 + 74

f) 574 + 69

g) $4.50 + $3.90

h) $2.75 + $3.95

i) $133 + $119

j) $45.90 + $27.60

Reflection and Discussion

Can you use a number line to show Sarah's strategy of taking some from one number and adding it to the other? Use 37 + 9 as an example.

Revision: The Best Strategy

1. Choose the most suitable strategy to solve the following problems.
Try to do the problem mentally. If this is difficult, use jottings to help keep track.
Which strategy did you choose to solve these problems? (Jalen's, Casey's Paddo's or Sarah's)

a) 25 + 34	J C P S	g) $85 + $49	J C P S
b) 186 + 57	J C P S	h) $185 + $63	J C P S
c) 39 + 84	J C P S	i) $289 + $31	J C P S
d) 223 + 34	J C P S	j) $1.95 + 0.15c	J C P S
e) 45 + 236	J C P S	k) $4.80 + $12.80	J C P S
f) 567 +399	J C P S	l) $4.95 + $5.75	J C P S

Practising Strategies 1

CLOSEST TO 100: A card game.

NUMBER OF PLAYERS
2 - 4

AIM
To add two digit numbers mentally

EQUIPMENT
Pack of playing cards with the tens and picture cards removed.
Scrap paper for jottings

RULES OF THE GAME
1. Shuffle the deck and deal each player 4 cards. Place all remaining cards in a central pile.
2. Each player creates two, 2 - digit numbers from the cards. The goal is to create two numbers that have a sum as close to 100 as possible. (For example, a player draws the cards 5, 6, 8, and 1, created 15 + 86 = 101.)
3. The players place their cards face up in front of them, arranging them so other players can see which two numbers they have created.
4. The player with the sum closest to 100 wins. The winner collects the cards from all the players and places them in their own separate pile. In case of a tie, the dealt cards are shared between the winners.
5. Another round of 4 cards per person is dealt from the central pile.
6. Play continues until all cards are used. The player with the most cards in their own pile after the last round, wins the game.

Variations: To make the game more challenging, deal 6 cards to each player and let them create two, 3 digit numbers. Players will then create two numbers that have a sum as close to 1000 as possible.

Practising Strategies 2

PHONE/TABLET APPS
Download one of the following free Apps onto your phone or tablet to practise your addition skills
Kids Learn Math Game; Mobileroo Pty Ltd
Basic Math with Smarty; Otto App Studio
Simple Sums v 1.0; Sygem; IwGame
King of Maths 1.3.4; Oddrobo Software AB

Practising Strategies 3

1. The Busselton Community Garden in Western Australia is the sustainability flagship of the Busselton Shire. It was developed in 2007 and in 2014 had over 100 members. The following questions all relate to the development of the garden and its on- going maintenance.
For the following problems:
- Write a number sentence to help you solve the problem
- Choose the most suitable strategy to solve the problem
- Calculate the solution
- Reflect on your answer. How do you know your answer is correct?

a) The cost of a garden plot in the Community Garden is $88 for a full member and $55 for concession holders. How much would it cost for one full member and one concession holder to have a plot each?

Write a number sentence.

Which strategy is the best?

What is the answer?

How do you know your answer is correct?

b) The cost of a small rainwater tank for the Garden was $219 whilst a larger tank cost $506 more. How much did the larger tank cost?

Write a number sentence.

Which strategy is the best?

What is the answer?

How do you know your answer is correct?

c) In a storm in 2009, 37 pumpkin plants were completely destroyed leaving 26 remaining. How many pumpkin plants were there to start with?

Write a number sentence.

Which strategy is the best?

What is the answer?

How do you know your answer is correct?

d) One family donated 250 grams of 'tiger' worms to the garden, whilst another family donated 390 grams of 'blue' worms. How many grams of worms were donated to the garden?

Write a number sentence.

Which strategy is the best?

What is the answer?

How do you know your answer is correct?

e) A group of families harvested 85 tomatoes. 131 tomatoes were left on the vines. How many tomatoes were in the garden to start with?

Write a number sentence.

Which strategy is the best?

What is the answer?

How do you know your answer is correct?

f) In the Community Garden there are 27 potato plants and some zucchini plants. There are 44 more zucchini plants than potato plants. How many zucchini plants does the Garden have?

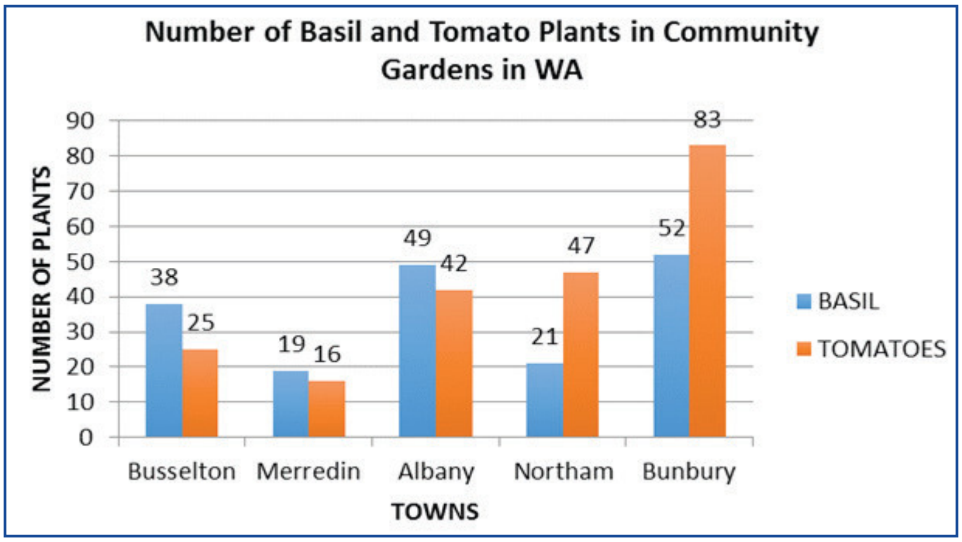
Write a number sentence.

Which strategy is the best?

What is the answer?

How do you know your answer is correct?

2. Many Community Gardens plant tomatoes next to basil to stimulate growth. The following graph shows the number of tomato and basil plants in each of the listed gardens across WA.



a) How many tomato plants did Albany and Bunbury have in total?

b) How many tomato and basil plants did Busselton have altogether?

c) Which town has 26 more tomato plants than basil?

d) A hailstorm destroyed 36 basil plants in Merredin. How many basil plants did Merredin have to start with?

Reflection on Learning

Complete the Summary Table	Advantages of this strategy	Disadvantages of this strategy	Type of example best suited to this strategy
Jalen's Method Description of this strategy			
Casey's Method Description of this strategy			
Paddo's Method Description of this strategy			
Sarah's Method Description of this strategy			

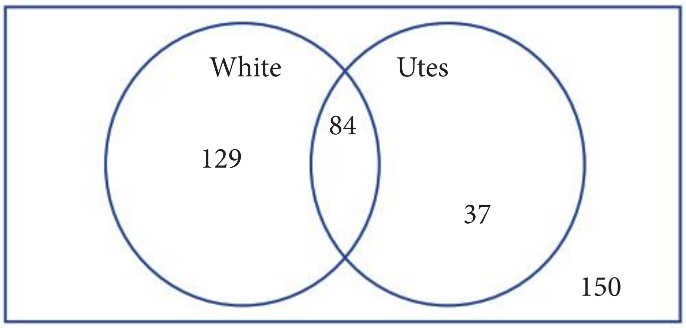
OLNA Practice Questions

1. Cohen has a casual job delivering 2 types of leaflets for pizza and burgers. On Monday, he delivered 86 pizza leaflets and 139 burger leaflets.

   How many leaflets did he deliver in total on Monday?

   A. 215 B. 225 C. 227 D. 195

2. Cars were counted on a main road to see how many cars were white and how many were Utes. The results are shown on the Venn diagram below.



   How many cars were counted?

   A. 250 B. 166 C. 300 D. 400

Topic 3

Addition of Large Whole Numbers and Money

Mathematics Discussion

We can break up larger numbers, just as we did smaller numbers, to help make mental addition easier.

For example, we can think of 2800 + 1400 as

2000 + 1000 + 800 + 400

OR 28 hundreds + 14 hundreds

OR 2800 + 1000 + 100 + 100 + 100 + 100

OR 2800 + 1000 + 200 + 200

OR 3000 + 1200

We can use written jottings or diagrams to help keep track of calculations that cannot be completely stored in our heads.

Whole Class Activity

Think: How can we use the strategies for adding smaller numbers when we need to add larger numbers?

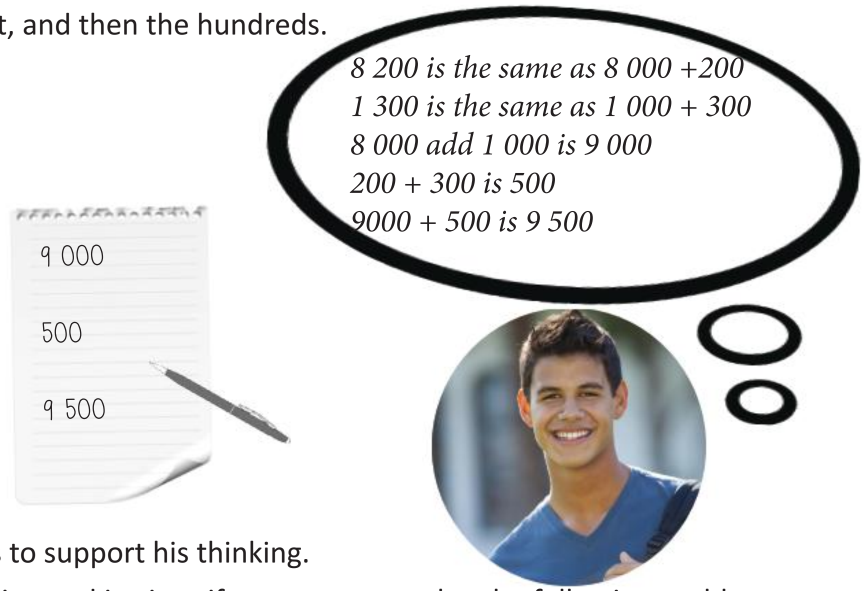
Try to solve this problem, 14 000 + 37 000.
Record the steps that you took to do the addition.

Share your thinking with your partner. Did you break up the numbers in the same way? What other strategies were used in the class?

Decide as a class, what the best strategy for this particular problem would be.

Jalen's Strategy for Adding Large Numbers

Jalen decided to try the partitioning strategy he had used for small numbers to add larger numbers. To solve a problem such as 8 200 + 1 300, he used place value to partition the numbers. He then added the thousands first, and then the hundreds.



Jalen used jottings to support his thinking.

1.Use Jalen's thinking and jottings if necessary, to solve the following problems.

a) 5 100 + 1 600

b) 7 300 + 2 500

c) 3 450 +2 320

d) 17 500 + 12 400

e) 32 000 + 43 000

f) 82 000 + 34 000

g) 256 000 + 137 000

h) 1 650 000 + 2 250 000

Reflection and Discussion

Jalen knew his method worked with small amounts of money. He wanted to try his strategy with larger amounts of money.
Try calculating $4 600 + $7 300 by adding the thousands first and then the hundreds.

Jalen's grandmother owned two houses; one in Carine valued at $810 000 and one in Applecross valued at $1 140 000. What were her combined total housing assets?

Adding larger numbers can sometimes be confusing due to the large number of place values. Verify the solutions to the two problems above using your calculator.

2. Use mental calculations or jottings if necessary, to solve the following problems.

a) $4 300 + $2 500

b) $3 700 + $9 200

c) $9 500 + $5 300

d)$54 000 + $27 000

e) $84 000 + $33 000

f) $75 000 000 + $26 000 000

g) $372 000 + $228 000

h) $960 000 + $55 000

Casey's Strategy for Adding Large Numbers

Casey decided to try the partitioning and counting forward strategy he had used for small numbers to add larger numbers.
To solve a problem such as 40 000 + 275 000, he remembered, that it was easier to start with the larger number and to think of the problem as 275 000 + 45 000. He could do this because addition is commutative.
Casey started at 275 000 and counted forward by 10 000's, then forward by 5000.

He used the following jottings to support his thinking.

Casey realized that the number he was counting forward by depended on the size of the numbers in the problem.

In problems such as 810 + 450, he would start at 810 and then count forward by hundreds, then tens.

In problems such as 17 000 + 5 500, he would start at 17 000 and then count forward by thousands, then hundreds.

1. Use Casey's thinking and jottings if necessary, to solve the following problems

a) 840 + 310

b) 5 600 + 8 100

c) 8 000 + 27 000

d) 65 000 + 35 000

e) 36 000 + 173 000

f) 660 000 + 70 000

g) 885 000 + 300 000

h) 138 000 000 + 6 000 000

Reflection and Discussion

Casey was sure his method would work with large amounts of money, just as it did with small amounts of money.
Try using Casey's method to solve $187 000 + $43 000

Kirstin purchased a motorbike for $43 000 and Tyran purchased a 4WD for $68 000. How much did the vehicles cost altogether?

Adding larger numbers can sometimes be confusing due to the large number of place values. Verify the solutions to the above two problems using your calculator

2. Use mental calculations or jottings if necessary, to solve the following problems.

a) $400 + $5 700

b) $67 000 + $6 000

c) $8 800 + $4 300

d) $44 000 + $75 000

e) $263 000 + $50 000

f) $30 000 + $1 080 000

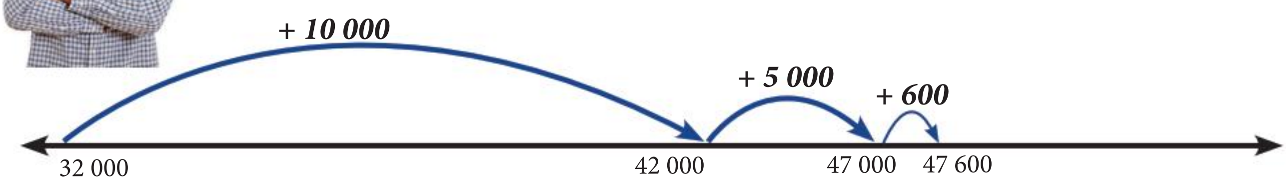
g) $520 000 + $280 000

h) $52 million + $74 million

Paddo's Strategy for Adding Large Numbers

Paddo decided to try the leaping along a number line to add larger numbers. Like Casey, Paddo remembered that to solve a problem such as 15 600 + 32 000, it was easier to start with the larger number and to think of the problem as 32 000 + 15 600.

He broke up 15 600 into 10 000 + 5 000 + 600 and added the parts to 32 000.



He started at 32 000 on the number line, then added 10 000 to get to 42 000 added 5 000 to get 47 000, then added 600 to get 47 600.

Paddo kept track of his thinking by jotting down numbers as he went:

1. Use Paddo's thinking, jottings and diagrams if necessary, to solve the following problems

a) 500 + 700

b) 4 400 + 800

c) 3 860 + 520

d) 430 + 5 800

e) 5 200 + 54 000

f) 53 215 + 6 200

g) 5 000 + 136 000

h) 160 000 + 2 510 000

Reflection and Discussion

Paddo knew his method worked with small amounts of money. He wanted to check that he could still apply his strategy when calculating larger amounts of money.
Can you add $1 500 and $35 600 by leaping along a number line?

In April 2013, a man in Northcote Victoria won $506 000 in Division 1 prizes in Lotto. Six weeks later, he won a further $662 000. What were his total winnings?

Adding larger numbers can sometimes be confusing due to the large number of place values. Verify the solutions to the above two problems using your calculator.

2. Use mental calculations or jottings if necessary, to solve the following problems.

a) $5 600 + $700

b) $3 300 + $720

c) $5 230 + $4 160

d) $560 + $3 800

e)$7 800 +$63 000

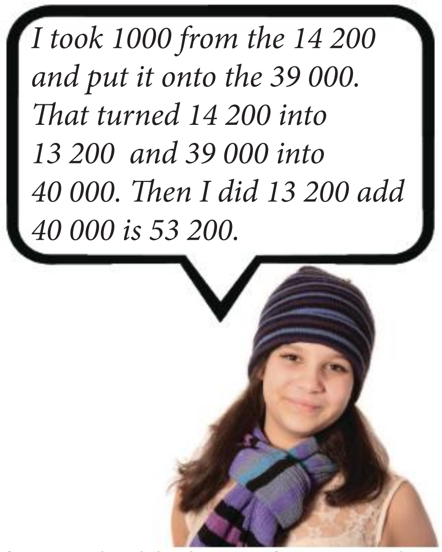
f) $43 620 + $5 180

g) $6 000 + $147 000

h) $250 000 + $1 607 000

Sarah's Strategy for Adding Large Numbers

Sarah decided that she could solve a problem like 14 200 + 39 000 using the method she had used for smaller numbers. Her thinking was as follows:



She took an amount off the first number and added it to the second number, making the calculation much simpler. Sarah used jottings to keep track of her thinking.

1. Use Sarah's thinking and jottings if necessary, to solve the following problems.

a) 4 900 + 5 200

b) 7 800 + 1 600

c) 1 240 + 990

d) 59 000 + 23 000

e) 3 999 + 1 004

f) 230 000 + 590 000

g) 699 999 + 200 001100

h) 1 800 000 + 2 900 000

Reflection and Discussion

Sarah was confident her method could be applied to adding large amounts of money.

Try using Sarah's method to add $23 600 and $36 900 .

Flights from Perth to Beijing in China, were $1 150 and flights from Beijing to New Delhi in India were $1 950. Calculate the cost of flying from Perth to New Delhi via Beijing.

Adding larger numbers can sometimes be confusing due to the large number of place values. Verify the solutions to the two problems above, using your calculator.

2. Use mental calculations or jottings if necessary, to solve the following problems.

a) $2 500 + $3 900

b) $2 995+ $5 405

c) $7 800 + $2 500

d) $64 000 + $99 000

e) $532 000 + $398 000

f) $695 000 + $240 000

g) $59 000 + $135 000

h) $1 499 000 + $5 005 000

Revision: The Best Strategy

1. Choose the most suitable mental strategy to solve these problems.

a) 7 800 + 2 100

b) 5 600+ 550

c) 5 600 + 8 200

d) 7 999 + 3 010

e) 52 000 + 39 000

f) 177 000 + 35 000

g) 750 + 7 400

h) 1 520 + 350

i) $765 000 + $400 000

j) $3 800 + $59 000

k) $1 800 000 + $270 000

l) $7 300 000 + $3 540 000

Practising Strategies 1

1. Jalen, Casey, Paddo and Sarah decided to travel together to Taiwan, a large island off the coast of mainland China. The following problems relate to their adventure.

For each of the following situations:

- Write a number sentence to help you solve the problem
- Choose the most suitable strategy to solve the problem
- Calculate the solution
- Reflect on your answer. How do you know your answer is correct?

(You might like to check your answer with a calculator)

a) Jalen, Casey and Paddo leave Perth for Taipai, capital of Taiwan. Their flights cost $1 860. Sarah flies out three days later. Her flight cost $520. What is the total cost of their flights?

Write a number sentence.

Which strategy is the best?

What is the answer?

How do you know your answer is correct?

b) The four travellers visit the cities of Taipai (population 2 619 000) and Changhua (population 1 300 000). What was the total population of these two major cities?

Write a number sentence.

Which strategy is the best?

What is the answer?

How do you know your answer is correct?

c) The friends pay for entrance to a museum in Taipai with cash. The entrance fee is 304 000 Taiwanese Dollars and they receive 196 000 Taiwanese Dollars change. How much money did they give the cashier?

Write a number sentence.

Which strategy is the best?

What is the answer?

How do you know your answer is correct?

d) On the last day of their holiday, the four friends had a number of Taiwanese Dollars. They spent 75 000 during the day and still had 46 000 Taiwanese Dollars remaining. How much did they have at the start of the day?

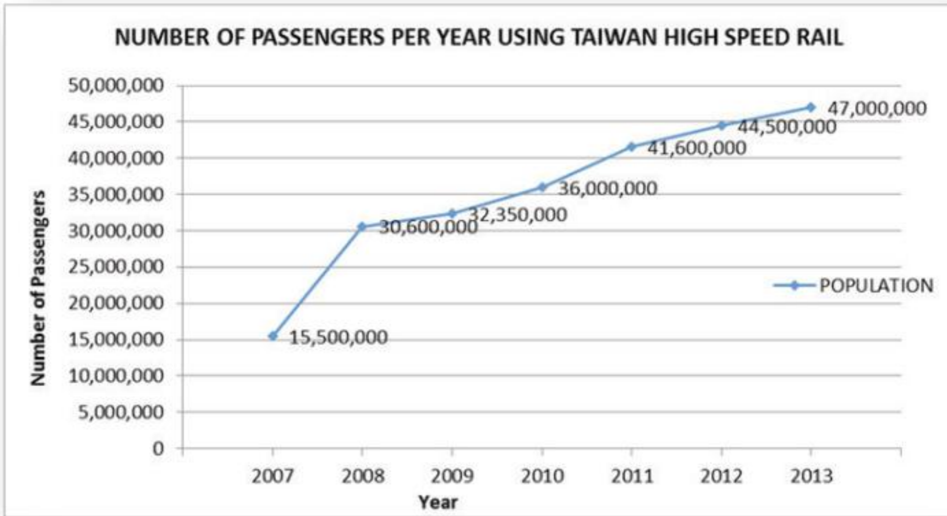
Write a number sentence.

Which strategy is the best?

What is the answer?

How do you know your answer is correct?

2. Whilst in Taiwan, the travellers used the Taiwanese High Speed Rail to travel to different parts of the city. It was obvious the Rail was well used by the Taiwanese population. View the line graph below to solve the following problems.



a) How many passengers rode the Taiwan High Speed Rail in total in 2012 and 2013?

b) From 2010 to 2011, the number of passengers increased by 4 600 000. True or false?

c) From 2007 to 2013 the number of passengers increased by 31 500 000. True or false?

d) Between which two years did the number of passengers increase the most?

Reflection on Learning

Whilst in Taiwan, the four friends hiked the 4 day Nangang District Hiking Trail. They walk 23 000 metres in the first day and 89 000 metres in the next 3 days. Calculate the distance of their hike in metres, using the 4 different methods outlined in this unit of work.
Show jottings to support your thinking in the table below.

Method	Jottings
Jalen	
Casey	
Paddo	
Sarah	

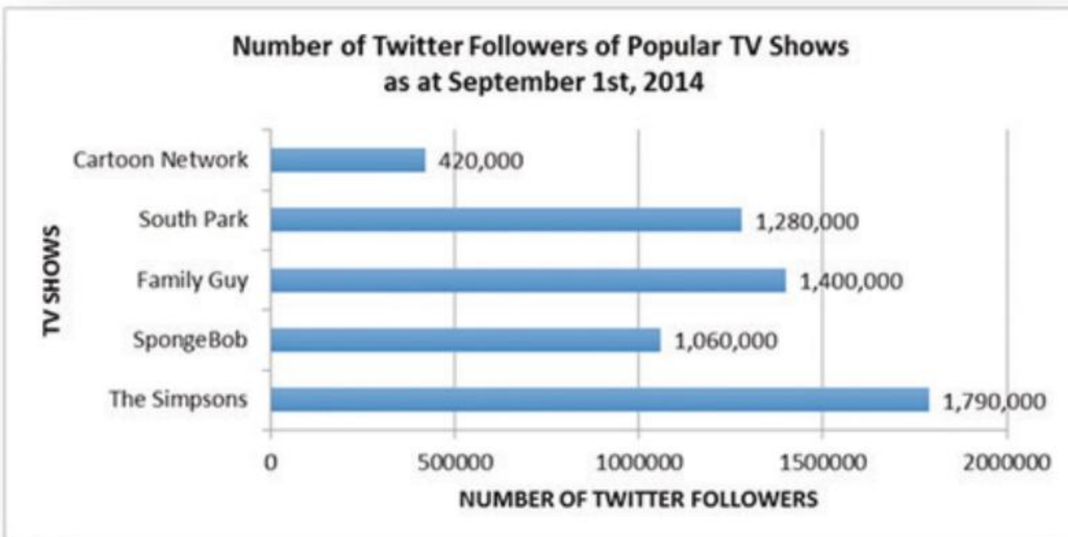
Circle the method that was easiest to use in this particular example. Explain why.

OLNA Practice Questions

1. The approximate population of Perth in 2011 was 1 650 000. In 2031, the population is expected to increase by 650 000. What will be the approximate population in 2031?

A Two million, two hundred and fifty thousand
B 2 300 000
C 2.03 million
D Twenty two million

2. Identify the two shows with the largest number of twitter followers.
What is their combined following?



A. 2 390 000 B. 3 290 000 C. 2 190 000 D. 3 190 000

Topic 4

Understanding and Recalling Basic Subtraction Facts

Mathematics Discussion

Maths is easier if you can remember and recall basic facts. We can use our basic addition facts to help us learn and recall the basic subtraction facts because addition and subtraction are related to each other. This can be demonstrated using Part-Part Whole thinking.

PART = 4	PART = 3
WHOLE = 7	

From this diagram we can generate many equivalent number sentences. For example,

4 + 3 = 7 3 + 4 = 7 7 - 4 = 3 7 - 3 = 4

For addition - TWO PARTS ADD TO MAKE THE WHOLE
For subtraction - WHOLE TAKE ONE PART = OTHER PART

We use Part-Part Whole thinking, together with the 2 main strategies we used for understanding addition of basic facts, to learn and remember the basic subtraction facts. Our strategies are:

- Combinations to Ten. We can use our 'tens facts' to solve subtraction. 10 - 7 = 3 because 7 + 3 = 10
- Doubles and near doubles. Using doubles facts such as 6 + 6 to solve 12 - 6 = 6 or 13 - 6 = 7

Whilst Commutativity was a strategy we used for addition facts, it does not apply to subtraction facts. We can change the order of an addition e.g. 3 + 8 is the same as 8 + 3. BUT, 7 – 5 does not equal 5 - 7.

In this section we will be focussing on problems where a PART is missing and therefore requires SUBTRACTION. These problems come in many forms:

7 - 4 = ?; 7 - 3 = ?; 7 - ? = 4; 7 - ? = 3; ? + 4 = 7; 3 + ? = 7

We can write all subtraction problems as addition and vice versa because addition and subtraction are the inverse operations of each other.

Eventually, basic subtraction facts should be automatic, without thinking of the problem as addition first.

Whole Class Activity 1 - Subtraction Combinations

Record all of the subtraction combinations from 10 - 10 through to 10 - 0 in the table below.

NUMBER	COMBINATIONS	NUMBER OF COMBINATIONS
0	10-10, 9-9, 8-8, 7-7, 6-6, 5-5, 4-4, 3-3, 2-2, 1-1, 0-0.	11
1	10-9, 9-8, 8-7, 7-6, 6-5, 5-4, 4-3, 3-2, 2-1, 1-0.	10
2	10-8,	
3		
4		
5		
6		
7		
8		
9		
10		

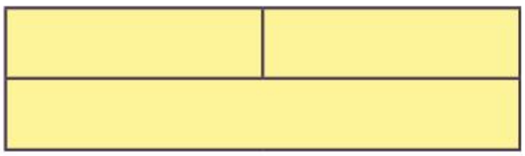
What patterns did you use when you were working out the combinations? What is the connection between the 'NUMBER' and the 'NUMBER OF COMBINATIONS'?

Practice Exercise 1

We can use 'Combinations to 10' to solve subtraction problems.
For example, 14 - 8 can be thought of as 8 + 2 + ? = 14, which is 8 + 2 + 4 = 14. 2 + 4 is 6 so 14 – 8 is 6.
Place the following questions into the Part-Part Whole model to help.

1.

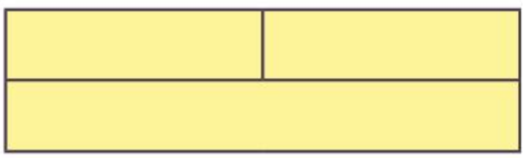
a) 11 - 9



Write the subtraction problem as an addition.

Find the answer.

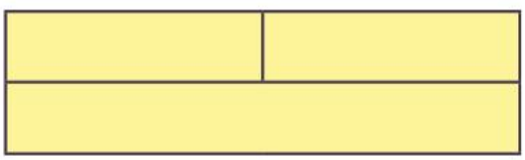
b) 12 - 8= ?



Write the subtraction problem as an addition.

Find the answer.

c) 15 - ? = 9



Write the subtraction problem as an addition.

Find the answer.

2. Use your knowledge of the subtraction facts you have just calculated to solve harder problems:

a)	b)	c)
11 - 9	12 - 8	15 - ? = 9
110 - 90	120 - 80	150 - ? = 90
1 100 - 900	1 200 - 800	$1.50 - ? = 0.90¢
$11 000 - $9000	12 000 - 8000	$15 000 - ? = $9 000

3. Solve the following using 'Combinations to 10' thinking;

a) 11 - 8 = ?

b) 17 - ? = 9

c) 12 - ? = 7

d) 15 - 8 = ?

e) 9 + ? = 13

f) ? = 16 - 9

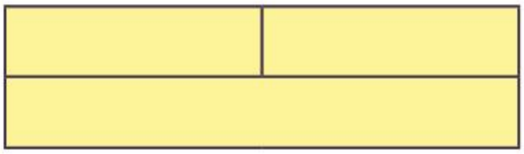
Practice Exercise 3

We can use 'Doubles' to solve subtraction problems. For example, 18 - 9 = ? can be thought of as 9 + ? = 18, which is 9 + 9 = 18.

Place the following questions into the Part-Part Whole model

1.

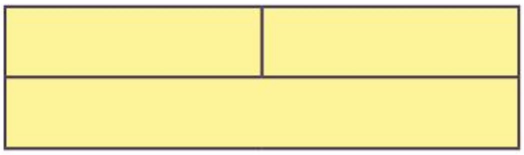
a) 6 - 3 = ?



Write the subtraction problem as an addition.

Find the answer.

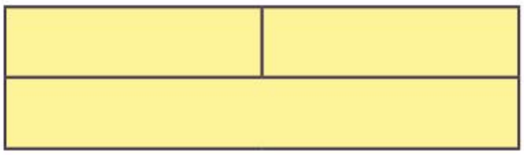
b) 16 - 8= ?



Write the subtraction problem as an addition.

Find the answer.

c) 14 - ? = 7



Write the subtraction problem as an addition.

Find the answer.

2. Use your knowledge of the subtraction facts you have just calculated to solve harder problems.

a)	b)	c)
6 - 3	16 - 8	14 - ? = 7
60 - 30	1 600 - 800	140 - ? = 70
6 000 - 3 000	80 + ? = 160	$14.00 - ? =$7.00
$60 000 - $30 000	16 000 - 8000	14 million - ? = 7 million

3. Solve the following subtraction problems using 'Doubles' thinking.

a) 10 - 56 - 3 = ?

b) 10 = 20 - ?

c) 814 - ? = 47

d) 18 - ? = 9

e) ? + 8 = 16

f) 8 = 4 + ?

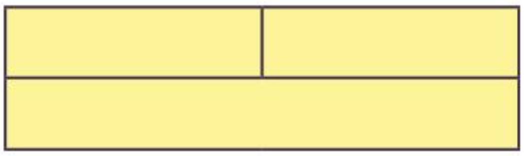
Practice Exercise 4

We can use 'Near Doubles' to solve subtraction problems.

Place the following questions into the Part-Part Whole model

1.

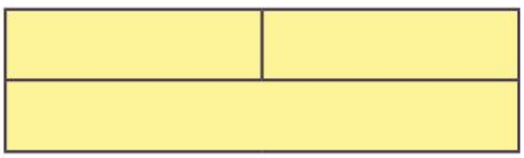
a) 9 - 4 =



Write the subtraction problem as an addition.

Find the answer.

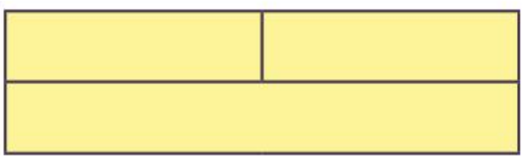
b)17 - 8= ?



Write the subtraction problem as an addition.

Find the answer.

c) 16 - ? = 7



Write the subtraction problem as an addition.

Find the answer.

2. Use your knowledge of the subtraction facts you have just calculated to solve harder problems.

a)	b)	c)
9 - 4	17 - 8	16 - ? = 7
90 - 40	1 700 - 800	70 + ? = 160
900 - 400	80 + ? = 170	$1.60 - ? = 0.70¢
$9 000 - $4 000	17 000 -– 8 000	$16 000 - ? = $7 000

3. Solve the following subtraction problems using 'Near Doubles.'

a) 7- 3 = ?

b) 15 - ? = 7

c) 17 - ? = 8

d) 8 - ? = 3

e) ? + 5 = 12

f) 9 = 4 + ?

Practice Exercise 5

1. Use part whole thinking, combinations to ten, doubles and near doubles to solve the following problems.

PROBLEM	WRITE AS AN ADDITION	STRATEGY	SOLUTION
14 - 7			
8 - 3 = ?			
15 - ? = 8			
17 - 9 = ?			
8 - ? = 4			
11 - ? = 5			
13 - ? = 8			
20 = ? + 10			

2. Use inverse thinking to solve the following problems.

a) 5 - 2

b) 8 - 5 = ?

c) 8 - ? = 3

d) 70 - ? = 30

e) 10 - 4 = ?

f) 19 - 9

g) 9 - ? = 1

h) 6000 - 3000

i) $17 - ? = $9

j) $1200 - ? = $800

k)13c - 6c = ?

l)$18 - $9

3. Use the relationship between addition and subtraction to complete all spaces in the following tables. Each row and column must add to the numbers in grey.

1.

a)

3		5
	3	12

b)

6		8
	11	20

c)

	$4	$8
$13		$20

d)

20		100
	120	190

e)

2		4	7
	5	1	
3			5
	8		20

f)

300	100		
		200	800
200	400		700
	900		2000

An Approach to Learning and Retaining Basic Subtraction Facts

FIVE MINUTE FURY!

Working with a partner, roll one 20 sided and one 10 sided dice simultaneously. Subtract the smaller amount from the larger and call out your response. Complete the activity for 5 minutes.
On the table below, place a line through all the facts you could recall instantly (within 3 seconds).

SUBTRACTION CHART				
1 - 1 = 0 2 - 1 = 1 3 - 1 = 2 4 - 1 = 3 5 - 1 = 4 6 - 1 = 5 7 - 1 = 6 8 - 1 = 7 9 - 1 = 8 10 - 1 = 9	2 - 2 = 0 3 - 2 = 1 4 - 2 = 2 5 - 2 = 3 6 - 2 = 4 7 - 2 = 5 8 - 2 = 6 9 - 2 = 7 10 - 2 = 8 11 - 2 = 9	3 - 3 = 0 4 - 3 = 1 5 - 3 = 2 6 - 3 = 3 7 - 3 = 4 8 - 3 = 5 9 - 3 = 6 10 - 3 = 7 11 - 3 = 8 12 - 3 = 9	4 - 4 = 0 5 - 4 = 1 6 - 4 = 2 7 - 4 = 3 8 - 4 = 4 9 - 4 = 5 10 - 4 = 6 11 - 4 = 7 12 - 4 = 8 13 - 4 = 9	5 - 5 = 0 6 - 5 = 1 7 - 5 = 2 8 - 5 = 3 9 - 5 = 4 10 - 5 = 5 11 - 5 = 6 12 - 5 = 7 13 - 5 = 8 14 - 5 = 9
6 - 6 = 0 7 - 6 = 1 8 - 6 = 2 9 - 6 = 3 10 - 6 = 4 11 - 6 = 5 12 - 6 = 6 13 - 6 = 7 14 - 6 = 8 15 - 6 = 9	7 - 7 = 0 8 - 7 = 1 9 - 7 = 2 10 - 7 = 3 11 - 7 = 4 12 - 7 = 5 13 - 7 = 6 14 - 7 = 7 15 - 7 = 8 16 - 7 = 9	8 - 8 = 0 9 - 8 = 1 10 - 8 = 2 11 - 8 = 3 12 - 8 = 4 13 - 8 = 5 14 - 8 = 6 15 - 8 = 7 16 - 8 = 8 17 - 8 = 9	9 - 9 = 0 10 - 9 = 1 11 - 9 = 2 12 - 9 = 3 13 - 9 = 4 14 - 9 = 5 15 - 9 = 6 16 - 9 = 7 17 - 9 = 8 18 - 9 = 9	10 - 10 = 0 11 - 10 = 1 12 - 10 = 2 13 - 10 = 3 14 - 10 = 4 15 - 10 = 5 16 - 10 = 6 17 - 10 = 7 18 - 10 = 8 19 - 10 = 9

Which subtraction facts were the most difficult to remember? Discuss.
Circle the facts on the table that cannot be recalled instantly.
Write them in the space below:

Circle each of the above facts into groups of 3. Learn each of the facts in the group, using combinations to ten, doubles, near doubles and part whole thinking.
Use tens frames, grid paper or a part whole diagram to form a mental image of each fact.

Ask your partner to 'test' you on these 3 facts. If you get them correct for three days in a row, then cross the facts off and learn three new facts.

Practice Exercise 4

Games to Assist in Practising and Retaining Basic Subtraction Facts

SUBTRACTION BATTLE - a card game.

NUMBER OF PLAYERS
2 – 4 players

AIM
To have the largest number of cards at the end of 10 minutes

EQUIPMENT
A deck of cards where Jacks are assigned a value of 10; Queens = 11; Kings =12; Aces = 1.

RULES OF GAME

1. Deal the cards face down until the deck runs out. Each player keeps his cards in a stack.
2. Each player turns two cards face up, and subtracts one card from the other. For example, if a 7 and a 4 are drawn, their answer is 3. If another player draws a 10 and a 2 then their answer is 8. They win because their answer is larger.
3. The winner collects all the cards and places them at the bottom of their pile.
4. If each player has the same answer, then it's 'Battle'! Reverse the operation and do addition with the same two cards. The winner of the round is the player who has the largest number when the cards are added.
5. At the end of 10 minutes each player counts his cards. The player with the most cards wins.

COMPLEMENTS TO 20 - a dice game.

NUMBER OF PLAYERS
3 players: one recorder and two competitors

AIM
To call out the complement to 20 before your opponent.

EQUIPMENT
A 20-sided dice, a Recording table, below.

RULES OF GAME

1. The recorder rolls the dice. The first player to call out the complement to 20 scores a point. For example, if a 13 is rolled, the players must call out 7 because 20 – 13 = 7.
2. The recorder then scores a point for the player who called out the complement first into the table below.
3. The winner is the player who has the greatest number of points after a 5 minute period.

	Tally	Total
Player A		
Player B		

VARIATIONS
Use two 10-sided dice and have players add the two numbers together after rolling both dice and THEN find the complement to twenty.

Practice Exercise 5

PHONE/TABLET APPS

Download the following free Apps to practise your basic subtraction facts.

Subtraction Wiz Free; The Rocket Studio
Basic Math with Smarty; Otto App Studio
Simple Sums v 1.0; Sygem; IwGame
King of Maths 1.3.4; Oddrobo Software AB
Basic Math v 3.30; ExplorerTechnologies
Adding Numbers Funbrain MathGame; Arkadiusz Adach

Reflection on Learning 1 - Extending Basic Facts

A maths class at Newton Moore Senior High School was asked: 'If you know 19 - 3 = 16, what other facts do you know?' The class responded as follows;

19 - 3 = 16
$1900 - $300 = $1600
19 tens + 3 tens = 16 tens
19 million - 3 million = 16 million
16c + 3c= 19c

Complete a similar activity with the following facts on a blank sheet of paper. Share your responses.

9 - 2 = 7 | *11 - 7 = 4* | *13 - 4 = 9* | *18 - 8 = 10*

Reflection on Learning 2 - Subtraction and Addition Strategies

Use subtraction and addition strategies to complete the following two-way table as quickly as possible. Use Part-Part Whole thinking to make it easier.

-	3	7	8	2	1	5	9	6	4	10
10										
13										
20										
12										
11										
15										
17										
14										
16										
5										

Reflect on your learning in this topic.
Have your basic subtraction number skills improved? Discuss.

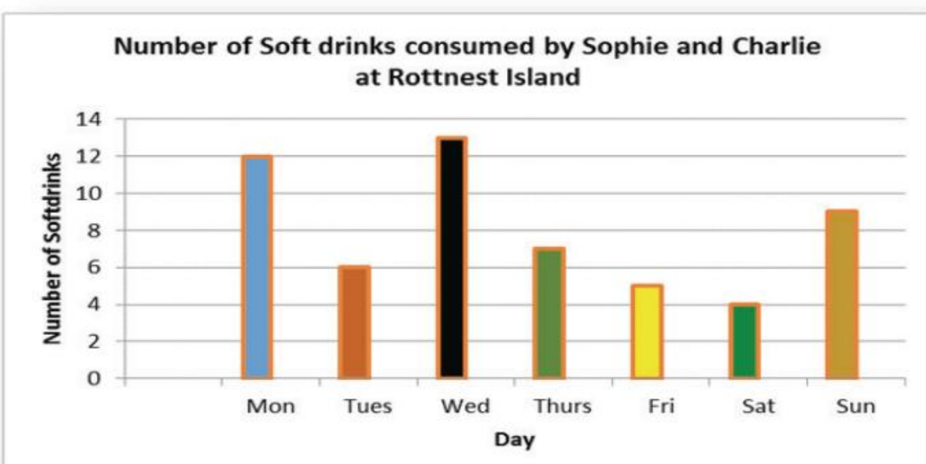
REMEMBER: Learning basic facts takes time, and after they are learnt, you need to practise them so that they are not forgotten. The brain is like any other muscle in the body, it gets better with practice.

Learn then practise.
Then after that, practise, practise, practise…

OLNA Practice Questions

1. The sum of the opposite faces of a standard six sided dice is always 7.
   Htet rolls three dice.
   He adds the top faces and gets 11.
   What is the sum of the three opposite faces?
   A. 8 B. 12 C.11 D. 10

2.



On which two consecutive days is the difference between the numbers of soft drinks consumed, 5?
A. Monday and Tuesday
B. Tuesday and Wednesday
C. Wednesday and Thursday
D. Saturday and Sunday

Topic 5

Subtraction of Whole Numbers and Money

Mathematics Discussion

We can break up (partition) numbers and/or use inverse thinking to help us solve subtraction problems in different ways. We use different strategies depending on the types of numbers in the problem.

- For 124 - 41:
  We can count backward by tens, then ones from 124 as follows:
  124 - 10 - 10 - 10 - 10 - 1 = 83, that is:
  124, 114, 104, 94, 84, 83.
- For 85 - 57:
  We break up 57 and subtract it from 85 as follows:
  85 - 50 - 5 - 2 = 28
- For 76 - 39:
  We can add or subtract an equal amount to both numbers to make one of them into a 'tens' number.
  For example, we can think of 76 - 39 as 77 - 40 = 37 by adding a one to each of the numbers.
- For 63 - 56:
  We can change the subtraction problem into an addition problem, using our understanding of Part-Part Whole. We can solve 63 - 56 = ? by thinking of the problem as 56 + ? = 63.
  As 56 + 7 = 63 then 63 - 56 = 7.
- For 63 - ? = 14
  We can also use Part-Part Whole thinking to solve more complex problems such as 63 - ? = 14 or 14 + ? = 63. Both of these problem can be thought of as 63 - 14 = ?

We can use diagrams or written jottings to help keep track of calculations that cannot be completely stored in our heads.

Whole Class Activity 1

Think: How can we manipulate numbers to make subtraction easier?

FOUR DIFFERENT METHODS

Casey, Paddo, Lauren and Jessie were calculating 57 - 39.

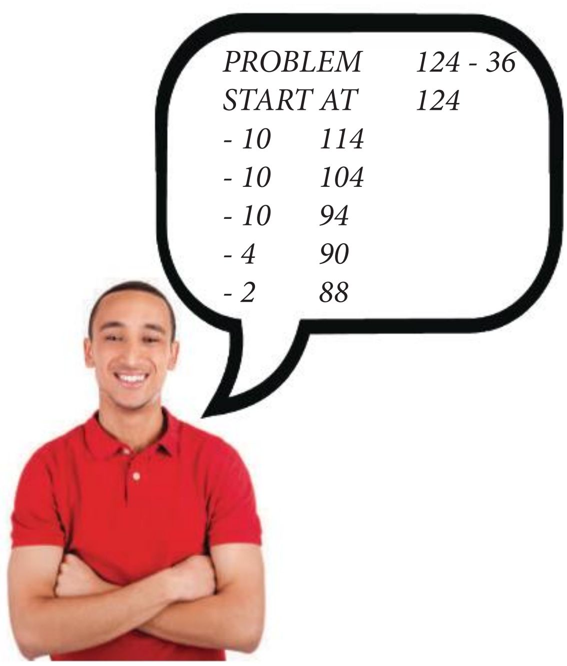
Casey said 57, 47, 37, 27, 20, 19, 18
Paddo said 57 - 30 - 7 - 2 = 18
Lauren said 57 - 39 = 58 - 40 = 18
Jessie said 39 + ? = 57 therefore 39 + 18 = 57

What were the four students thinking?
Explain their thinking using a table, number line or diagram.

What is the difference between the strategies?

Casey's Strategy for Subtracting Numbers

Casey uses counting forward and backward to solve problems. He explained his method of counting backward to solve subtraction problems using a table. He demonstrated a problem such as 124 – 36 as follows:



1. Use Casey's thinking and the grids to solve the following problems:

a)

PROBLEM	68 - 23
START AT	

b)

PROBLEM	114 - 23
START AT	

c)

PROBLEM	246 - 25
START AT	

d)

PROBLEM	56 - 34
START AT	

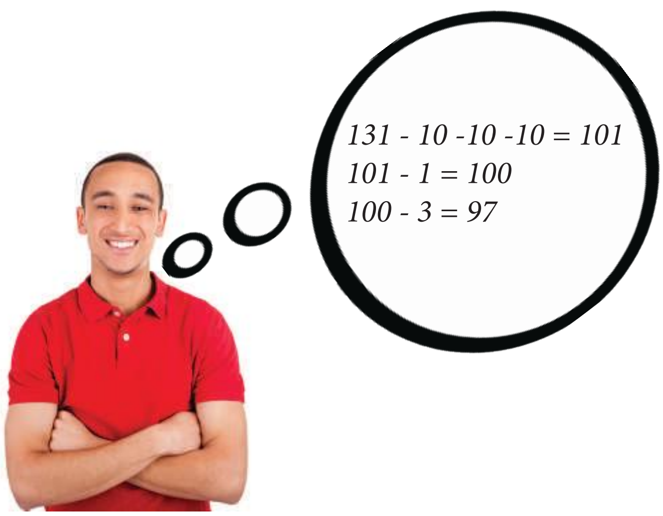
e)

PROBLEM	136 - 47
START AT	

f)

PROBLEM	523 - 32
START AT	

Casey tried to solve problems by mentally counting backwards. To subtract 34 from 131, he thought:



Casey sometimes found he needed to write down a few numbers to keep track of where he was up to. In those questions, Casey used a table like those above.

2. Use Casey's method to mentally solve the following problems. Use jottings to help if necessary.

a) 54 - 21

b) 94 - 33

c) 134 - 42

d) 233 - 52

e) 174 - 35

f) 224 - 30

Reflection and Discussion

Casey was confident his counting backward method would work with money.

Calculate $125 - $43 by counting backward?

Does this work when you have to subtract cents; $32.20 - $0.50?

What do you think?

3. Use Casey's method to mentally solve the following money problems. Use jottings to help if necessary.

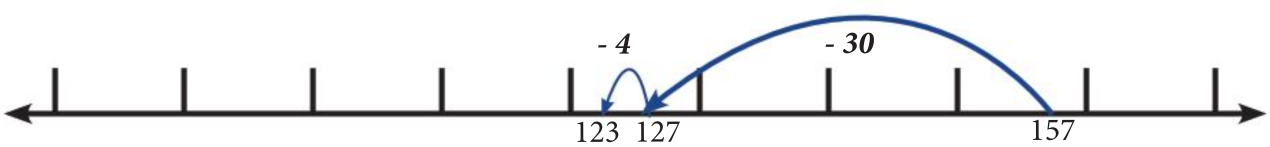
a) $1.30 - 0.40¢ d) $96 - $34

b) $10.45 =-0.65¢ e) $4.20 - $1.40

c) $122 - $41 f) $522 - $36

Paddo's Strategy for Subtracting Numbers

Paddo likes using a number line to solve problems.
He demonstrated 157- 34 as follows:



Paddo partitioned the number 34 to make the subtraction easier. He thought of 34 as being 30 + 4. He did this because it is easy to subtract 30 from a number (ie 157 subtract 30 is 127). He then subtracted 4 from 127 to make 123.

1. Use Paddo's strategy to calculate the following on a number line.

a) 46 - 9

a) 47 - 33

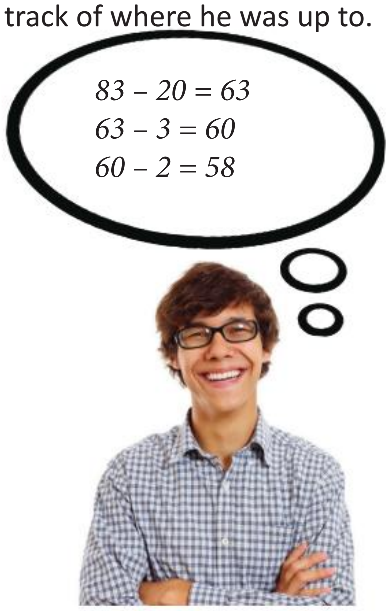
b) 72 - 36

c) 127 - 51

d) 780 - 350

e) 245 - 180

Paddo tried to solve problems by visualizing the leaps along a number line. However, he found he needed to write down a few numbers to keep track of where he was up to.
To subtract 25 from 83, he wrote:



2. Use Paddo's method to mentally solve the following problems. Visualise the number line and use jottings to help if necessary.

a) 45 - 9

b) 95 - 47

c) 182 - 61

d) 53 - 32

e) 64 - 25

f) 254 - 130

Reflection and Discussion

Paddo wondered whether the same method would work with money.

Can you calculate \$85 - \$38 by leaping along a number line?

Does this work when you have to subtract cents; \$65.50 - \$13.20?

What do you think?

3. Use Paddo's method to solve the following money problems.

a) $67 - $8

b) $74 - $52

c) $51 - $24

d) $13 - $9.50

e) $3.25 - 0.15c

f) $12.10 – $9.30

4. Use Paddo's method to mentally solve the following money problems.
Use jottings to help if necessary.

a) $82 - $8

b) $54 - $36

c) $1.60 - 0.85¢

d) $47 - $23

e) $4.70 - $3.50

f) $25 - $16.30

Reflection and Discussion

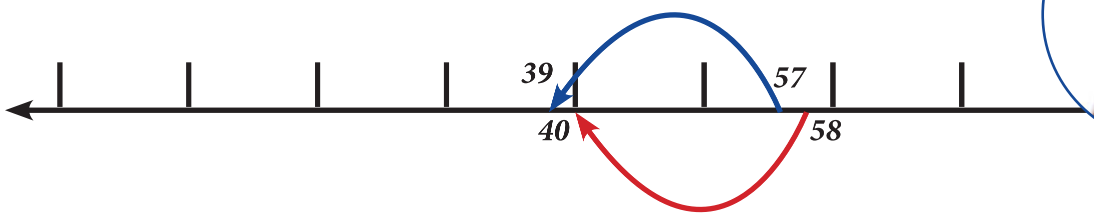
How are Casey and Paddo's methods similar?

How are the methods different?

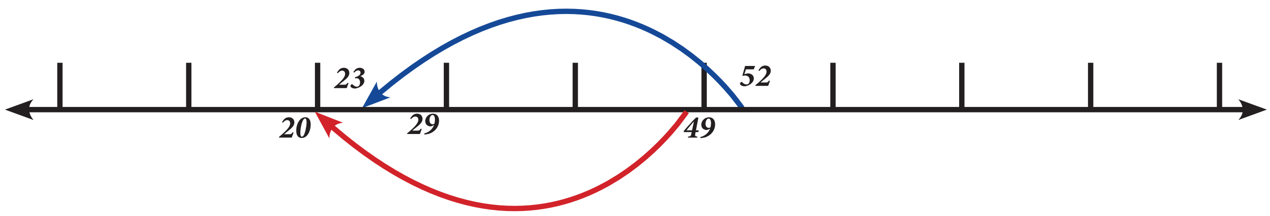
What types of problems suit Casey's method best? What types of problems suit Paddo's method best?

Lauren's Strategy for Subtracting Numbers

To solve 57 - 39, Lauren used a number line too. She added 1 to each of the numbers, making 57 - 39 into 58 - 40. This works because the difference between 57 and 39 is the same as the difference between 58 and 40.



Sometimes Lauren had to add or subtract more than 1 to a number to make the next ten. For example to solve 52 - 23, she can subtract three from each number making it 49 - 20, which is much easier.



1. Use Lauren's strategy to calculate the following on a number line.

   a) 56 - 9

   b) 37 - 9

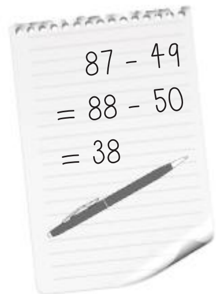
   c) 53 - 19

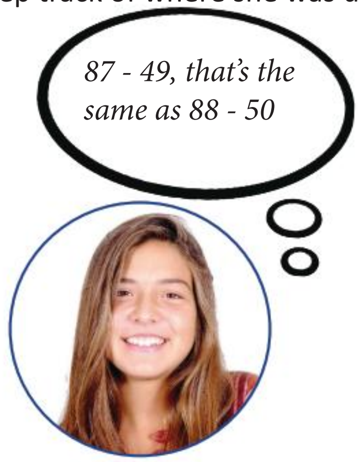
   d) 83 - 38

   e) 110 - 21

   f) 460 - 22

Lauren tried to solve problems by visualising differences on a number line. However, she found she needed to write down a few numbers to keep track of where she was up to.
To subtract 49 from 87, she wrote down:





2.Use Lauren's method to mentally solve the following problems.
VisualiSe the number line and use jottings to help if necessary.

a) 72 - 9

b) 68 - 39

c) 170 - 83

d) 32 - 18

e) 50 - 21

f) 380 - 290

3. Use Lauren's method to mentally solve the following money problems.

a) $67 - $29

b) $5 - $1.95

c) $50 - $2.99

d) $132 - $58

e) $11 - $1.05

f) $121 - $10.90

Reflection and Discussion

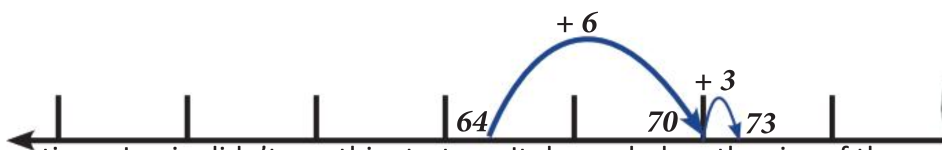
Paddo and Lauren were talking about how each of their mental methods best suited particular problems.
Paddo thought problems such as 62 - 25 best suited his method.
Lauren thought that problems such as 81 - 29 best suited hers.
What do you think?

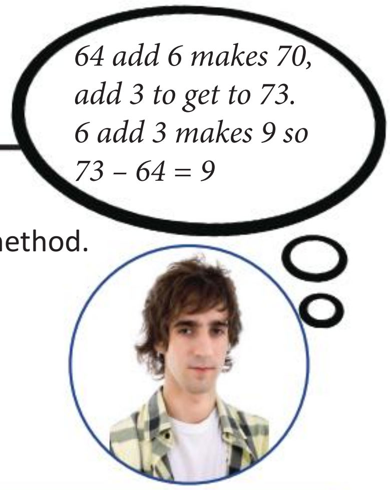
Jessie’s Strategy for Subtracting Numbers

Jessie uses the Part-Part Whole model to help solve a variety of subtraction problems.
When solving a problem such as 73 - 64, Jessie used the model to change the problem from a subtraction into an addition.
Jessie placed the numbers into the Part-Part Whole model as follows:

64	?
73	

He then wrote the number sentence: 64 + ? = 73
Jessie then counted forwards using a number line to solve the problem by addition.



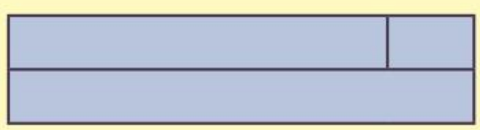


Sometimes Jessie didn’t use this strategy. It depended on the size of the numbers in the problem. If the numbers were 73 – 25, Jessie would think of this as subtraction and solve it using either Casey, Paddo’s or Lauren’s method.

Reflection and Discussion

Why would it be easier to solve 73 - 64 as an addition (64 + ? = 73) and 73 - 25 as a subtraction?

(HINT: you might like to use a Part-Part Whole diagram and an example with smaller numbers to help explain eg, 18 - 3 and 18 - 16.)



1. Use Jessie's thinking to complete the following.

a) 45 - 38

Draw the Part-Part Whole model and place the numbers in the model.

Write 2 equations from the model that would solve the problem.

Circle whether it's easier to solve the problem by:

ADDITION SUBTRACTION

Calculate the answer.

b) 93 - 87

Draw the Part-Part Whole model and place the numbers in the model.

Write 2 equations from the model that would solve the problem.

Circle whether it's easier to solve the problem by:

ADDITION SUBTRACTION

Calculate the answer.

c) 57 - 13

Draw the Part-Part Whole model and place the numbers in the model.

Write 2 equations from the model that would solve the problem.

Circle whether it's easier to solve the problem by:

ADDITION SUBTRACTION

Calculate the answer

d) 76 - 57

Draw the Part-Part Whole model and place the numbers in the model.

Write 2 equations from the model that would solve the problem.

Circle whether it's easier to solve the problem by:

ADDITION SUBTRACTION

Calculate the answer

Jessie's Strategy for Solving More Complex Subtraction Problems

To solve more complex subtraction problems such as 28 + ? = 105, Jessie used the Part-Part Whole model to change the problem from addition into subtraction.

Jessie placed the numbers into the Part-Part Whole model then wrote the number sentence:
105 - 28 = ?

28	?
105	

He then solved the problem using Casey, Paddo or Lauren's method.
For example, 105 - 28
= 107 - 30
= 77 (Lauren)

Other subtraction problems such as 50 - ? = 24 can also be solved using Part-Part Whole.
Jessie placed the numbers into the model then wrote the number sentence 50 - 24 = ?

?	24
50	

He then solved the problem using Casey, Paddo or Lauren's method.
For example, 50 - 24
= 50 - 20 - 4 (or 50 - 10 - 10 - 4)
= 46 (Paddo or Casey)

1. Use Jessie's thinking to complete the following. Try to solve the problems mentally.

a) 54 + ? = 100

Draw the Part-Part Whole model and place the numbers in the model.

Write an equation from the model that would solve the problem.

Calculate the answer.

b) 95 - ? = 42

Draw the Part-Part Whole model and place the numbers in the model.

Write an equation from the model that would solve the problem.

Calculate the answer.

c)33 + ? = 95

Draw the Part-Part Whole model and place the numbers in the model.

Write an equation from the model that would solve the problem.

Calculate the answer.

d) 126 - ? = 59

Draw the Part-Part Whole model and place the numbers in the model.

Write an equation from the model that would solve the problem.

Calculate the answer.

e) 72 = ? + 18

Draw the Part-Part Whole model and place the numbers in the model.

Write an equation from the model that would solve the problem.

Calculate the answer.

Reflection and Discussion

The Part- Part Whole model can help change problems into both addition and subtraction. We can then decide whether it is easiest to solve the problem as addition or subtraction. This decision depends on the type and placement of the numbers in the problem.

Circle the problems that are easiest to solve by subtraction

23 + ? = 51	54 - 18
63 - 56	32 + 51
61 - ? = 29	74 - ? = 13
? – 17 = 41	? + 48 = 112

Write 3 more problems that are easiest to solve by subtraction.

Swap with your partner to solve their 3 problems. Discuss.

Reflection and Discussion

Jessie wondered whether his understanding of Part-Part Whole would help solve problems involving money.

Can you calculate $123 - $117 by changing it into an addition problem?

Does this work when you have to subtract money problems with cents; $34.25 - $33.75? What do you think?

How can using this method help, if you are working in a shop and are giving a customer change from their purchase?

Explain using the example ‘A customer purchases a t-shirt for $44.50. How much change would you give from $50?’

Can you calculate ? + $24 = $51 by changing it into a subtraction problem?

Does this work when you have to calculate money problems with cents; $9.50 + ? = $23.25
What do you think?

How can using this method help when solving an example such as 'Sadie has saved some money and Kirstin has saved $79. Together they have $156. How much does Sadie have?'

2. Use Jessie's understanding of Part-Part Whole to solve the following money problems. Use number sentences and jottings to help if necessary.

a) $52 - $45

b) $131 = ? + $12

c) ? + $9.50 = $18.20

d) $168 - ? = $97

e) $1.10 - 0.95¢

f) $11.10 + ? = $19.60

Revision: The Best Strategy

1. Choose the most suitable strategy to solve the following problems. Sometimes the problem may involve using two strategies, such as Jessie's and Lauren's. Circle both if this is the case. Try to do the problem mentally. If this is difficult, use jottings or a number line.

a) 87 - 76	J C P S	b) 134 - 42	J C P S
c) 40 - 29	J C P S	d) 73 - ? = 36	J C P S

e) 48 + ? = 134	J C P S	f) 254 - 137	J C P S
g) 838 - 819	J C P S	h) $257 - $23	J C P S
i) $62 - $19.95	J C P S	j) ? + $4.80 = $5.30	J C P S
k) $1.15 - 0.35c	J C P S	l) $185 + ? = $274	J C P S

Practising Strategies 1

CARD ACTIVITY - 21

NUMBER OF PLAYERS
2 - 4

AIM
To subtract two digit numbers mentally

EQUIPMENT
Pack of playing cards with the tens and picture cards removed.
Scrap paper for jottings

RULES OF THE GAME

1. Shuffle the deck and deal 4 cards to each player. Place remaining cards in a central pile.
2. Each player creates two, 2 - digit numbers from their cards. The goal is to create two numbers that have a difference as close to 21 as possible (For example, a player may have drawn the cards 8, 6, 5, and 4, creating the problem 85 – 64 = 21.)
3. After players have created their numbers, they place their cards face up in front of them, ar ranging them so other players can see their two numbers.
4. The player with the difference closest to 21, wins. The winner collects the cards from all the players and places them in their own separate pile. In the case of a tie, the dealt cards are shared between the winners.
5. Players choose another 4 cards from the central pile and continue the game until all cards are used. The player with the most cards after the last round wins the game.

Variations:
To make the game more challenging, choose 6 cards from the pile, create two, 3 digit numbers and create a subtraction problem that is closest to 250.

Practising Strategies 2

PHONE/TABLET APPS
Download one of the following free Apps onto your phone or tablet to practise your subtraction skills
Kids Learn Math Game; Mobileroo Pty Ltd
Basic Math with Smarty; Otto App Studio
Simple Sums v 1.0; Sygem; IwGame
King of Maths 1.3.4; Oddrobo Software AB

Practising Strategies 3

1. Malaysia is located in Southeast Asia. The following questions all relate to this country.
For the following problems:
- Draw a diagram best suited to the problem
- Write a number sentence to help you solve the problem
- Choose the most suitable strategy to solve the problem
- Calculate the solution
- Reflect on your answer. How do you know your answer is correct?

a) Male Orangutans in the protected area of Sabah in Malaysia, have an average weight of 72kg. The females have an average weight of 49kg. How much larger, on average, is the male Orangutan?

Draw a diagram

Write a number sentence

Choose the strategy

Calculate the solution

How do you know your answer is correct?

b) Recycled glass in Malaysia is paid at a rate of US$32 per tonne, whilst recycled plastic receives US$60 per tonne. How much more per tonne is received for plastic?

Draw a diagram

Write a number sentence

Choose the strategy

Calculate the solution

How do you know your answer is correct?

c) Malaysia has 150 species of snake, of which 134 are non-venomous. How many are venomous? Draw a diagram Write a number sentence Choose the strategy Calculate the solution How do you know your answer is correct?
d) The life expectancy for males in Malaysia in 1965 was 64 years. It increased to reach 72 years in 2015. How many years did the life expectancy of males increase during this 50 year period? Draw a diagram Write a number sentence Choose the strategy Calculate the solution How do you know your answer is correct?
e) The average rainfall in April in Kuala Lumpur, the capital of Malaysia is 280mL. The average monthly rainfall in June is 149mL less. What is the average monthly rainfall for June? Draw a diagram Write a number sentence Choose the strategy Calculate the solution How do you know your answer is correct?

f) There are 134 species of frogs and bats in the protected Taman Negara National Park in Malaysia. There are 55 species of frogs. How many species of bats are there?

Draw a diagram

Write a number sentence

Choose the strategy

Calculate the solution

How do you know your answer is correct?

2. The following table shows the crops grown by farmers in the Kedah region of Malaysia.

	Grows Cocoa	Doesn't Grow Cocoa	Total
Grows palm oil	46		134
Doesn't grow palm oil			
Total	65		263

a) How many farmers grow Palm Oil but not Cocoa?

b) How many farmers grow Cocoa but not Palm Oil?

c) How many farmers do not grow Palm Oil?

d) How many farmers do not grow Cocoa?

e) How many farmers do not grow either crop?

Reflection on Learning

On your own, write 8 subtraction questions, in mixed order, that are best suited to Casey's, Paddo's, Lauren's or Jessie's methods.

On a separate piece of paper, calculate the solutions.

Swap your questions with your partner.

Ask them to nominate the best method for solving each of your 8 problems and then solve them.

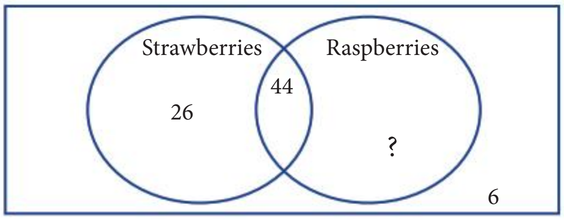
Compare and explain your strategies. Did your partner's choice of strategy match your own? Why or why not?

OLNA Practice Questions

1. The normal price of diesel at a petrol station is $1.60 per litre.
   A customer has a voucher that offers a saving of 4c per litre.
   How much does the customer pay per litre?

   A $1.20 B $1.44 C $1.56 D $1.64

2. A group of 85 people at a Fruit and Vegetable market were asked whether they like strawberries or raspberries. The results are shown in the Venn diagram below:



   How many people liked raspberries but not strawberries?
   A. 9 B. 19 C. 12 D. 15

Topic 6

Subtraction of Large Whole Numbers and Money

Mathematics Discussion

We can manipulate numbers to help make mental subtraction of large numbers easier.

1. We can change subtraction problems into addition, using Part-Part Whole. We can solve
   75 000 – 66 000 by thinking of the problem as: 66 000 + ? = 75 000.
   We can count forward from 66 000 until we reach 75 000.
   66 000, 67 000, 68 000, 69 000, 70 000 add 5 000, that's 9 000.

2. We can solve 123 000 – 34 000 by counting backward from 123 000 by 10 000's as follows:
   123 000 – 10 000 – 10 000 – 10 000 – 3 000 – 1 000 = 89 000, that's
   123 000, 113 000, 103 000, 93 000, 90 000, 89 000.

3. We can solve 75 000 – 36 000 by breaking up 36 000 into 30 000 + 5 000 + 1 000 and using a leaping back along a number line approach from 75 000 as follows:
   75 000 – 30 000 – 5 000 – 1 000 = 39 000

4. We can solve 95 000 – 38 000 by adding or subtracting an equal amount to both numbers to make one of them into a 'tens' number (eg 10's, 100's, 1000's etc).
   For example, we can think of 95 000 – 38 000 as follows:
   97 000 – 40 000 = 57 000.
   We added two thousand to each of the numbers.

5. If the problem is more complex, such as: 65 000 - ? = 27 000 or ? + 27 000 = 65 000,
   We can use a combination of the previous strategies to solve.
   For example:
   Part-Part Whole helps us think of both these problems as a subtraction.
   That is, 65 000 – 27 000 = ?
   Leaping back along a number line then helps us to think of the problem as:
   65 000 – 25 000 – 2 000 = 38 000.

We can use diagrams or written jottings to help keep track of calculations that cannot be completely stored in our heads.

Whole Class Activity 1

Think: How can we use the strategies for subtracting smaller numbers when we need to subtract larger numbers?

Try to solve this problem, 39 560 – 37 500

Record the steps that you took to do the subtraction.

Share your thinking with your partner. Did you break up the numbers in the same way? What other strategies were used in the class?

Decide as a class, what the best strategy for this particular problem would be.

Jessie's Strategy for Subtracting Large Numbers

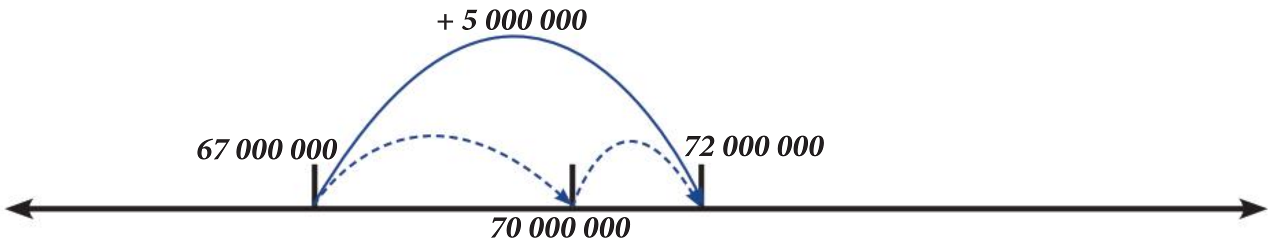
Jessie wanted to know if his strategy of using addition as the inverse of subtraction worked for solving subtraction of larger numbers, just as it did for subtracting smaller numbers.

When solving a problem such as 72 000 000 – 67 000 000, Jessie placed the numbers onto the Part-Part Whole model as follows:

67 000 000	?
72 000 000	

He reflected on the two equations that could be used to solve the problem:
72 000 000 – 67 000 000 = ?
67 000 000 + ? = 72 000 000

He decided that in this type of problem, it was much easier to think of addition.
Jessie then counted forwards from 67 000 000 on a number line to solve the problem using addition.



67 million add 3 million is 70 million, add 2 million is 72 million.
That is 67 000 000 + 5 000 000 = 72 000 000. The answer is 5 000 000.

1. Use Jessie's thinking and jottings if necessary, to solve the following problems:

a) 7 500 - 6 900

b) 45 000 - 37 000

c) 33 500 - 32 800

d) 143 000 - 137 000

e) 572 000 - 493 000

f) 131 000 - 92 000

g) 1 120 000 - 940 000

h) 2 230 000 - 2 190 000

Reflection and Discussion

Jessie was confident his method could be applied to subtracting large amounts of money for certain types of problems.
Try using Jessie's method to calculate. $2 150 000 - $1 960 000

The movie 'Harry Potter and the Order of the Phoenix' made $896 000 000 whilst 'Harry Potter and The Order of the Phoenix' made $939 000 000. Use Jessie's thinking to calculate the difference between the two movies?

Verify the solutions to the two problems above, using your calculator.
Does Jessie's method work for larger money amounts?

2. Use mental calculations or jottings if necessary, to solve the following problems using Jessie's adding on strategy.

a) $4 200 - $3 800

b) $12 200 - $11 500

c) $3 550 - $2 700

d) $58 500 - $56 700

e) $152 000 - $146 000

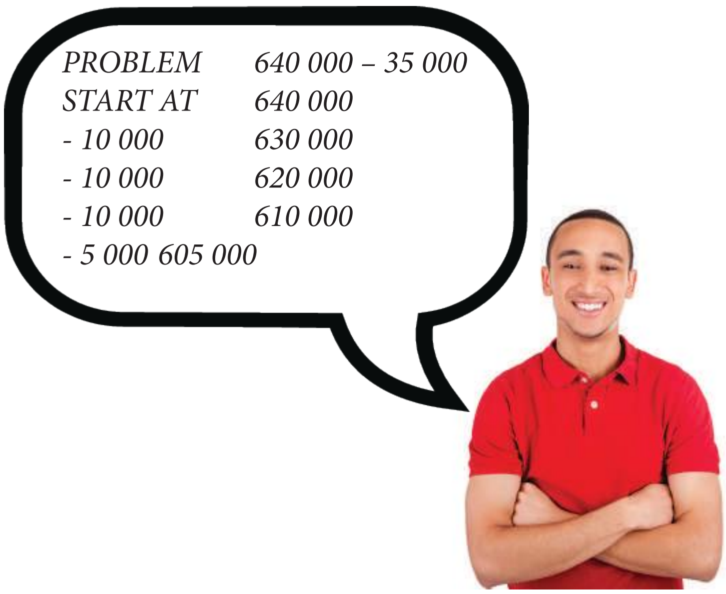
f) $262 000 - $248 000

g) $121 000 - $85 000

h) $2 010 000 - $1 925 000

Casey's Strategy for Subtracting Large Numbers

Casey was confident he could use forwards or backwards counting to subtract larger numbers. When solving a problem such as 640 000 – 35 000, he started at 640 000 and then counted backward by tens of thousands and then thousands as follows:



The numbers Casey counted backward by, depended on the size of the numbers in the problem.

- In problems such as 9 700 - 250, he counted backward by hundreds, then tens.
- In problems such as 56 000 – 4 000, he counted backward by thousands.

Sometimes Casey used forwards counting instead of backwards counting.

- To solve 6 500 – 2300 he counted backwards.
- To solve 6 500 – 4 2 000 he counted forwards.

1. Use Casey's forwards or backwards counting method, with diagrams and jottings if necessary, to solve the following problems.

a) 6 300 - 500

b) 34 000 - 27 000

c) 210 000 - 35 000

d) 545 000 - 65 000

e) 630 000 - 440 000

f) 1 100 000 - 900 000

g) 200 300 - 500

h) 1 000 020 - 60

Reflection and Discussion

Casey's forwards or backwards counting method worked with small amounts of money.
Does his method work with larger amounts of money?
Would you calculate $1 200 000 - $800 000 by counting forwards or backward?

Kaleb paid an $8 500 deposit on a motorbike worth $43 500. How much did he still owe on the bike?

Subtracting larger numbers can sometimes be confusing due to the large number of place values. Verify the solutions to the above two problems using your calculator.

2. Use mental calculations or jottings if necessary, to solve the following problems using Casey's method.

a) $5 200 - $400

b) $53 000 - $45 000

c) $350 000 - $60 000

d) $13 000 - $9 500

e) $740 000 - $620 000

f) $1 020 000 - $40 000

g) $154 400 - $600

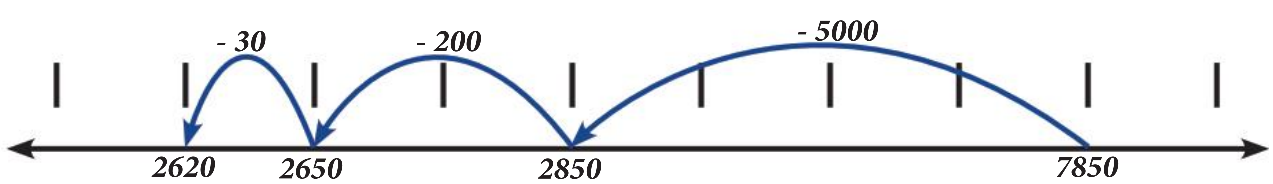
h) $2 000 000 - $1 640 000

Paddo's Strategy for Subtracting Large Numbers

Paddo decided to try the leaping along the number line strategy he had used for small numbers to subtract larger numbers.

Before solving a problem such as 7 850 – 5 230, he broke the 5 230 into 5 000 + 200 + 30 and then subtracted the parts from 7 850.

He started at 7 850 on the number line, subtracted 5 000 to get 2 850, then subtracted 200 to get 2 650 and finally subtracted 30 to get 2 620



Paddo kept track of his thinking by jotting down numbers as he went :

1. Use Paddo's thinking, diagrams and jottings if necessary, to solve the following problems.

a) 5 700 - 300

b) 7 800 - 3 200

c) 9 460 - 320

d) 2 200 - 700

e) 3 500 - 800

f) 63 500 - 21 000

g) 147 000 - 25 000

h) 2 156 000 - 1 103 000

Reflection and Discussion

Paddo knew his method worked with small amounts of money. He wanted to check that he could use his strategy when calculating larger amounts of money.
Can you calculate $540 000 - $135 000 by leaping along a number line?

The average house price in Karratha in September 2013 was $630 000. This fell by $80 000 in the following month. What was the average house price in Karratha in October 2013?

Subtracting larger numbers can sometimes be confusing due to the large number of place values. Verify the solutions to the above two problems using your calculator.
Does Paddo's method work for larger money amounts?

2. Use mental calculations or jottings if necessary, to solve the following problems using Paddo's method.

a) $5 800 - $1 300

b) $16 750 - $3 500

c) $8 760 - $4 300

d) $4 500 - $700

e) $74 000 - $32 000

f) $82 000 - $24 000

g) $154 000 - $7 000

h) $2 650 000 - $1 320 000

Lauren's Strategy for Subtracting Large Numbers

Lauren decided that there was an easier way than Paddo's leaping along a number line method for solving problems such as 53 000 - 29 000. Her thinking was as follows:

Lauren kept track of her thinking by jottings, as follows:

1. Use Lauren's thinking and jottings if necessary, to solve the following problems.

a) 6 500 - 900

b) 35 000 - 17 000

c) 24 500 - 9 500

d) 167 000 - 138 000

e) 872 000 - 9 000

f) 530 000 - 295 000

g) 152 000 - 1 999

h) 1 530 000 - 1 190 000

Reflection and Discussion

Lauren was confident her method could be applied to subtracting large amounts of money.

Try using Lauren's method to calculate. $164 000 - $119 000

Steven Spielberg's highest grossing movies, were 'ET' which made $1 129 000 000 and 'Jaws' which made $1 019 000 000. How much did 'ET' exceed 'Jaws' in gross dollars?

Check the solutions with your calculator if necessary.

Does Lauren's method work for larger money amounts?

2. Use mental calculations or jottings if necessary, to solve the following problems.

a) $7 200 - $900

b) $63 000 - $48 000

c) $5 250 - $1 950

d) $154 000 – $128 000

e) $372 000 - $9 000

f) $622 000 - $195 000

g) $233 000 - $2 999

h) $3 530 000 - $1 980 000

Solving more Complicated Subtraction Problems Using a Combination of Strategies

Part-Part Whole thinking is very useful for solving more complicated problems.

When solving a problem such as 185 000 + ? = 350 000, place the numbers in the Part-Part Whole model as follows:

185 000	?
350 000	

Then the problem can be thought of as 350 000 - 185 000 = ? or as 185 000 + ? = 350 000 and can be solved using the method that best suits the problem.

This could be:
Jessie's method to use part whole thinking to count forward;
Casey's method to count forwards or backward by 'tens' numbers;
Paddo's method to partition one number and take the parts from the other; or
Lauren's method to add or subtract an equal amount to make a 'tens' number.

Which of these would you use to solve this problem?

1. Use Part-Part Whole and one of the strategies above to mentally solve the following problems. Use jottings or a number line to help.

a) ? + 4 200 = 9 500

b) 37 000 + ? = 58 000

c) ? = $123 000 - $48 000

d) 970 000 - ? = 490 000

e) 8 900 000 = 10 000 000 - ?

f) $720 000 = $50 000 + ?

g) ? = 43 560 - 42 300

h) $2 100 000 - ? = $1 900 000

Revision: The Best Strategy

Which strategy do you like the best? Often, this can vary according to the numbers in the problem. It can also sometimes involve using 2 strategies. Choose the most suitable mental strategy for each problem and then solve.

a) 5 600 - 2 400

b) 6 350 - ? = 750

c) 8 400 - 2 900

d) 3 200 - ? = 700

e) 73 400 + ? = 73 650

f) ? + 8 000 = 12 350

g) $724 000 - ? = $680 000

h) 268 000 - 42 000

i) $36 500 - $2 900

j) ? + $199 000 = $360 000

k) $651 000 - $295 000

l) $2 340 000 - $2 299 000

Practising Strategies

1. Jessie, Casey, Paddo and Lauren have decided to travel to Vietnam.

The following problems relate to their adventure.

For each of the following situations:

- Write a number sentence to help you solve the problem
- Choose the most suitable strategy to solve the problem
- Calculate the solution
- Reflect on your answer. How do you know your answer is correct?

(You might like to check your answer with a calculator)

a) Lauren had saved $12 000 for the trip whilst Paddo had saved $9 500. How much more did Lauren have to spend?

Write a number sentence.

Which strategy is the best?

What is the answer?
How do you know your answer is correct?

b) In Ho Chi Min City, Casey spent 29 000 VND (Vietnamese Dong) less on dinner than Jessie did on his. Jessie's dinner cost 484 000 VND. How much was Casey's dinner?

Write a number sentence.

Which strategy is the best?

What is the answer?
How do you know your answer is correct?

c) Accommodation in Ho Chi Min City cost 16 650 000 VND (Vietnamese Dong) for a moderately priced hotel, or 7 200 000 VND less for a budget hotel. How much would it cost to stay in a budget hotel?

Write a number sentence.

Which strategy is the best?

What is the answer?
How do you know your answer is correct?

d) Lauren went on the Mountain Bike and Rafting Adventure tour in Hanoi which cost 2 350 000 VND. Jessie chose to do the shorter Mountain Bike tour which cost 1 450 000 VND. How much more expensive was Lauren's tour?

Write a number sentence.

Which strategy is the best?

What is the answer?
How do you know your answer is correct?

2. This graph shows the prices, in Vietnamese Dong, of meal options at five restaurants in Ho Chi Minh City, Vietnam.

a) How much more did it cost to eat a meat meal at the Moon Restaurant than a fish meal?

b) What was the difference in fish meal prices between Le Petra's and Café 128?

c) How much cheaper is it to eat a vegetarian meal at Cinnamon's than at the Moon?

d) Which two restaurants have a difference in their vegetarian meal prices of 87 000 VND?

e) What is the difference in price between a meat and vegetarian meal at Scotty's?

Reflection on Learning

a) Circle the problems in ***red*** in the table below that would be best suited to Jessie's method of counting forward.

63 000 – 58 000	$4 600 - $ 1 800
831 000 – ? = 499 000	? + 620 000 = 750 000
1 200 000 – 450 000	$276 500 - $134 500
73 050 = 72 850 + ?	2 752 000 – 1 900
$5 470 000 + ? = $5 650 000	$675 000 - $599 000

What types of subtraction problems are best suited to Jessie's method?

Design 3 problems of your own that would best be solved using Jessie's method. Include one that involves Part-Whole thinking.

b) Circle the problems in ***green*** in the table above that would be best suited to Casey's method of counting backward in tens numbers.
What types of subtraction problems are best suited to Casey's method?

Design 3 problems of your own that would best be solved using Casey's method. Include one that involves Part-Whole thinking.

c) Circle the problems in ***black*** in the table above that would be best suited to Paddo's Method to partition one number and take the parts from the other.
What types of subtraction problems are best suited to Paddo's method?

Design 3 problems of your own that would best be solved using Paddo's method. Include one that involves Part-Whole thinking.

d) Circle the problems in ***blue*** in the table above that would be best suited to Lauren's method to add or subtract an equal amount to make a 'tens' number.
What types of subtraction problems are best suited to Lauren's method?

Design 3 problems of your own that would best be solved using Lauren's method. Include one that involves Part-Whole thinking.

OLNA Practice Question

1.
100 040, 100 030, 100 020, 100 010, 100 000, _______
Which number comes next in this sequence?

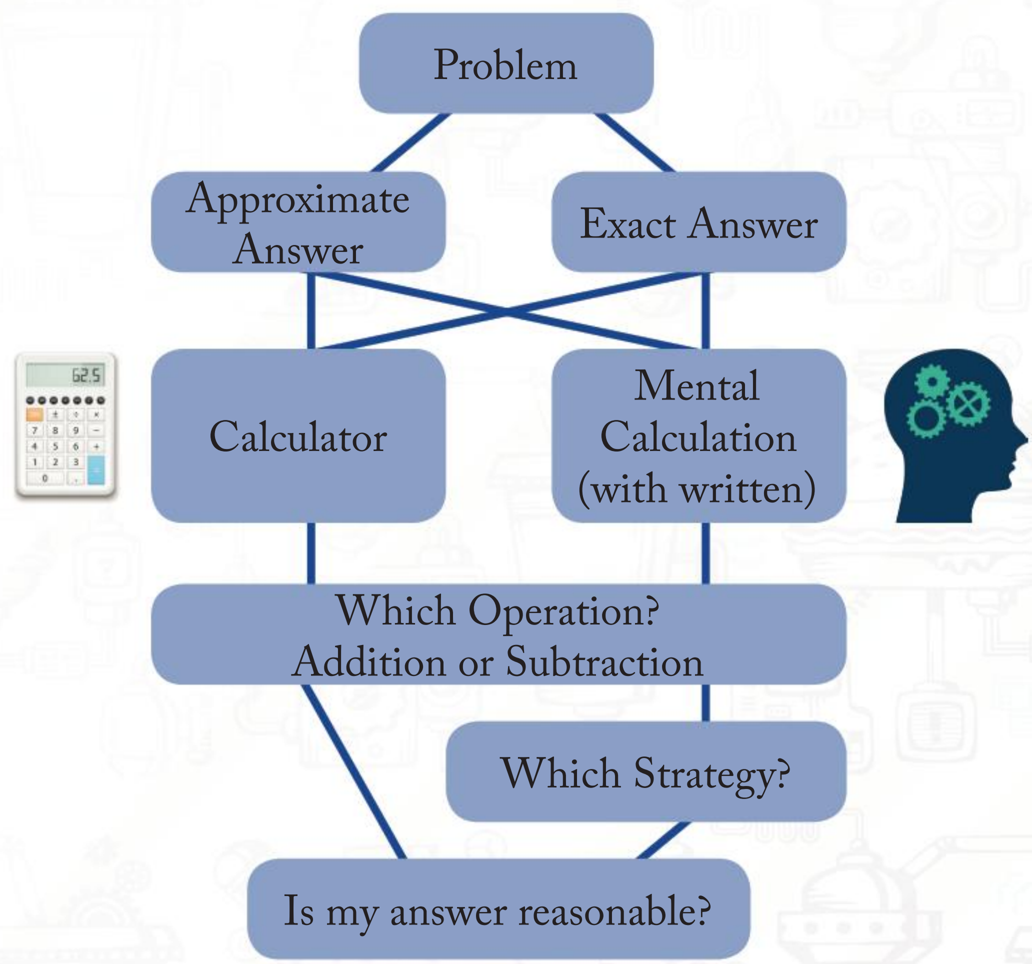
A. 99 990　　B. 99 090　　C. 999 990　　D. 99 000

Topic 7

Choosing Between Mental and a Calculator to Solve Problems

Mathematics Discussion

When solving addition and subtraction problems, we make many decisions. Firstly, we decide whether an exact answer is needed or whether an approximate answer will be good enough. Next we decide whether to solve the problem mentally, (using written jottings to keep track) or to use a calculator.



We tend to solve a problem mentally if the numbers are not too difficult, and use a calculator for all other problems. After solving the problem, we need to decide whether our solution makes sense. In this section we are dealing with problems that require exact answers. We will be focussing on making the choice between a calculator and a mental calculation.

Whole Class Activity 1

Working in pairs. You and your partner commence work on the following problems at exactly the same time.

STUDENT A is to complete all problems mentally.
STUDENT B is to complete all problems by using a calculator.

The student who finishes first is to call out **"Finished!"**.
The other student is to continue working until they too have finished the problems.

Problem	Solution
5 + 1000	
300 + 50 + 8	
99 + 99 + 99	
1000 - 300	
50 + 50 + 50 + 50 + 50	
3 600 - 1400	
15 000 + 25 000	
$1.00 - 0.75c	
0.25c + 0.75c+ 0.50c	
$1.50 + $1.10 + $3.00	

Who finished first? What did you notice?

Whole Class Activity 2

Complete the following, deciding on whether you would solve the problem using a calculator or mental methods (with written jottings if needed). The first has been completed for you.

Problem	Method		Explanation of Choice
53 + 11		✓	*The problem only involves 2 digits with no carrying. It is quick to solve using Jalen's method.*
			
			
$51.27 - $37.53			
			
			
145 + 32			
			
			
7 200 - 3 900			
			
			
2 145 +1 679			
			
			

What types of problems are best solved using a calculator? Which are best solved using mental? Discuss.

Choosing Which Operation

After deciding that a problem is best solved using either mental strategies or a calculator, the next choice is 'Which Operation, + or - ' to use.

Using part whole thinking, can help us to decide which operation to choose.

- If the WHOLE is missing, we use ADDITION
- If a PART is missing, we use SUBTRACTION

<table>
<tr><td>Part</td><td>Part</td></tr>
<tr><td colspan="2">Whole</td></tr>
</table>

Sometimes it is obvious which operation to choose. For example:

a) 365 988 + 23 654 = ? b) 4 205 000 - 2 478 921 = ?

Sometimes it is not obvious, for example, when solving more complex problems such as

c) ? + 1 300 = 5 500 d) ? - 5498 = 65 783 e) 40 000 - ? = 34 567

When solving these more complex problems, it helps to enter the numbers into a Part-Part Whole diagram.

f) ? +1 300 = 5 500

<table>
<tr><td>?</td><td>1 300</td></tr>
<tr><td colspan="2">5 500</td></tr>
</table>

A PART is missing so we SUBTRACT
5 500 - 1 300 = ?

g) ? - 5498 = 65 783

<table>
<tr><td>5 498</td><td>65 783</td></tr>
<tr><td colspan="2">?</td></tr>
</table>

A WHOLE is missing so we ADD
54 982 + 65 783 = ?

h) 40 000 - ? = 34 567

<table>
<tr><td>?</td><td>34 567</td></tr>
<tr><td colspan="2">40 000</td></tr>
</table>

A PART is missing so we SUBTRACT
400 000 - 34 567 = ?

Whole Class Activity 2

Complete the following problems with the class, discussing your choices as you go.

- Place the numbers into the Part-Part Whole model.
- Write a number sentence to enter into the calculator.
- Use the calculator to find the answer.

a) 6 237 + ? = 11 507

What would you enter into a calculator?

Answer

b) ? + $34.21 = $51.92

What would you enter into a calculator?

Answer

c) 574 - ? = 345

What would you enter into a calculator?

Answer

d) ? - 35 621 = 2876

What would you enter into a calculator?

Answer

e) 678 900 = ? - 347 180

What would you enter into a calculator?

Answer

Whole Class Activity 3

The following table guides the decision making process as outlined by the flow diagram on page 138. Complete the table as a class. The first example has been completed for you.

Problem	Method	Operation	Strategy and Solution	Is your answer reasonable?
154 - 29 = ?	✓	*subtract*	*154 – 29* *= 155 – 30* *= 125*	*yes*
$37 + $22 = ?				
126 + ? = 510				
37356 - 28 947 = ?				
?- $67.17 = $8.25				
$54.05 + $19.99 = ?				
? +7 500 000 = 8 600 000				

Practice Exercise 1

1. Circle the problems that are best solved by calculator.

a) 45 890 - 37 902= ?

b) 54 - 31 = ?

c) 36 + 39 = ?

d) 1 452 + 2 397 = ?

e) ? + 8 = 24

f) 23 - ? = 19

g) 32 876 + ? = 40 001

h) ? - 75 623 = 23 954

i) $152 + $37 = ?

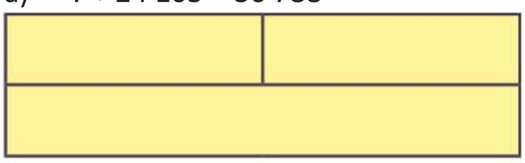
j) $21.50 + $8.50 = ?

k) 5 200 000 - 8 71 7 345 = ?

l) 47 - 38 = ?

2. Solve the following by
   - Placing the numbers into the Part-Part Whole model.
   - Writing a number sentence to enter into the calculator.
   - Using the calculator to find the answer.

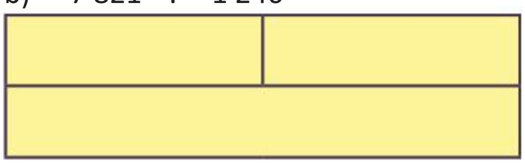
a) ? + 24 105 = 36 788



What would you enter into a calculator?

Answer

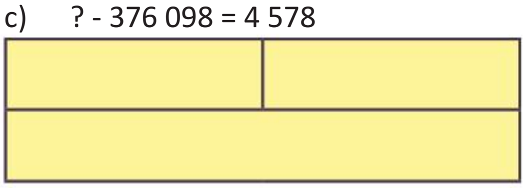
b) 7 821 - ? = 1 246



What would you enter into a calculator?

Answer

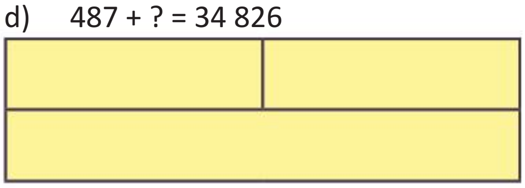
c) ? - 376 098 = 4 578



What would you enter into a calculator?

Answer

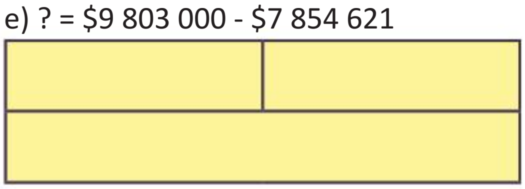
d) 487 + ? = 34 826



What would you enter into a calculator?

Answer

e) ? = $9 803 000 - $7 854 621



What would you enter into a calculator?

Answer

3. Make decisions using the flow diagram on page 138 to complete the following table.

Decide:

- Calculator or mental
- Addition or subtraction
- Which strategy

Problem	Decisions and Solution	Is your answer reasonable? Yes or No
a) \$53 + \$32 = ?		
b) 450 – 380 = ?		
c) \$25807 + ? = \$123600		
d) \$258 - ? = \$23		
e) \$124 - \$39 = ?		
f) ? - 39 = 157		
g) \$35.54 - \$28.78 = ?		
h) ? + 567 235 = 821 889		
i) \$12 .10 - \$10.40 = ?		

4. Use the decision making process outlined in the flow diagram on page 138 to calculate the solutions to the following.

a) 9 + 74 = ?

b) \$51 + \$36 = ?

c) 65 + 28 = ?

d) 86 + ? = 39

i) \$102 - \$18 = ?

j) \$5.30 + \$3.95 = ?

e) 7 409 + 87 603 = ?

f) 219 - ? =193

g) ? - \$500 = \$650

h) ? + \$7.50 = \$13.50

k) \$52.95 + \$47.86 = ?

l) \$51 000 + \$38 000 = ?

Reflection on Learning

Choose two problems from the list below.
The first problem must be best solved mentally and must use addition to calculate the answer.

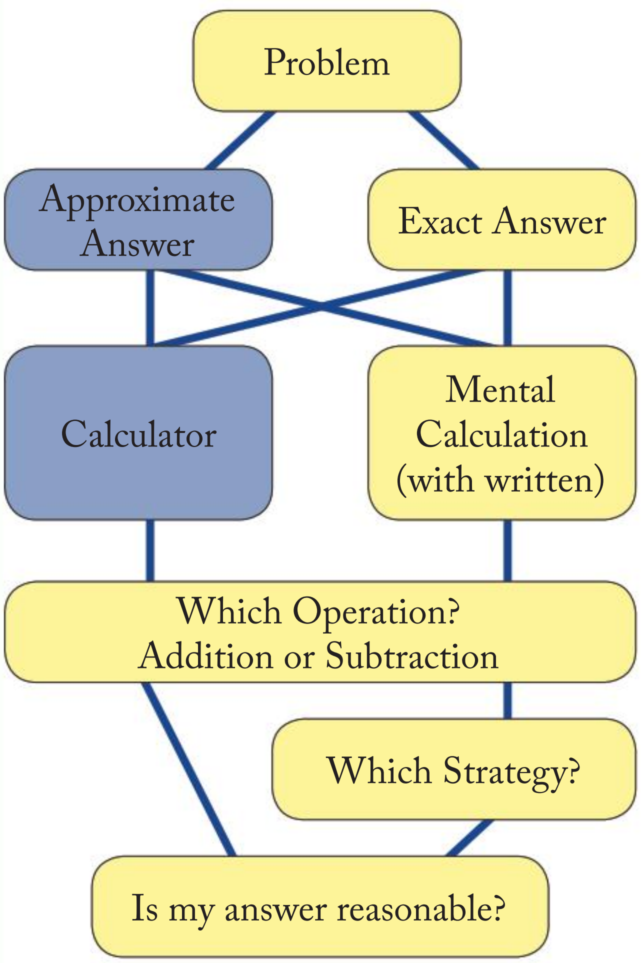
The second one must be best solved using a calculator and must use subtraction to calculate the answer

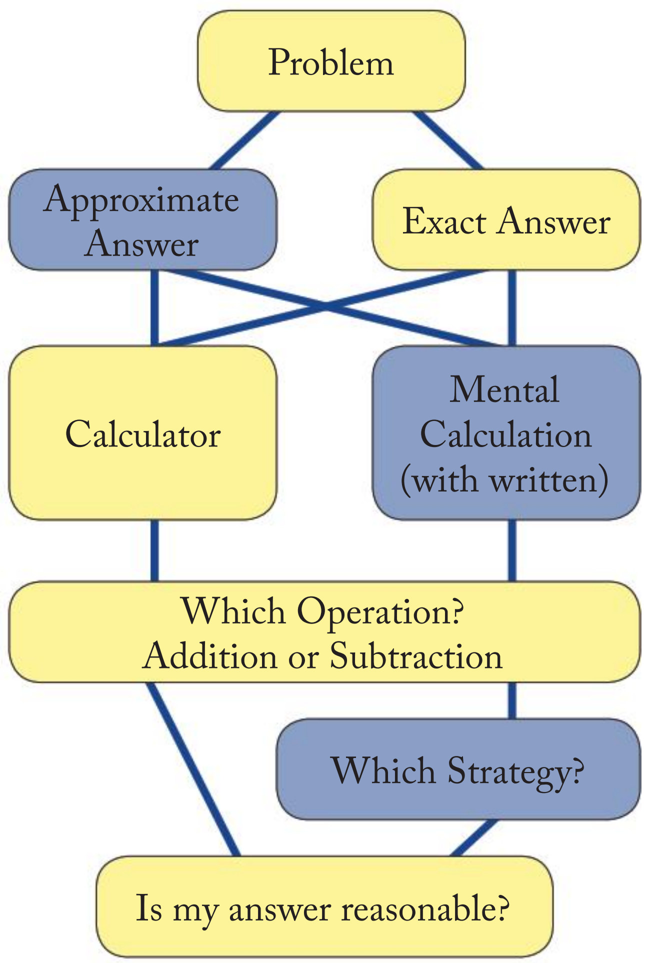
? - 56 899 = 72 105	19 + ? = 47	$65 - ? = $32
? - 3 200 = 5 400	5 763 - ? = 1 326	23 788 + ? = 45 333
? - 934 000 = 1 327 500	? + 290 = 700	30 000 + ? = 150 000

Follow the flow chart in the left to solve the first problem by mental processes.

Follow the flow chart on the right to solve the second problem using a calculator.

Compare your flow charts with a partner. What do you notice?





OLNA Practice Questions

1. Riley was solving the following problem:

27 365 + ☐ = 52 354

He realised the problem would be best solved using a calculator. What would Riley enter into the calculator to solve the problem?

A 52 354 + 27 365 =
B 27 365 – 52 354 =
C 52 354 – 27 365 =
D 27 365 ÷ 52 354 =

2. 273, 324, 375, ________, 477.

The missing number in the sequence above is:

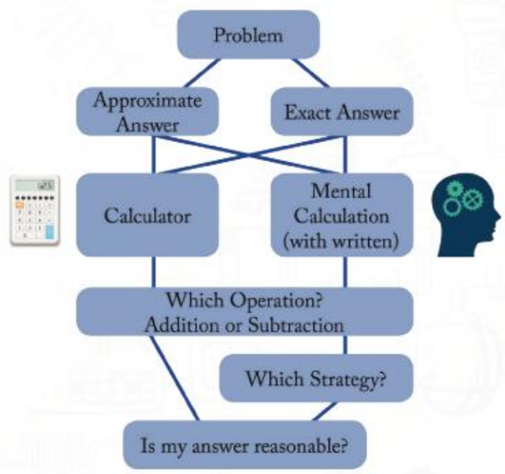
A. 415 B. 425 C. 426 D. 396

Topic 8

Choosing Between Addition and Subtraction to Solve Everyday Problems

Mathematics Discussion

When solving everyday problems involving maths we make many decisions. The list of decisions is shown on our decision making flow chart. First, we decide whether an exact answer is needed or whether an approximate answer will be good enough. Next we decide whether to solve the problem mentally, (using written jottings to keep track) or to use a calculator. Next we decide whether to use addition or subtraction.



Sometimes there is an 'action' suggested in the problem that tells us which operation to choose, for example, in a situation where money is 'spent' we might choose subtraction. Sometimes there is no 'action' to suggest which operation to use and we have to work out which is best. Placing the numbers into a part whole diagram can help us to decide.
For example, Tom has $990 in his Smart Saver bank account. He deposits his tax refund in the account and the balance is now $2 050. How much was the tax refund Tom deposited?

Opening Balance is $990	Deposit ?
Closing Balance is $2050	

This problem could be solved by thinking of this as addition $990 + ? = $2 050.
Sometimes, as in the addition number sentence above, we cannot input the number sentence in a calculator. We need to use part whole thinking and the inverse to write the problem as an equation we can input into a calculator.

The diagram can help us decide which operation to use:

- If the WHOLE is missing, we can use ADDITION
- If a PART is missing, we can use SUBTRACTION

In this case, one of the Parts is missing, so we use subtraction. We can re-write the equation as $2 050 - $990 = ? We can then solve the problem by our chosen method; either using a calculator or by using a mental calculation strategy.

In this section we will be focussing on the 'Which Operation + or – ' section of the flow chart to solve everyday word problems.

Whole Class Activity 1

Think: When solving a word problem, how do I know whether I should use addition or subtraction?

Solve the following problems using the decision making flow diagram:

a) Katie has a Smart Saver bank account. She pays $93.28 for her shopping at the supermarket with eftpos. Her account balance after this purchase is $2 367.54. How much did she have in her account before shopping?

Decide: APPROXIMATE ANSWER or EXACT ANSWER?

Decide: MENTAL or CALCULATOR?

Write a number sentence to reflect the problem.

Place the information in a Part-Part Whole diagram.

Decide whether to use addition or subtraction.
PART missing (subtraction) or WHOLE missing (addition).

Write an equation that can be solved on a calculator.

Solve. If mental, which strategy? If a calculator, enter the numbers.

Calculate the solution.

Check if the answer is reasonable.

b) Tom spent $7 250 on a car and car insurance. If the car was $5 100, how much was the insurance?

Decide: APPROXIMATE ANSWER or EXACT ANSWER?

Decide: MENTAL or CALCULATOR?

Write a number sentence to reflect the problem.

Place the information in a Part-Part Whole diagram.

Decide whether to use addition or subtraction.
PART missing (subtraction) or WHOLE missing (addition).

Write an equation that can be solved on a calculator.
Solve. If mental, which strategy? If a calculator, enter the numbers.

Calculate the solution.

Check if the answer is reasonable

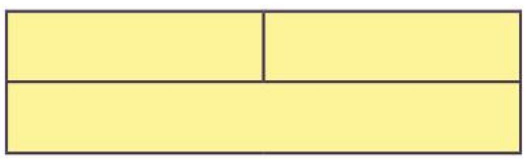
Discussion: When do you have to change the initial number sentence into another number sentence in order to solve a problem with a calculator?

The following problems all require exact answers and are best solved using a calculator.
Complete the problems by:

- Placing the numbers into the Part-Part Whole model.
- Decide whether to use addition or subtraction and write the number sentence you would enter into the calculator.
- Using the calculator to find the answer.

Practice Exercise 1

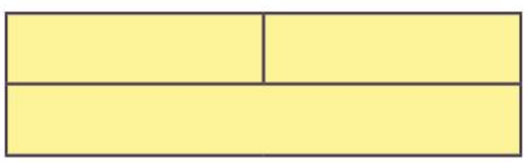
1. a) Ethan withdrew $184 dollars from his bank account to pay for tickets to the School Ball. His bank balance after the withdrawal was $387.53. How much did he have in the bank to start with?



What would you enter into a calculator?

Answer

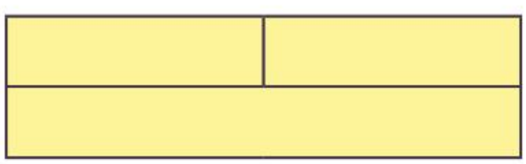
b) For the School Ball, Htet's suit cost $299.95. If his shoes were $150.45 cheaper than the suit; how much were his shoes?



What would you enter into a calculator?

Answer

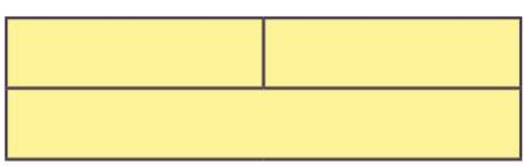
c) Twins, Samantha and Tia paid $135.90 for shoes for the School Ball. Samantha's shoes cost $55.95. How much were Tia's?



What would you enter into a calculator?

Answer

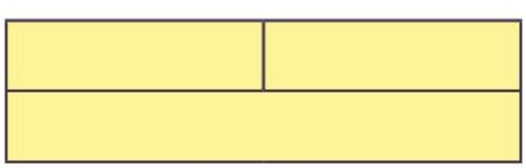
d) Sadie paid the $62.95 manicure for the school Ball by eftpos. After this payment, her account balance was $212.07. How much did Sadie have in the bank before her manicure?



What would you enter into a calculator?

Answer

e) James had saved $310 for the school Ball. He estimated that he needed $500. How much more did he need to save?



What would you enter into a calculator?

Answer

2. The following table guides the decision making process as outlined by the flow diagram on page 138. Complete the table. The first example has been completed for you.

Problem	Method		WHICH OPERATION? Number Sentences and Part/Whole diagram	Strategy and Solution	Is your answer reasonable?
a) Carlos and Harry were the main point scorers in the Basketball games at Country Week. Harry scored 62 points and together they scored 98 points. How many did Carlos score?		✓	*subtract*	*154 – 29* *= 155 – 30* *= 125*	*yes*
b) Dan took $84 spending money to Country Week. He paid for a movie ticket and was left with $66. How much was the movie ticket?					
c) Maddie lost the Speech competition at Country Week by 15 points. She scored 68 points. What did the winner score?					
d) Derby DHS travelled 2393km to get to Country Week. Esperance SHS travelled 728 km. How much further did the Derby team travel?					
e) Australind SHS and Bunbury Catholic College scored a total of 61 goals in the Country Week netball final. If Bunbury scored 38 goals, how many did Australind score?					

f) Country Week for the Northam SHS team cost $72.50 less than Geraldton SHS, which cost $754. How much did the team members from Northam pay?					
					
					
g)Port Hedland SHS scored 32 goals in hockey during Country Week. Karratha SHS scored 15 more. How many goals did Karratha score?					
					
					

3. Use the decision making process outlined in the flow diagram on page 149 to calculate the solutions to the following:

a) Bianca had driven 32 hours, with supervision, after she had received her learner's permit. She then drove a further 27 hours with supervision before earning her 'P' plates. How many hours did Bianca drive with supervision?

b) Caitlyn had $125 in her bank account but would like to have $215 in order to pay for driving lessons. How much more does she need to earn?

c) Belle had some money saved to pay for car insurance. She earned $75 working and now has $752.55 in her bank account. How much did she have to start with?

d) Mitchell had $167 and spent $79 on car seat covers. How much does he have now?

e) Liam had $553 and gave his brother some to help him pay for a new tyre on his car. He now has $372.85. How much did he give his brother?

f) Oscar had some money in his wallet and he loaned $125 to his sister. He now has $19.50 left in his wallet. How much did he have to start with?

1. The following receipts were found in Nikita's purse. Use the decision making process outlined in the flow diagram on page 138 to calculate the missing prices.

Item	Price
Milk	$2.00
Bread	$3.59
Biscuits	$2.84
Total	

Item	Price
Soap	$2.10
Razors	$3.96
Cleanser	
Total $17.98	

Item	Price
Eggs	$4.70
Flour	
Sugar	$2.85
Total $9.23	

Item	Price
Bananas	
Plums	$4.80
Apples	$5.40
Peaches	$7.10
Total $22.00	

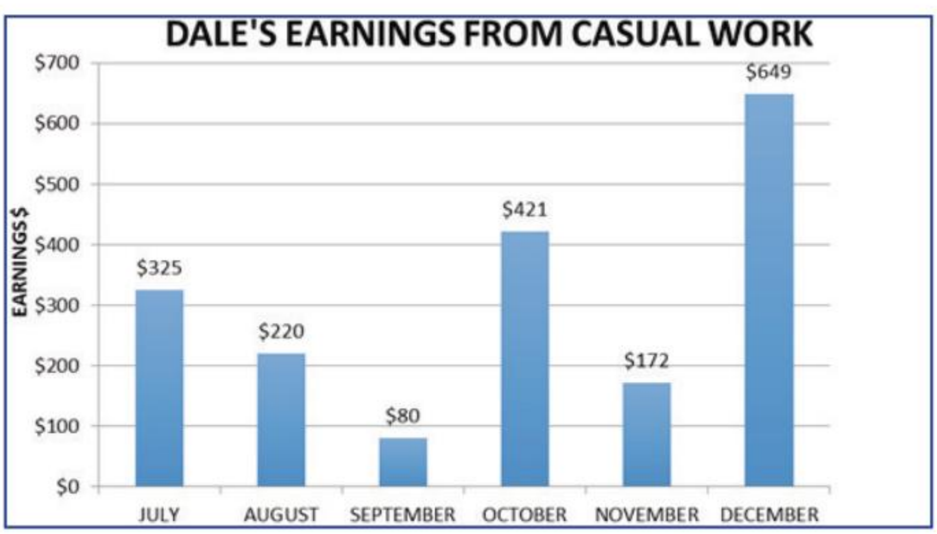
Practice Exercise 2

2. Olivia is saving for "Leavers Week". She has a Commonwealth Savings Account that only allows her to deposit money. Olivia has a part-time job and makes regular deposits into her account.

   Use the decision making process outlined in the flow diagram on page 138 to complete Olivia's bank statement.

AMOUNT IN BANK	DEPOSIT	BALANCE
$62	$19	
	$29	
		$152
		$221
	$92	
		$406
		$500

3. Read the graph and decide whether to use addition or subtraction to solve the following problems.



a) How much did Dale earn in July and August altogether?

b) How much did Dale's earnings increase from November to December?

c) How much less did Dale earn in September than August?

d) Dale's earnings decreased by $249 from December to the next January. How much did he earn in the January?

e) Dale did not spend any money in July. If he had $765 in his savings at the end of July, how much did he have at the start?

4. Many teenagers enjoy takeaway foods but don't know how much salt and sugar is in them. Health experts suggest that teenagers should have a maximum of 1500g of sodium and 25g of sugar per day.

Read the nutritional charts below for some popular take-away foods.

a) Design a menu for a day using only takeaway foods. Your menu must fit within the health expert's suggestions.

NUTRITIONAL CHART

Item	Energy (Kj)	Protein (G)	Fat (G)	Sugar (G)	Sodium (Mg)
Hamburger	2100	31	25	10.5	990
Chicken Burger	1750	18.9	20	3.9	700
Fish Burger	1350	15	14	3.5	610
Bacon/Egg Sandwich	2100	27	22	11	1210
Toast with butter	900	7.5	8	1.2	320
Chicken/Salad Wrap	2360	35	22	7	1380
Medium Chips	1600	5.5	23	0	180
Chicken Nuggets	1260	20	20	0.3	435
Garden Salad	250	1.3	0.5	2	18
Soft Drink Large	910	0	0	55	50
Diet Soft Drink Large	9	0	0	0	75
Milkshake	1910	18	5	75	320
Orange Juice	870	2	0.4	48	13
Soft serve icecream	850	6	7	30	90

Meal	Food Eaten	Sodium	Sugar
Breakfast			
Lunch			
Dinner			
Snacks			
Total			

b) Is it possible to eat only take-away foods for a day and still fit within the health guidelines? From what you know about healthy eating, comment on your menu.

Reflection on Learning 1

Write a number sentence for each of the following problems.
Decide whether your number sentence could go into a calculator or whether you need to use the inverse relationship to change it.

	Number sentence	Okay for calculator?
Aaron Sandilands, the ruckman in the Fremantle Dockers is 211cm tall. He is 37cm taller than Hayden Ballantyne, the Dockers forward. How tall is Hayden?		
Hayden Ballantyne is 37cm shorter than Aaron Sandilands who is 211cm tall. How tall is Hayden?		
Aaron Sandilands is 211cm tall and Hayden Ballantyne is 174cm tall. How much taller is Aaron than Hayden?		
Hayden Ballantyne is 174cm tall and Aaron Sandilands is 211cm tall. How much shorter is Hayden than Aaron?		

Reflection on Learning 2

View the following on youtube to summarize this topic:

- 'Model Drawing: Part-Part-Whole Word Problems' by TheParentCore 3:59
- 'Mattison's Math Moments- Part part whole m4v' by babalien 5:37

OLNA Practice Questions

1. Jordan spent $47.50 on a dress and was given $12.50 change. How much money did she give the Sales Assistant?

A. $50 B. $35 C. $60 D. $70

2. This table shows the approximate populations of 6 cities.

CITY	POPULATION
NEWSTEAD	3 600 000
WAYVIEW	2 100 000
GERALDTOWN	1 400 000
NEWBERRY	875 000
FANBROOK	485 000
MUNSTON	415 000

How many more people live in Wayview than in Fanbrook and Munston combined?

A. 1 200 000 B. 1 100 000 C. 900 000 D. 2 010 000

Topic 9

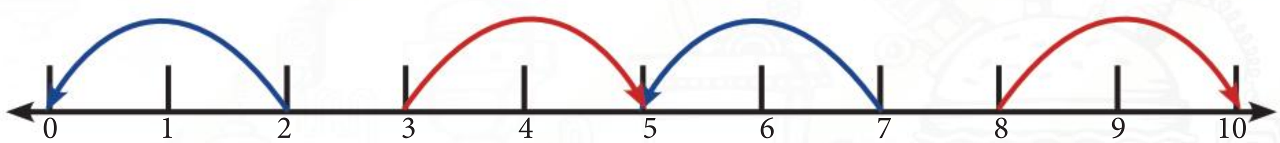
Rounding Money to the Nearest 5 Cents

Mathematics Discussion

In shops and in advertisements you often see things like this hamburger and data projector having prices such as $5.99 or $137.23.

In Australia, the smallest unit of money is 5 cents. Therefore, we cannot pay with cash, the exact amount when prices end in 9 cents or 3 cents. It is therefore important to be able to round a number up or down to the nearest 5 cents, in order pay for items with cash.

We can use a number line to model rounding to 5 cents.



Amounts that end in 1 or 2 round down to 0.
Amounts that end in 3 or 4 round up to 5 and amounts that end in 6 or 7 round down to 5.
Amounts that end in 8 or 9 round up to 10.
Hence, if we were paying cash for the items above, we would pay $6.00 for the hamburger and $137.25 for the data projector.

Whole Class Activity 1

Think: When do I need to round to the nearest 5 cents? Why do I need to?

Supermarkets often distribute catalogues to mailboxes in their area in order to advertise their products. This can be helpful for people who are comparing prices and for those who are shopping within a budget.

View grocery items available in catalogues or online from major supermarkets.

Choose and record, 5 items whose price would be rounded DOWN to the nearest 5 cents if you were to pay cash for that item. Choose 5 items whose price would be rounded UP to the nearest 5 cents if you were to pay cash for that item.

Share your recordings with the class. Was it easier to find items that needed to be rounded up or down? Discuss.

Practice Exercise 1

1. Round the following items to the nearest 5 cents

ITEM	COST ROUNDED TO NEAREST 5C	ITEM	COST ROUNDED TO NEAREST 5C
$22.57 		$15.42 	
$598.79 		$36.54 	

2. Round the following amounts to the nearest 5 cents.

a) $33.02

b) $19.96

c) Five dollars and nine cents

d) Six dollars and ninety eight cents

Reflection and Discussion

When you pay for things by cash, all amounts are rounded to the nearest 5 cents because the smallest coin in the Australian currency is 5c.

What happens when you pay with a credit or debit card? Is the total rounded? Why? Why not?

3. Samantha compared the cost of a particular brand of shampoo at two different supermarkets.

Supermarket 1 - the shampoo cost $4.43

Supermarket 2 – the same shampoo cost $4.47

a) Which supermarket should Samantha purchase the shampoo from if she was paying by

- cash?
- eftpos?

b) How can supermarkets and other stores use rounding to increase profit?

Reflection and Discussion

Hazel bought 2 packets of lollies at the local supermarket, one for $2.19 and the other for $1.13. Hazel wondered whether she needed to pay $3.35 or $3.30?

How did Hazel arrive at the amounts of $3.35 or $3.30?

Which is the correct amount? Discuss.

How is the total cost of shopping determined? Is it calculated by rounding first and then adding, or adding first and then rounding?

View the dockets below to assist you in justifying your response.

	$
STRAWBERRIES 250GRAM	7.50
Quantity: 3 @ $2.50 each	
STRAWBERRIES 250G 3 FOR $5	-2.52
JOHN WEST SKINLESS & 130GRAM	6.00
Quantity: 3 @ $2.00 each	
KRAFT PEANUT BUTTER 780GRAM	5.00
%COLES BAGS STORAGE R 50PACK	1.90
Sub Total	$17.88
Rounding	0.02
Total for 8 items	$17.90
Cash	50.00
Change	32.10
GST INCLUDED IN TOTAL	$0.17

	$
COLES DAIRY HDPE MI 2LITRE	2.00
MEADOW LEA MARGARIN 1KG	4.70
CLS CHKN BREAST 4PK PERKG	14.51
%COLES PAPER BAKING:1 15METRE	3.13
SWEET CORN 1EACH	1.68
RUSTIC BAGUETTE 300G 300GRAM	2.00
Sub Total	$28.02
Rounding	-0.02
Total for 6 items	$28.00
Cash	50.00
Change	22.00
GST INCLUDED IN TOTAL	$0.28

4. Calculate the exact solution and the rounded price of the following problems. Decide whether to solve each problem mentally (if so, which strategy) or by calculator.

Problem	Exact Solution	Rounded Price To Nearest 5C
0.32c + 0.47c		
0.61c + 0.05c		
$2.68 + $23.89		
$643.34 + $101.88		

5. Calculate the exact total amounts for the following supermarket receipts and then round the total to the nearest 5c.
Draw a line to connect the receipt to the correct rounded amount.

$23.20 $23.25 $23.15 $23.10

Item	Price
	$2.54
	$3.79
	$11.21
	$5.60
Total	

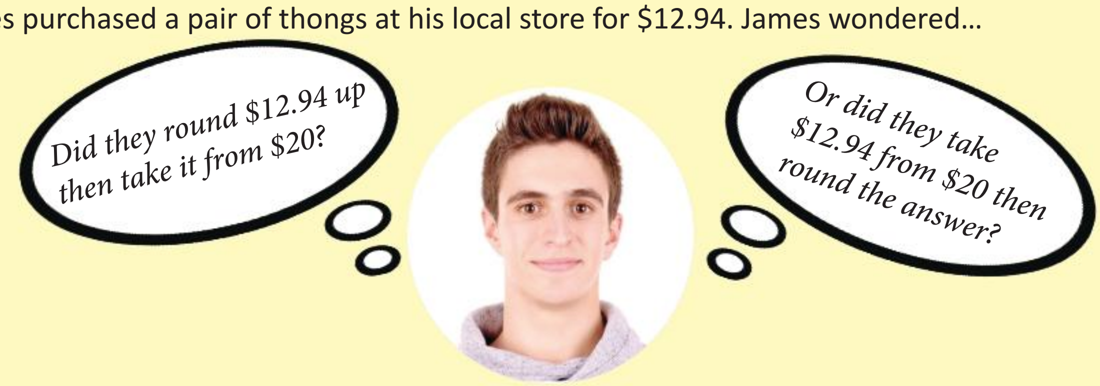
Item	Price
	$5.78
	$5.61
	$10.23
	$1.59
Total	

Item	Price
	$6.54
	$7.29
	$6.37
	$2.92
Total	

Item	Price
	$10.56
	$7.01
	$2.87
	$2.80
Total	

Reflection and Discussion

James purchased a pair of thongs at his local store for $12.94. James wondered...



Does it make a difference in which order the rounding occurred?

What if the thongs were $12.93? or $12.98?

How is change in all shops worked out? Is it calculated by rounding first and then subtracting, or subtracting first and then rounding? Why is this so?

6. Rethink each problem below using rounding. Decide whether to solve each problem mentally (if so determine a strategy) or by calculator and then calculate the answer. The first problem has been completed for you.

Problem	Rounded Problem	Amount Of Change
$1.00 – 0.32c	$1.00 – 0.30c	0.70c
$2.00 – 0.67c		
$10.00 - $1.72		
$10.00 - $2.96		
$50.00 - $23.87		

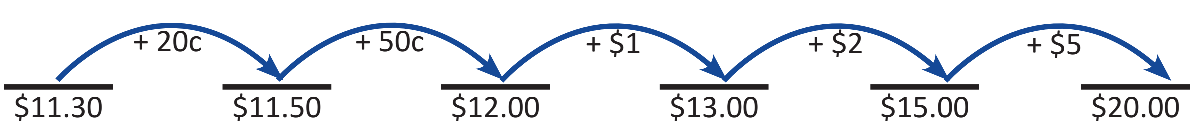
Giving Change by Counting Forward

Jayden works at a fruit and vegetable shop on weekends.
When dealing with cash purchases, he uses both rounding and Jessie's idea of using addition as the inverse of subtraction, to help determine the correct change.

For example, a customer purchases fruit to the amount of $11.29 and gives Jayden a $20 note ($20 - $11.29). Jayden rounds the purchase to the nearest 5c ($11.30).

He changes the problem into an addition and thinks of it as $11.30 + ? = $20.00

He starts at $11.30 and counts forward, until he reaches $20.



The amount of change given was 20c + 50c + $1 + $2 + $5 = $8.70

7. Use Jayden's method to calculate the change from:

a) A $23.89 purchase from a $50 note

b) A $3.67 purchase from a $5 note

c) A $7.53 purchase from a $20 note

d) A $12.32 purchase from a $50 note

8. Use the decision making process outlined in the flow diagram on page 138 and part-whole thinking, to solve the following problems.

a) Beth had $50 in her wallet. She purchased lollies to the value of $3.22. How much would she have in her wallet now?

b) Laura purchased a chocolate for $2.32 and received $7.70 change from the cashier. How much did Laura give the Sales Assistant?

c) Daniel bought a movie ticket for $16 and some popcorn for $7.73. How much change would he get from $50?

d) Riley's bill for coffee and cake was $7.75. He spent $4.93 on a cake. How much was the coffee? Is this the only possible price of the coffee?

e) Devin bought chips for $4.72 and a soft drink. The total bill was $7.05. Calculate two possible prices for the soft drink?

f) Danielle had $10. She purchased a body wash and was given $2.15 change. How much was the body wash? Calculate two possible prices for the body wash?

Reflection on Learning

The following items were in a recent 'Office Stuff' catalogue:

$9.93

$1.13

0.94c

0.74c

$6.84

1. Round the cost of each of the above items to the nearest 5c.

2. Determine the cost of purchasing an eraser and a compass with cash.

3. Determine the cost of purchasing scissors and drawing pins with eftpos.

4. Calculate the change from $10 when purchasing scissors.

5. Calculate the change from $20 when purchasing a calculator and a compass.

6. Would $20 be enough to pay to buy all of the above items?

OLNA Practice Question

1. James bought the following items at the local Deli.

$1.66

$3.97

How much change would James receive from a $10 note?

A. $4.40 B. $4.37 C. $4.35 D. $5.35

Topic 10

Using Estimation Strategies

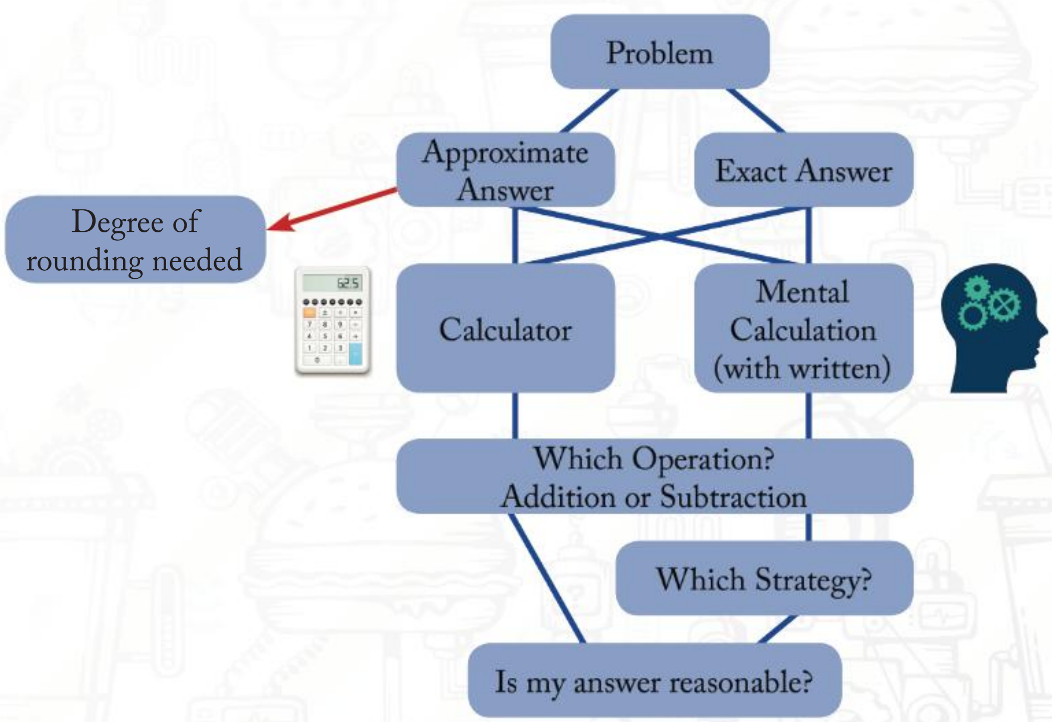
Mathematics Discussion

We use estimation strategies when we do not need an answer to be exact. Rounding up gives us an overestimate of the original amount, whereas rounding down will give us an underestimate.

Mostly we tend to round up in order to ensure that we have enough money, petrol, food etc. for our everyday needs.

In the past we used 'rounding rules'. If a number ended in a digit that was between one and four, then the number was rounded down. If the number ended in a digit between five and nine, then it was rounded up. Nowadays, we tend to overlook these rules, instead we choose to round up or down depending on the context, and mostly this means that we round up.

The context of a problem will also determine the degree of rounding. In some situations we might round to the nearest whole number, in others situations we might round to the nearest ten, hundred, thousand or even the nearest million.



Whole Class Activity 1

Discuss each of the following scenarios and decide whether an estimate or an accurate value is needed in these everyday situations. Justify your answer.

Scenario	Circle one	Justification
Receiving a quote from a carpet layer to recarpet your bedroom.	Estimation Accurate answer	
Converting $100 Australian dollars to Vietnamese Dong whilst in Vietnam.	Estimation Accurate answer	
Asking a taxi driver how much it would cost to get a ride from the gym to your work.	Estimation Accurate answer	
Change from a $50 note when buying a magazine from a supermarket.	Estimation Accurate answer	
Buying a new car from a car dealer and considering paying for extras such as window tinting, leather seats and Bluetooth.	Estimation Accurate answer	
The amount of chips you get when you purchase $4 worth of chips from a fish and chip store.	Estimation Accurate answer	

Whole Class Activity 2

Look in the vehicle sales section of the newspaper.
Cut out and glue 4 cars, trucks, boats or caravans with their prices on a blank sheet of paper.

Round the cost of the vehicles up to the nearest ten, hundred, thousand, tens of thousand and hundreds of thousand of dollars and write the rounded amounts beneath the pictures.

Circle the rounded figure that is best to use when describing the cost of the vehicles to friends.

How could using correct rounding distort the actual cost of a vehicle?

Is it most appropriate to provide an accurate or an approximate answer when asked the cost of the vehicle from:

a) the bank manager to whom you are applying for a loan for the vehicle?

b) a friend?

Practice Exercise 1

1. Round the following items up to the amount indicated:

NUMBER	NEAREST $1	NEAREST $10	NEAREST $100	NEAREST $1000
$576.35				
One hundred and sixty two dollars and one cent				
$8 412.67				
$12 388.50				
$187 533.42				
$2 899 999.55				

2. Round the following items up to the amount indicated.

ITEM	ROUNDED COST
Large takeaway coffee $5.15 	nearest $1 nearest $10 nearest $100
Umbrella $29.50 	nearest $1 nearest $10 nearest $100
Glasses $244.95 	nearest $1 nearest $10 nearest $100
Mobile Phone $675.05 	nearest $1 nearest $10 nearest $100
Desk $2 395.756 	nearest $1 nearest $10 nearest $100

Circle the rounded amount in each of the above situations that would most likely be used when describing the price of the item to friends.

3. In 1998 ASIC (Australian Securities and Investment Commission) permitted all companies with total assets in excess of $10 million to round their assets as follows:

Total assets greater than $10 million but less than $1 billion can be rounded to the nearest thousand dollars.

Calculate the rounded figures that would be submitted to ASIC on financial reports for companies with assets of:

a) $10 105 678

b) $24 789 378

c) $567 897 822

d) $385 399 788

4. What amount you would round to in the following situations, if you were explaining the scenario to a friend (eg nearest $100)? Justify your response.

a) Johnny Depp bought a house for $12 365 799 in Miami.

b) Carly bought some running shoes for $78.99

c) Bianca spent $9.95 on a showbag at the Royal Show

d) James paid $2 155 for a new mo-ped.

e) Tia earned $65 558 in a financial year.

f) Harry's profit when he bought a vintage record for $7.35 and sold it for $28.15

Whole Class Activity 2

Using supermarket catalogues, find 5 items that could be bought for each of the following amounts. Round the prices up to ensure you have enough money.

GROUP 1	$10	GROUP 3	$50
GROUP 2	$20	GROUP 4	$100

In the table below, write down your chosen items and round the prices up to the nearest dollar.
Calculate the estimated totals for the 5 items.
Check that the total lies below the maximum amount for each group.
Swap lists with a partner to check and explain estimates.

Items And Rounded Prices In Group 1 - $10	Items And Rounded Prices In Group 2 - $20	Items And Rounded Prices In Group 3 - $50	Items And Rounded Prices In Group 4 - $100
TOTAL	TOTAL	TOTAL	TOTAL

How did you ensure your items would be under the total allowed? Discuss?

Reflection and Discussion

Discuss the following scenarios, considering each of the following:

- The amount the dollars were rounded to (nearest $10 etc)
- Whether the rounding was an over estimation or an under estimation
- If the choice of rounding was reasonable given the context of the problem.
- If an estimate or an accurate response was most appropriate.

a) Tyler had $55.45 in his bank account that he was planning to use on a trip to Bali. He told his Mum that he had saved almost $100.

b) Dylan wanted a bike for his birthday. He chose one for $751 and told his parents that it was $800.

c) Claire received a tax refund for $995 and told her friends it was $1000.

d) Shelly and Tia were going to the movies. They decided that Shelley should queue in the ticket line and Tia should queue in the Candy Bar line.
Shelly bought Tia a ticket for $14 and told her it was $10.
Tia bought Shelly popcorn and a drink for $8 and told her it was $10.

Using 'Under and Over Estimates' to get a closer estimate

Sometimes when we round up we get an estimate that is too large. For example to estimate $214 add $475, if we round $214 up to $300 we are making the quantity much larger. We would get a more accurate estimation if we round $214 down to $200 and round $475 up to $500 and then add $200 and $500 to get an estimate of $700. This is closer to the actual amount, which is $689.

Practice Exercise 2

1. In each of the following problems, round each number to the most appropriate amount and calculate the rounded solution.

a) $6.24 + $7.85 (eg, $6 + $8 = $14)

b) $50.00 - $8.33

c) $678 + $299

d) $1 715 - $593

e) $56 366 - $23 648

f) $180 301 + $211 999

g) ? + $6.23 = $19.15

h) 67.98 - ? = $37.22

2.In each receipt, round the amounts to the most appropriate amount before calculating the estimated missing amounts. Draw a line to connect the receipt to the correct rounded missing amount.

$1900 **$25** **$1100** **$27**

$24 **$1400** **$26** **$1200**

a)

Item	Price
	$11.07
	$6.99
	$2.77
	$4.49
Total	

b)

Item	Price
	$6.10
	$5.88
	$10.10
	$5.24
Total	

c)

Item	Price
	$4.87
	$7.13
	$8.90
	$5.24
Total	

d)

Item	Price
	$523
	$196
	$___
	$677
Total $2816	

e)

Item	Price
	$_____
	$4412
	$3189
	$2588
Total $12100	

f)

Item	Price
	$4.31
	$9.78
	$7.56
	$2.14
Total	

g)

Item	Price
	$87
	$210
	$578
	$189
Total	

h)

Item	Price
	$26689
	$52322
	$_____
	$30905
Total $111100	

3. The following price list was in a Wembley music store

WEMBLEY MUSIC STORE

Speakers	$672.50
Guitar	$1198
DVD	$24.99
Single CD	$4.25
Double CD	$28.50
T-Shirts	$19.95
Posters	$7.25
iPod	$186.90

a) Complete the table by determining the costs of the following items:

Items	Aprroximate Cost By Rounding	Exact Cost By Calculator
DVD and Single CD		
DVD and poster		
ipod and a T-Shirt		
Double CD and a Guitar		
An ipod and a Guitar		
Speakers, Guitar and ipod		

How closely did your estimates match the exact answer?

Which estimate varied the most from the exact answer? Why did this occur?

b) Cohen has a $50 voucher to spend at the Wembley Music Store. Use estimation to decide what he could purchase, so as to spend as close to $50 as possible. List 4 different combinations for Cohen.

c) Tyran was given $100 for his Birthday. Estimate the change Tyran would receive if he purchased from the music store:

A DVD

A Poster

4. Select the best estimate from the list below for each of the following:

$11	$120	$15
$110	$16	$1100
$14	$10	$12

a) The total cost of buying strawberries for $3.49 and blueberries for $6.99

b) Ben spent $599 on a new bike and $123 on a new pair of sneakers in order to fulfill the job requirements of distributing catalogues to mailboxes. He earned $615 income in a financial year. What is his estimated loss for the year?

c) The change received from $20 when buying a chocolate for $3.85.

d) Kate had $150. She bought a dress and was left with $28.50. What is the estimated price of the dress?

e) How much more to save for a new $500 bike when you have saved $484.90

f) Lochie had some savings. He was given $243.45 and now has $1 312. Estimate the amount of his original savings?

g) Having $232 in your bank account, giving your sister $217.90 and estimating what your balance would be.

h) The total cost of buying songs from itunes for $3.46, $3.78 and $4.01

i) The change received from $5000 when purchasing a TV for $4987.50

Is My Estimation Reasonable?

After completing an estimation we need to think about the answer in relation to the original problem to see if our answer is reasonable.

Practice Exercise 3

1. Use rounding to determine if the results in the following problems are reasonable. If the scenario is wrong, use rounding and approximation to briefly explain why.

a) I bought a drink for $2.25, chips for $6.50 and a chocolate for $1.99. The shopkeeper said that it all came to $13.

b) Shannon had $200 in her wallet. She wanted to buy a T-Shirt for $39.95 and a Jacket for $154.50. Her sister said she didn't have enough money.

c) At the Royal Show, Ryan bought a chocolate showbag for $7.75 and a liquorice showbag for $5.50. He estimated that he had spent $14 so far.

d) $115.42 is spent from $200. The change is approximately $85.

e) Damon had $100. He was given $71 change from a purchase of $19.

Reflection on Learning 1

Solve the following four problems using the decision making table below:

1. Andrew was planning his brother's 7 year-old birthday party and realized he had forgotten to buy balloons. He purchased the balloons and received $2.35 change from a $5 note. How much were the balloons?

2. Andrew's mother purchased candles for $1.83 and soft drink for $5.47. How much was the total bill if Andrew's mother pays using eftpos?

3. Andrew's father purchased streamers for $2.89, whistles for $3.53 and poppers for $3.88. He had a $10 note in his wallet. Was this enough to make the purchases?

4. Andrew's mother had $200. She gave Andrew some money to pay for the hire of the bouncy castle and was left with $22.50. How much was the hire of the bouncy castle?

Problem	Method		WHICH OPERATION? Number Sentences and Part/Whole diagram	Strategy and Solution	Is your answer reasonable?
		✓			

Reflection on Learning 2

Given a budget of $50 and using mailbox or online catalogues from supermarkets, determine a shopping list to cater for the food for Andrew's brother's 7 year old birthday party for 8 guests. The shopping list must include party pies because they are Andrew's little brother's favourite. They retail for $6.73.

Use rounding to help determine a shopping list that fits within the budget.

Is $50 a reasonable budget? Discuss.

OLNA Practice Question

1. This table shows how many people attended three soccer games

Number of People Attending	
Friday Night Game	53 302
Saturday Night Game	40 500
Sunday Game	62 780

To the nearest thousand, what was the total number of people attending the three games?

A 156 000
B 157 000
C 158 000
D 160 000

Section Four

Time

Content Focus

Foundation Mathematics

1.4.1 Identify and describe the tools and units commonly used to measure time.

1.4.2 Determine whether an estimate or an accurate time measurement is needed in everyday situations.

1.4.3 Choose which tool and/or unit is appropriate for measuring or stating a time in common everyday contexts.

1.4.4 Develop and use a sense of duration of standard time units: seconds, minutes, hours, days, weeks and months to estimate and compare time.

1.4.5 Read and use digital and analogue watches, clocks (12-hour time only), and stopwatches.1.4.6 Read and use various forms of calendars and timetables.

1.4.6 read and use various forms of calendars and timetables

1.4.7 Compare units of time to say how long events take, or to order events in time.

1.4.8 Understand and use the relationship between

- Seconds and minutes
- Minutes and hours
- Hours and days
- Days, weeks and months

1.4.9 Read, write and interpret commonly used expressions of time located in various texts and media.

Australian Curriculum

ACMNA039
ACMNA041
ACMMG062
ACMMG085
ACMMG086

Topic 1

Days, Weeks and Months

Mathematics Discussion

Time is an attribute of measurement used to describe how long it takes for something to occur. It can be measured using a variety of units. In this topic we will focus on the units days, weeks and months. They are used to separate years into smaller portions of time. Calendars and timetables are the tools used to measure and keep track of days, weeks and months.

Whole Class Activity 1

Think about the situations in the past week where you have measured time using days, weeks or months. Record two situations for each unit on the table below.

Unit	Situations
Day	
Week	
Month	

Share your situations with another person.
Which unit do you use most often? Why?

Whole Class Activity 1

Calendars and timetables are the tools used to track days, weeks and months. They also give information about when events happen.

Look at the pictures of the calendar and timetable. Label the features of each tool and answer the following questions:

- What do you use it for?
- How do you use it?
- What units does it use?

a) Calendar

- What do you use it for?
- How do you use it to?
- What units does it use?

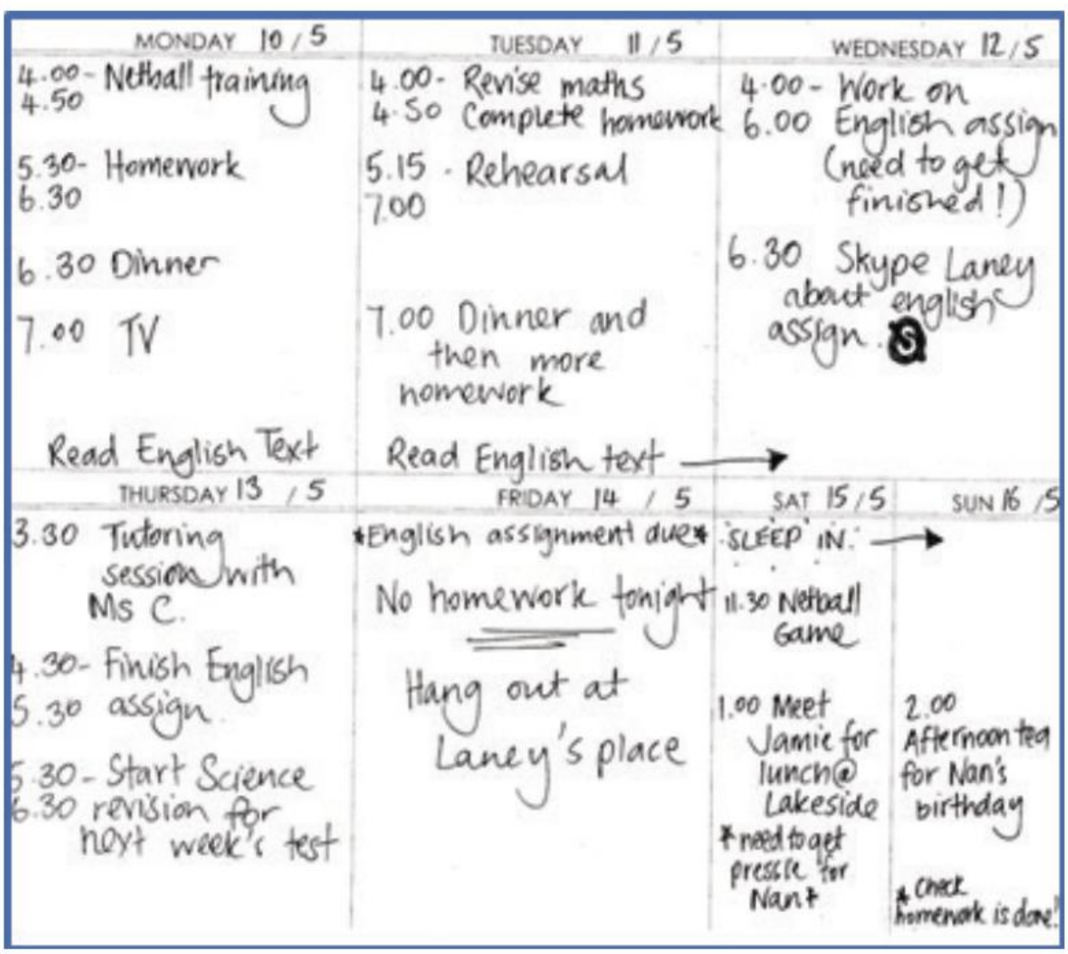
b) Timetable

Timed Stops					
Stop No.		•	18108	18314	•
Route No.		Whitfords Stn	Ocean Reef Rd / Eddystone Av	Belridge Senior High School	Joondalup Stn
Monday to Friday (continued)					
pm	463	5:21	-	5:34	5:50
	464	5:31	5:40	-	5:56
	463	5:35	-	5:48	6:03
	464	5:45	5:54	-	6:10
	463	5:52	-	6:05	6:20
	464	6:02	6:11	-	6:27
	463	6:12	-	6:25	6:40
	464	6:17	6:26	-	6:42
	463	6:37	-	6:49	7:04
	464	6:37	6:46	-	7:00
	464	6:57	7:04	-	7:18
	463	6:57	-	7:08	7:22
	464	7:12	7:19	-	7:32
	463	7:19	-	7:29	7:43
	464	7:39	7:46	-	7:59
	464	8:09	8:16	-	8:30
	464	8:39	8:46	-	9:00
	464	9:09	9:16	-	9:30
	464	10:09	10:16	-	10:30
	464	11:09	11:16	-	11:30
am	464	12:09	12:15	-	12:27

- What do you use it for?
- How do you use it to?
- What units does it use?

Practice Exercise 1

1. Josie keeps track of her after school activities on a weekly timetable so she stays organised. Look at her timetable then answer the questions that follow.



a) What month is this week in?

b) When is Josie's English assignment due?

c) What time does netball training start?

d) Why does Josie need to buy a present?

e) What test does Josie have next week?

f) How much time has Josie timetabled to get her English assignment finished?

2. Download the timetable for the Armadale/Thornlie train line
http://www.transperth.wa.gov.au/timetablepdfs/Armadale%20Thornlie%20Line%2020140330.pdf

Skim and scan the timetable to familiarise yourself with its layout and content. Find each of the headings listed in the table below and explain what it is telling you.

Timetable Heading	What is it telling you?
To Thornlie/Armadale	
Monday to Friday	
To Perth	
Sunday and Public Holidays	
Beckenham 9912 column	
Then at the following minutes past each hour	
Pattern column (T, C)	

Use the Armadale/Thornlie train timetable to answer the following questions.

a) What time is the first train to leave Perth station heading to Armadale on Tuesday?

b) What time does the last train from Perth station heading to Armadale leave on a Saturday?

c) Sann is going to Perth on Saturday morning, after 8:30am. His nearest station is Cannington. Give three times he could catch a train.

d) Clare lives near the Kelmscott station and on Sunday is going to visit her cousin, who lives in Victoria Park. Clare plans to arrive at Victoria Park station before 11:00am. List two times Clare might leave from Kelmscott station.

e) Anna has a 10:00am class at Polytechnic West, which is a 5 minute walk from Armadale train station. Which trains could she catch from Perth station and arrive on time for her class?

3. Use the clues below to fill in the calendar for the Duff family.

a) March 15th is a Sunday
b) The second Monday of each month Mrs Duff goes to a P&C meeting
c) Jenny has cricket training every Thursday
d) Mr Duff is going on a work trip from the 4th until the 8th
e) Jackson's birthday is on 17-03-2015
f) St Patrick's day is on the 17th
g) Jackson is having a birthday party on the Saturday after his birthday
h) Jenny is going to a party on the last Saturday of the month
i) Mrs Duff has to pay her phone bill on the 23rd
j) Mr Duff is going to Jackson's parent interview on the 31st at 5.00pm

March 2015

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday

Whole Class Activity 4

When planning an event that involves a number of different tasks to be completed, a timeline can be a useful way of organising the information. Plotting the order and timing of tasks helps you to be clear about what needs to be done and when.

Katherine is going camping on Friday afternoon. Next to each task, write when it should be completed. This is a list of tasks Katherine needs to do before she goes on her camping trip.

Pack the car	Ask her neighbour to feed the cat
Check the tent is ready to use	Pack clothing and toiletries
Turn off lights and lock doors	Buy food for 3 days of camping

Write the tasks in the order they need to be completed, along the line.

Practice Exercise 2

1. The Cann family are planning a birthday party for their son. There are a number of tasks that need to be completed in the lead up. Read through the events and put them on a timeline to show the order they must be completed in.

   a) The birthday party is on the 20-06-2015 at 7:00pm.

   b) Invitations sent out 2 weeks before the party.

   c) Food purchased 3 days before the party.

   d) Present picked up from post office on 17th June.

   e) Cake picked up 3 hours before the party.

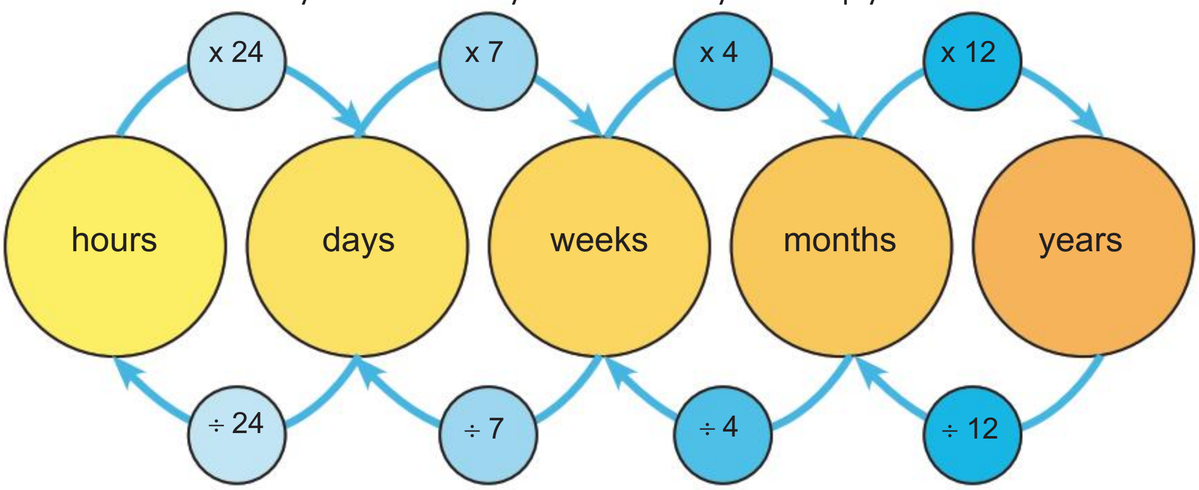
   f) Helium balloons ordered 7 days before the party.

Relationships

Converting between units of time makes it simpler to calculate and estimate the length of time. For example, it may be difficult to estimate or imagine how far away 140 days is. By converting 140 days to 20 weeks or 5 months, you can better estimate what can be done in that amount of time.

The relationships between the units of time are:

- There are 24 hours in a day.
- There are 7 days in a week.
- There are 4 weeks in a month.
- There are 12 months in a year.
- There are 52 weeks in a year.
- There are 365 days in a common year and 366 days in a leap year.



Whole Class Activity 3

Work with a partner and use your calculator to convert each unit of time. Record the calculation you used to convert the time and say why you chose to convert to that unit.

Time	Convert to	Calculation used	Answer
72 hours	days	72 hours ÷ 24 hours per day=	
35 days	weeks		
8 weeks	months		
24 months	years		
8 months	days		
7 days	hours		
6 months	weeks		
4 years	months		
156 weeks	years		

Practice Exercise 3

1. Use your calculator to convert each time to the unit listed.

a) 120 hours = _______ days

b) 264 hours = _______ days

c) 2 weeks = _______ days

d) 6 weeks = _______ days

e) 5 years = _______ months

f) 7 years = _______ months

g) 2 months = _______ weeks

h) 9 months = _______ weeks

i) 70 days = _______ weeks

j) 161 days = _______ weeks

k) 24 weeks = _______ months

l) 40 weeks = _______ months

2. Use your calculator to convert the following times.

a) 64 minutes = ________ hours and _______ minutes

b) 292 minutes = ________ hours and _______ minutes

c) 345 minutes = ________ hours and _______ minutes

d) 426 minutes = ________ hours and _______ minutes

e) 796 minutes = ________ hours and _______ minutes

3. Order these times from shortest to longest. Use your calculator to convert them if necessary.

a) 3 weeks, 7 days, 1 year, 5 months, 1 month, 28 days

b) 4 months, 49 days, 7 days, 8 weeks, 35 days, 6 months

c) 3 months, 24 months, 1 week, 52 weeks, 14 days, 14 weeks

d) 70 days, 7 years, 7 days, 17 weeks, 7 months, 72 months

Whole Class Activity 5

Elapsed time is the amount of time that passes between one time and another. To calculate an amount of elapsed time count forwards from the start time until you get to the end time. Imagining the jumps on a number line is a useful strategy for counting on.

Clarke has a clock on his wall that displays the time and date.

Clarke has planned a holiday to Bali later in the year. The plane leaves at 1:50 pm on Monday 6th June.

Clarke wants to work out how long there is between now and when his holiday starts.

How might he work it out?

______

How long does he have to wait?

______

Practice Exercise 5

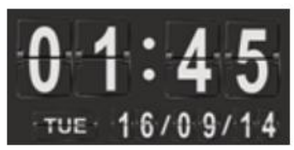
1. Write the start date (circled in red), and work out the date at the end of the time period shown in the elapsed time column.

Calendar	Start	Elapsed Time	End
		3 weeks	
		10 days	

		1 week and 3 days	
		1 month, 2 weeks and 3 days.	

2. Look at each pair of times and calculate the amount of time between them.

a) 



b) 

c) 

Reflection on Learning 1

On a blank sheet of paper, draw a timetable for next week, showing the important events and times taking place. You might include sports practice and matches, homework, work shifts, study, rehearsals, parties and recreation activities.

Consider the aspects that need to be included so that it is helpful for you and can be interpreted by someone else.

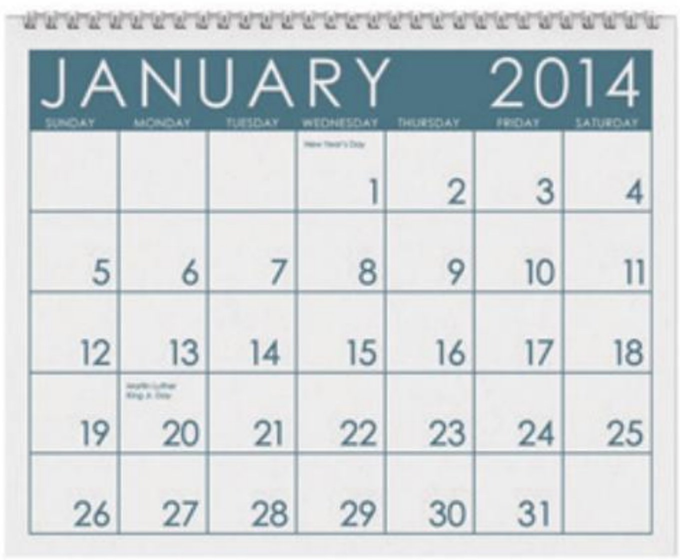
Reflection on Learning 2

Select one of the tools listed below that are used to measure and track days, weeks and months and explain how or why you might use it, which information might be recorded and your own personal experience with using this tool.

Bus or train timetable　　　Calendar　　　Timeline　　　Diary

OLNA Practice Question

1. Claire went on an overseas holiday in January 2014. She left on Friday 11 January.



She arrived home exactly 2 weeks later.
On what date in January did she arrive home?

A. 18　　　B. 25　　　C. 26　　　D. 31

Topic 2

Seconds, Minutes and Hours

Mathematics Discussion

We measure time using a variety of units. In this topic we will focus on the units - seconds, minutes and hours. These units are used to separate days into shorter time periods.

Days are subdivided up into hours, hours subdivided into minutes and minutes are subdivided into seconds.

Clocks and watches are the tools we use to measure seconds, minutes and hours. They may be digital or analogue. Digital clocks use only numbers whereas analogue clocks have rotating hands to show the time.

Whole Class Activity 1

Think about the situations in the past week where you have measured time using days, weeks or months. Record two situations for each unit on the table below.

Unit	Situations
Day	
Week	
Month	

Share your situations with another person.
Which unit do you use most often? Why?

Analogue Clocks

An analogue clock has different length hands that go around the dial at different speeds.
It has two sets of markings. The first set of markings is the numbers 1 to 12, evenly spaced around the dial. These numbers are used with the hour hand (shortest hand) to tell which hour of the day it is.

The second set of markings is the marks between the numbers, evenly spaced around the dial. There are 60 marks. They are used with the minute hand (long hand) to tell which minute of the hour it is.

If the clock has a second hand (longest hand) this also moves through the 60 marks, but at a faster speed than the minute hand.

When you read an analogue clock you;

1. See which hour it is by looking at the position of the hour hand,
2. See how many minutes have passed in the hour by looking at the position of the minute hand and
3. If there is a second hand (some clocks don't have these) see how many seconds have passed the minute by looking at the position of the longest hand.

Whole Class Activity 2

These clocks show only the hour hand. What hour of the day is each showing?

These clocks show only the minute hand. What minute of the hour is each showing?

These clocks show only the second hand. What second of the minute is each showing?



Practice Exercise 1

1. Read the clocks and write how you would say the time.

a) 	b) 	c) 
d) 	e) 	f) 

2. Read the following times and show them on the clock faces.

a) 7 o' clock 	b) one thirty 	c) 10 minutes past 4 
d) 25 minutes past 10 	e) 13 minutes past 5 	f) 52 minutes past 12 

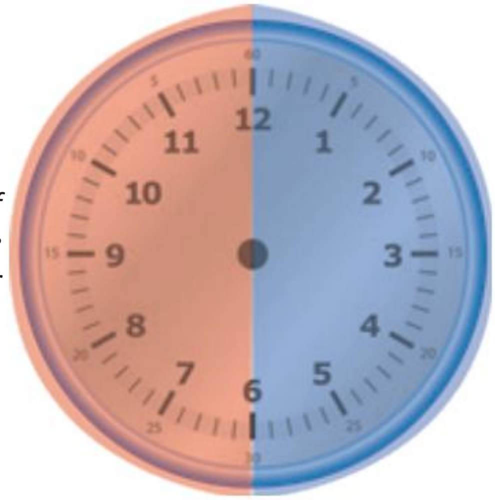
Time Expressions

The 60 markings around the dial are evenly spaced, with each number showing 5 minutes have passed. The clock below shows the total minutes that have passed at each of the numbers from 1 to 12.

Consider the following phrases;

"I'll meet you at half past 10."
"I will be finished by 20 to 7."
"It is 5 past."

These expressions are based on seeing the clock as two halves. The left side of the clock describe how many minutes have passed the hour. The right side shows how many minutes there are to go until the next hour begins.



Consider the following phrases;
"It's quarter to 9."
"I finish work at half past 2."
"I'm leaving at quarter past."
These expressions are based on seeing the clock divided into quarters.

One quarter of the hour has passed, so this can be said as "quarter past."

Half of the hour has passed, so this can be said as "half past."

There is one quarter to go until the next hour begins. This can be said as "quarter to."

Whole Class Activity 3

What are the different ways you could say the times on the clocks below?

Practice Exercise 2

1. Read the clocks and write two different ways of saying each time.

a) 	b) 	c) 

2. Read the following times and show them on the clock faces.

a) quarter past 1 	b) one thirty 	c) 10 minutes past 4 
d) 10 minutes to 3 	e) 25 minutes to 5 	f) 17 minutes to 10 

Digital Clocks

Hours, minutes and seconds can be also measured using a digital clock. Digital clocks display digits to show the time.

Whole Class Activity 3

Look at the pictures of the digital clock and digital stopwatch. List the features and uses of each clock. Label the parts of each device.

a) digital stopwatch

- How does it work?
- What do you use it for?
- How do you read it?
- What units are you able to measure with it?

b) digital clock

- How does it work?
- What do you use it for?
- How do you read it?
- What units are you able to measure with it?

Practice Exercise 3

1. Read the clocks and write how you would say the time, in words.

a)

b)

c)

d)

e)

f)

2. Read the following times and show them on the clock faces.

a) quarter past 8

b) five minutes past three

c) 1 hour, 20 minutes and 0 seconds

d) 20 to 4 	e) 3 hours and 53 seconds 	f) 2 hours, 34 minutes and 2 seconds 

Benchmarks

Having personal benchmarks for the different units of time is useful for estimating how long it will take you to do something.

Whole Class Activity 4

How long is 10 seconds?

Work with a partner. One person estimates how long 10 seconds is by tapping the desk at the end of 10 seconds. The other person uses a clock or stopwatch and says whether the estimate was too short or too long, and by how much. Swap roles.

What strategies did you and your partner use to estimate 10 seconds.

Estimate how long 1 minute is using the same method..

Use the same technique to estimate 3 minutes.

Which time were you more accurate at estimating?

What strategies did you and your partner use to estimate 1 minute and 3 minutes.

Practice Exercise 4

1. Estimate how long it will take to complete the actions listed below.

Action	Estimate
a) Say the first 10 letters of the alphabet backwards	
b) Complete this addition 54 + 143 =	
c) Write your whole name three times	
d) Walk across the room	
e) Skip count by 5's to 100	

Choose 2 actions from the table and time how long they take.

Action	Time	Measuring Tool Used

2. Read each student's estimate below. Use your measurement benchmarks to decide if their estimate is reasonable or unreasonable. Justify your choice. If the estimate is unreasonable provide a more reasonable estimate.

a) Tara estimates it takes 12 hours to fly from Perth to Sydney.
This estimate is reasonable unreasonable.
Justify:

b) Sann estimates it takes him 2 minutes to brush his teeth.
This estimate is reasonable unreasonable.
Justify:

c) Tegan estimates it takes 30 minutes to boil a saucepan of water.
This estimate is reasonable unreasonable.
Justify:

d) Tristan estimates it will take 3 minutes to catch the bus home.
This estimate is reasonable unreasonable.
Justify:

3. Look at the time benchmarks below and give an example of something you know takes that amount of time.

Time Benchmark	Something that takes this long
a) 10 minutes	
b) 30 minutes	
c) 1 hour	

Relationships

There are relationships between the units, and knowing these helps you to convert between units and make good estimates. For example, it can be difficult to estimate how long 900 seconds is. By converting 900 seconds to 15 minutes you can better estimate what you could complete in that time. The relationships focussed on during this topic are;

- There are 60 seconds in a minute
- There are 60 minutes in an hour

Whole Class Activity 5

Work with a partner and use your calculator to convert each unit of time. Record the calculation you used to convert the time and say why you chose to convert to that unit.

Time	Convert to	Calculation used	Answer
3 hours	minutes	3 hours x 60 minutes per hour	3 hours =
5 minutes	seconds		5 minutes =
120 seconds	minutes		120 seconds =
150 minutes	hours		150 minutes =
6 ½ hours	minutes		6 ½ hours =
90 seconds	minutes		90 seconds =

Practice Exercise 4

1. Use your calculator to convert the following times.
   a) 2 minutes = ____________ seconds

   b) 7 minutes = ____________ seconds

   c) 12 minutes = ____________ seconds

   d) 180 seconds = ____________ minutes

   e) 300 seconds = ____________ minutes

   f) 660 seconds = ____________ minutes

   g) 120 minutes = ____________ hours

   h) 360 minutes = ____________ hours

   i) 900 minutes = ____________ hours

2. Use your calculator to convert the following times from seconds to a combination of minutes and seconds.

   a) 190 seconds = ________ minutes and _______ seconds

   b) 312 seconds = ________ minutes and _______ seconds

   c) 533 seconds = ________ minutes and _______ seconds

   d) 630 seconds = ________ minutes and _______ seconds

   e) 827 seconds = ________ minutes and _______ seconds

3. Use your calculator to convert the following times from minutes to a combination of hours and minutes

   a) 64 minutes = ________ hours and _______ minutes

   b) 292 minutes = ________ hours and _______ minutes

   c) 345 minutes = ________ hours and _______ minutes

   d) 426 minutes = ________ hours and _______ minutes

   e) 796 minutes = ________ hours and _______ minutes

4. Order these times from shortest to longest. Use your calculator to convert them if necessary.

a) 5 minutes, 32 seconds, 3 hours, 30 minutes, 122 minutes, 290 seconds

b) 4 hours, 44 minutes, 400 seconds, 470 minutes, 230 minutes, 2 hours

c) 8 minutes, 485 seconds, 120 minutes, 3 hours, 65 minutes, I hour

d) 180 minutes, 180 seconds, 8 hours, 240 minutes, 420 seconds, 2 hours

Elapsed Time

Elapsed time is the amount of time that passes between one time and another. There are some helpful strategies for calculating elapsed time and on the following pages you will explore 2 of these strategies, Number Lines and T Charts.

Whole Class Activity 6

Melva has used a number line and a counting forward strategy to find how much time is between 8:35am and 11:17am.
She draws a line across the page, with the start time at one end and the finish time at the other.

She uses a triangle to show the hour jumps, a big curve to show chunks of minutes and little curves to show individual minutes.

Melva then adds each amount to find the total amount of elapsed time is 2 hours and 42 minutes.

1. Use Melva's method to find how much time elapses between;

a) 3:45 and 6:30

b) 7:35 and 11:24

c) 9:04 and 12:35

d) 8:27 and 1:41

Harry has used a T-Chart to find out how much time has elapsed between 9:15am and 12:04pm. He draws a 2 column table, with the start time at top of the left column and the finish time at the top of the right column.

Harry adds chunks of time to the start time. He records the start time in the left column, the time it will be after he adds 2 hours in the right column. He jots down the amount of time he added at the side of the table.

He keeps adding chunks of time and recording what he is doing until he gets to the finish time.

9:15	12.04	
9:15	11:15	*2 hours*
11:15	11:30	*15mins*
11:30	12:00	*30mins*
12:00	12:04	*4 mins*

To find the total amount of elapsed time, Harry adds the times he jotted down at the side of the table. He finds the total is 2 hours and 49 minutes.

2. Use Harry's method to find how much time elapses between;

a) 2:50 and 5:20

c) 10:14 and 1:45

b) 6:25 and 9:33

d) 7:36 and 10:52

Reflection and Discussion

Which method did you prefer? Why?

Which method was easiest for you to visualise?

Practice Exercise 4

Use the T-chart or Number Line method to solve these problems.

1. John began writing his essay at: He finished writing his essay at:

a) What time did John begin his essay?

b) What time did he finish his essay?

c) How long did it take John to complete his essay?

2. Christine left the house at: She needs to be at work by:

It takes 10 minutes to walk to the bus stop, then 45 minutes on the bus and another 15 minute walk to her office. Will Christine make it to work on time?

Reflection on Learning

The following question from Yahoo Answers went viral on social media in 2009. Write how you would respond to this question. (https://answers.yahoo.com/question)

60 Seconds and 1 minute aren't really the same? ★

This is a bit of a random question, but the answer ha sbeen bugging me for a long time. Ok so...

On a microwave, if you push 60, then it will cook for 60 seconds or one minute. (Following me?)
AND if you also press 1:00 it will cook for one minute, or 60 seconds. (Right, right?)
OK! Well, my question is....
If you add 1:00 + 1:00 it is = 2:00 right? So your food will cook for a total of two minutes.
BUT if you add 60 seconds + 60 seconds it will only cook for one minute and twenty seconds. Even though 60 seconds is one minute?
(I know, confusing question.)

I guess to put it into simpliest terms, How come 1 minute + 1 minute = 2 minutes, but 60 seconds + 60 seconds = only one minute and twenty seconds?

OLNA Practice Questions

1. The lunchbreak at Kent St High starts at quarter to one. Which clock shows this time?

2. A bus timetable is shown:

Strufield	7:47	–	7:50	7:54
Burswood	–	–	7:52	–
Crayden	–	–	7:54	–
Eshfield	7:51	–	7:56	7:59
Autumn Hill	7:53	–	–	8:01
Lawsam	7:55	–	–	8:03
Persham	7:57	–	–	8:05
McDonaldton	–	–	–	8:11
Rudfern	8:03	8:05	8:09	8:14
Central	8:06	8:09	8:12	8:17
Town Square	8:09	8:12	8:15	8:20
Wynyard	8:12	8:15	8:18	8:23

You need to be at Wynyard by 8:20. You catch the bus at Burswood. It takes you 30 minutes to get ready and 2 minutes to walk to the bus station at Burswood. What is the latest time you can get up?

A. 7:20 B. 7:51 C. 7:55 D. 8:21

Section Five

Length, Mass and Capacity

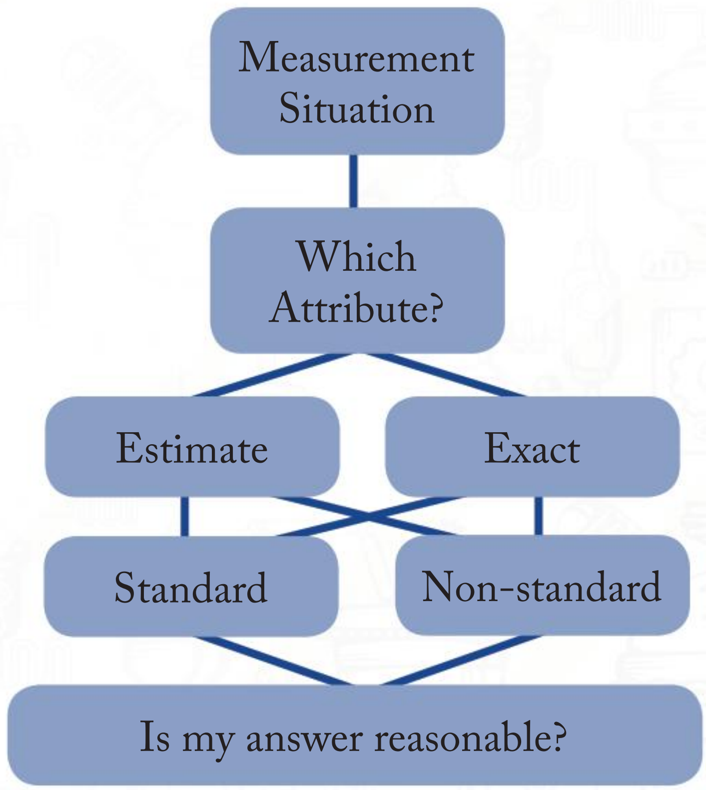
Content Focus

Foundation Mathematics	Australian Curriculum
1.3.1 Identify and discuss situations which involve using length, mass and capacity measures. 1.3.2 Determine whether an estimate or an accurate length, mass or capacity measurement is needed in everyday situations. 1.3.3 Choose appropriate measuring tools to solve everyday problems involving length, mass and capacity. 1.3.4 Use informal units of length, mass and capacity, (for example, hand span, stride, cups) to estimate, measure and compare the size of everyday things. 1.3.5 Develop and use a sense of size of commonly used standard length, mass and capacity units; for example, 1 cm, 1 m, 500 mL, 1L, 500 gm, 1 kg to estimate in familiar situations. 1.3.6 Understand standard units are divided into sub-units and recall commonly used relationships, such as 1cm = 10 mm; 1 m = 100 cm =1000 mm; 1L = 1000 ml; 1 kg = 1000 gm 1.3.7 Choose which standard length, mass or capacity unit is appropriate for everyday contexts. 1.3.8 Use a variety of simple calibrated scales to measure and compare length, mass and capacity to the nearest whole number. 1.3.9 Add and subtract whole number length (including perimeter), mass and capacity measures, to solve everyday measurement problems. 1.3.10 Determine whether an answer is reasonable by using estimation and the context of the problem. 1.3.11 Communicate solutions (oral and written) consistent with the language of the context.	ACMMG019 ACMMG037 ACMMG061 ACMMG084 ACMMG108 ACMMG109

Topic 1

Measurement Decisions

Mathematics Discussion



When faced with measurement situations, we make many decisions. Firstly, we decide which attribute (aspect of an object) needs measuring. Then we consider if an estimate is good enough or whether an accurate measurement is needed. Next, we decide whether to use a standard or non-standard unit. After measuring, we need to decide if our measurement makes sense.

In this section we are focussing on situations that require estimated and exact measurements with non-standard units for the attributes of length, mass and capacity.

Whole Class Activity 1

Read the following situations and circle which attribute needs to be measured.

Situation A Linda is laying some reticulation in her yard and has run out of pipe. Linda needs to finish the job today so will have to buy more pipe at the hardware store.	Length Mass Capacity
Situation B Murray is trying to reduce the amount of water his family uses. He set a target of saving 10 buckets of water per day. He will check his next water bill to see if he has succeeded.	Length Mass Capacity
Situation C Abdul is organising a BBQ for his workmates and needs to buy enough sausages for everyone. The butcher sells sausages by the kilo. Abdul is ringing the butcher with his order tomorrow.	Length Mass Capacity
Situation D Pat is going on a fishing trip in her boat. She needs to buy enough diesel fuel to last 4 days. Pat is trying to calculate how much she will need and how much it might cost.	Length Mass Capacity
Situation E Declan needs to buy a desk for his office at the furniture sale that ends today. The desk can only fit in one place in the room so it has to be just the right size.	Length Mass Capacity

How did you decide which attribute needed to be measured?

Estimate or Accurate Measure?

After deciding what to measure, the next choice is whether an estimate will give an answer that is close enough for the situation, or whether this will cause us to waste materials, money or time.

Whole Class Activity 2

For each situation above, think about the level of accuracy needed.

Which situation requires the highest level of accuracy?

Why is accuracy more important to this situation?

Which situation requires the lowest level of accuracy?

Why is accuracy less important in this situation?

Choosing and Using Units

The unit we choose needs to match the attribute being measured and the level of accuracy needed. We can be more accurate by choosing a smaller unit or by subdividing the unit.

Units can be standard or non-standard. Non-standard units can be anything, such as string, hand-spans, strides and handfuls. Standard units are things like metres, litres and kilograms.

Whole Class Activity 3

Below are pictures of non-standard units commonly used for measuring length, mass and capacity.

Which attribute could this be used to measure?

How would you use it to measure?

Example of a real-life situation.

Which attribute could this be used to measure?

How would you use it to measure?

Example of a real-life situation.

Which attribute could this be used to measure?

How would you use it to measure?

Example of a real-life situation.

Which attribute could this be used to measure?

How would you use it to measure?

Example of a real-life situation.

Which attribute could this be used to measure?

How would you use it to measure?

Example of a real-life situation.

Which attribute could this be used to measure?

How would you use it to measure?

Example of a real-life situation.

For each object that needs to be measured, think of a non-standard unit to use and the reason for choosing this

Item to be measured	Non-standard Unit	Reason
Doorway width		
Amount of liquid a large jug will hold		
Boundary fence of a park		
Measuring a piece of wood to make a bookshelf		
Amount of herbicide and water to mix in a watering can		

Compare the units you chose with those of another student. What did you notice?

Practice Exercise 1

1. For each situation decide if a non-standard unit is appropriate or inappropriate. Give reasons for your decision.

   a) Sam needs to quickly decide if the bookcase will fit through the doorway.
   appropriate   inappropriate   Why?

b) Rob measuring the perimeter of the paddock so he knows how much fencing wire to buy.
appropriate inappropriate Why?

c) Ben is cooking a roast and needs to cook it for 30 minutes for every 500g of meat.
appropriate inappropriate Why?

d) Deb is mixing cordial for her daughter's party in a 5 litre container and needs to know how much water and how much cordial to mix together.
appropriate inappropriate Why?

e) Fin is posting a document. If it weighs more than 500g he has to buy a different envelope.
appropriate inappropriate Why?

2. For each measurement decide if it is reasonable or unreasonable? If it is unreasonable, say why.

a) Nina measured the distance from her front door to the curb and found it was 27 strides.
reasonable unreasonable Why?

b) Billie measured the rug at 100 hand spans long.
reasonable unreasonable Why?

c) Darcy estimated that is would take 7 bucketfuls of dirt to fill the plant pot.
reasonable unreasonable Why?

d) Jimmy estimated the letter weighed the same as five one dollar coins.
reasonable unreasonable Why?

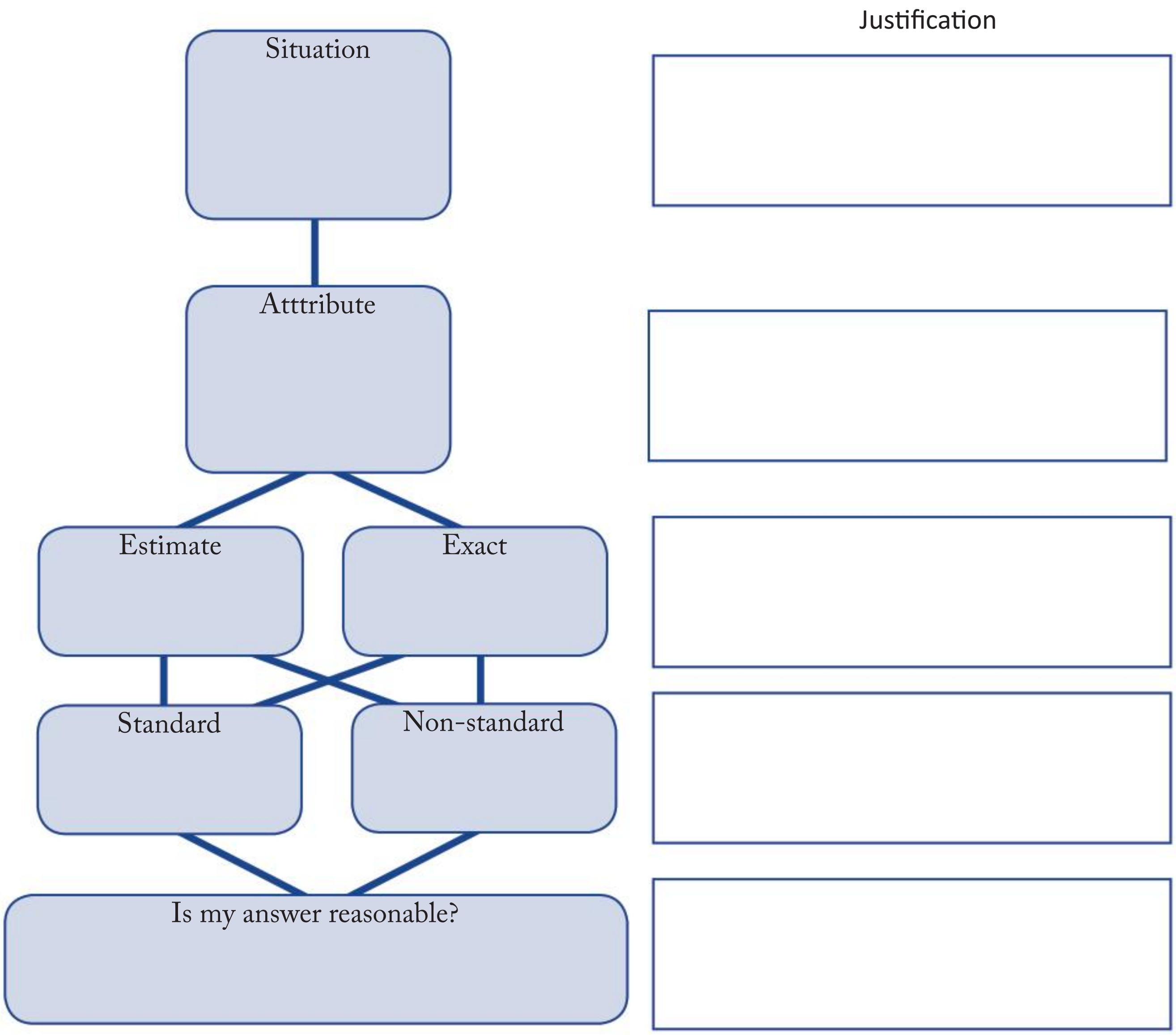
e) Kim argued with her sister that the cereal container would hold 20 cups of Nutrigrain.
reasonable unreasonable Why?

Reflection on Learning

Jonathan is moving interstate and needs to transport his dog on the plane. He has to buy a travelling crate for the dog.

What will Jonathan need to know in order to buy the right crate?

Complete the diagram below to show the decisions you would make in this situation. Say why you made each decision in the box on the right.



OLNA Practice Question

1. Two identical cylinders are placed on a bench.
   One is filled with popcorn and the other is filled with rice.
   What is the same and what is different about the two filled cylinders?

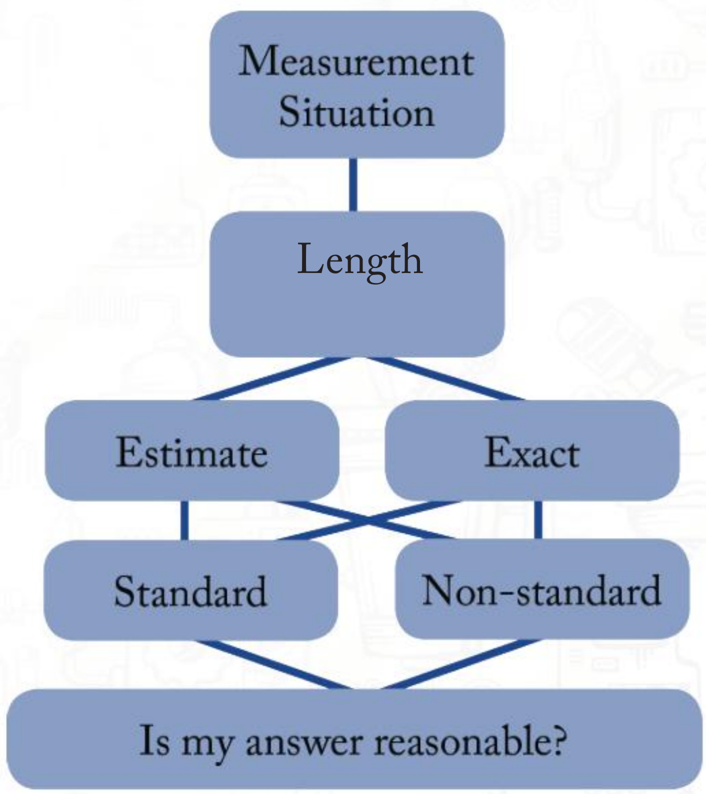
   A. The mass is the same and the capacity is different
   B. The volume is the same and the length is different.
   C. The capacity is the same and the mass is different.
   D. The mass is the same and the height is different.

Topic 2

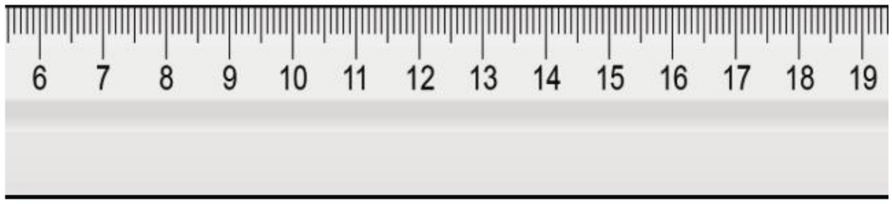
Standard Length Units

Mathematics Discussion

In order to use measurement in everyday situations we need to make many decisions. Firstly we decide what to measure. Next we decide whether an estimate or exact measurement is required. Next we work out the unit that best suits the situation. In this section we are focussing on situations that require estimated or exact measurements with standard units, for length.



Whole Class Activity 1



Label the features of the broken ruler above; millimetre, centimetre, half centimetre.

What do the numbers on the ruler tell you?

What do the longest lines mean?

What do the shortest lines mean?

Why is it that some lines have numbers and some do not?

A broken ruler is still useful. How might you use this piece of ruler to measure lengths?

Calibrated Scales

A ruler is an example of a calibrated scale. Calibrated scales include tape measures, rulers, odometers and trundle wheels. They are called calibrated scales because they use standard units, like centimetres (cm), millimetres (mm) and kilometres (km). We use them when we need to be accurate and when we need to share measurements with others.

Whole Class Activity 2

For each of the calibrated scales listed below;

- Draw a labelled diagram of the scale
- Describe how to use it to measure length.
- Say which unit/s it is best for measuring.
- Give an example of when you have used it or seen someone else use it to measure length

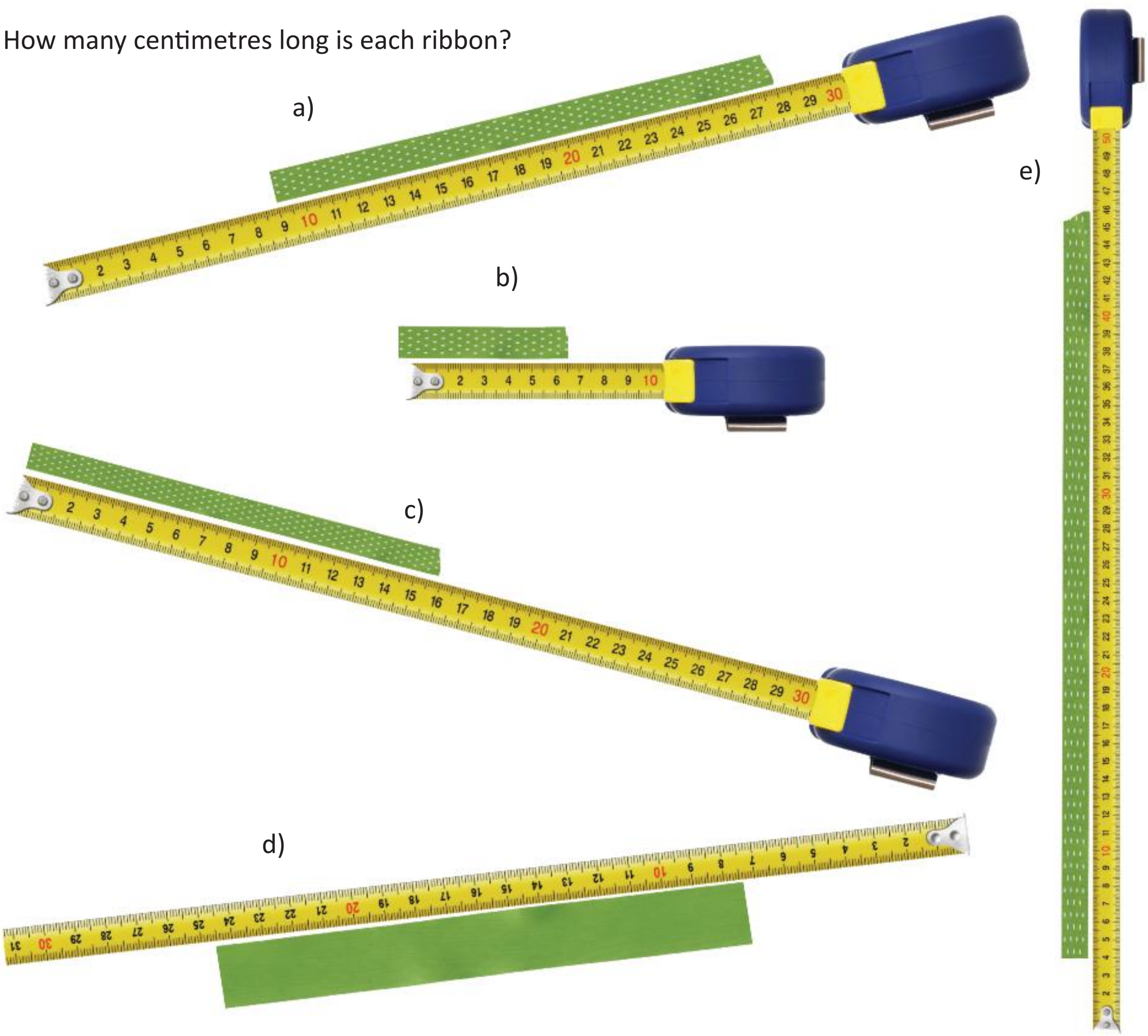
Ruler	Tape Measure
Trundle Wheel	Odometer

Practice Exercise 1

1. Which calibrated scale would best measure each of the following?

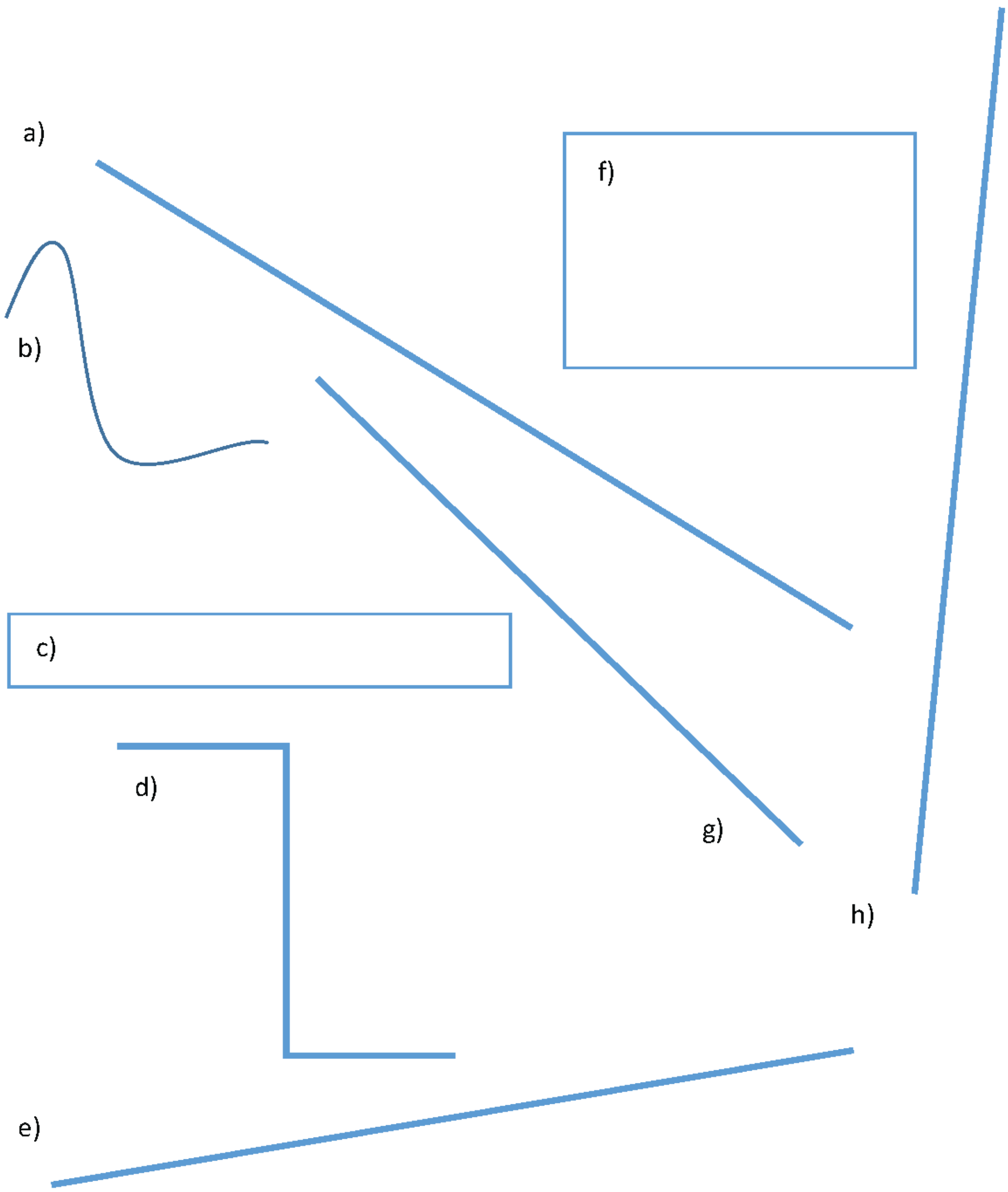
Situation	Scale
Measuring the depth of a swimming pool.	
Distance from your house to the shops.	
Working out how much material you need to sew a cushion cover.	
Measuring a piece of cardboard to make a gift tag.	
Calculating how far you ran in your morning's run.	
Marking out the lane lines for the athletics meet.	
Measuring the diameter of your sister's wrist, to buy her a bracelet that fits.	

2. How many centimetres long is each ribbon?



3. Measure these lengths using any calibrated scales you have available to find the 2nd shortest length.

What is your plan for finding the 2nd shortest line?



Which line has the 2nd shortest length?

Explain how you found the solution.

Personal Benchmarks for Millimetres, Centimetres and Metres

It is helpful to have an idea of the size of common standard units of length in order to make accurate estimates and to know that measurements given to you are reasonable. For example, knowing your finger is one centimetre wide gives you a benchmark for estimating centimetres.

Whole Class Activity 3

Use a ruler or tape measure to find a part of your body you could use as a benchmark for the following units.

Length Measurement	Benchmarks
1 millimetre (mm)	
1 centimetre (cm)	
1 metre (m)	

Discuss the benchmarks you chose and the reasons why you chose them?

Write down any of your friend's benchmarks that you think would be good to use.

Use your benchmark for 1 metre to estimate 5 metres, 10 metres and 100 metres distances.

What is about 5 metres from the door?

What is about 10 metres from the door?

What is about 100 metres from the door?

Use your benchmark for 1 metre and a tape measure to find benchmarks for the lengths listed below.

Length Measurement	Benchmarks
5 metres	
10 metres	
100 metres	

Discuss the benchmarks you chose and the reasons why you chose them?

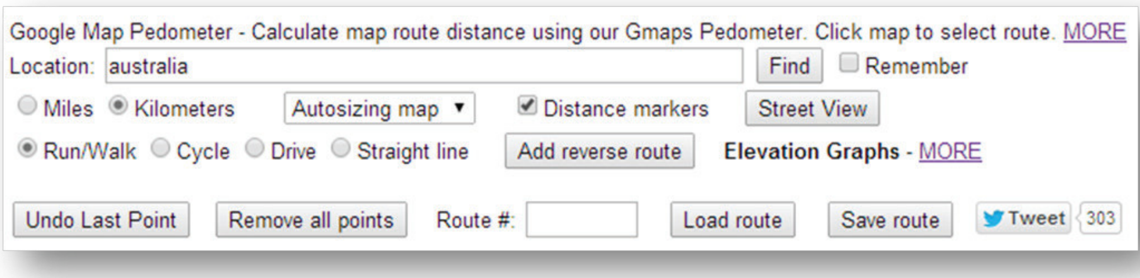
Write down any of your friends benchmarks you think would be good to use.

Personal Benchmark for Kilometres

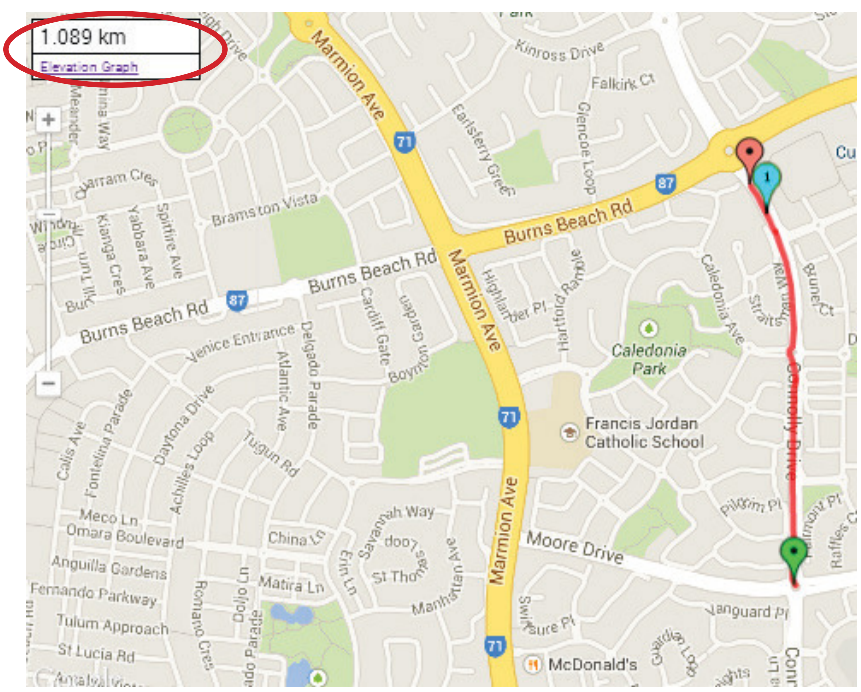
Developing personal benchmarks for the length of 1 kilometre is a little more challenging. It is impractical to use 1000 metre rulers to find out how far 1 kilometre is!

Think about and share suggestions for benchmarks you could use for 1 kilometre.

Go to www.mappedometer.com



Choose a location you are familiar with to put in the location field. The map will bring up the location. Make sure the kilometres button is selected. Make a path on the map by clicking along a route. Mark a path with landmarks so you know where the kilometre begins and ends. Stop when you have marked a distance of 1km.



Describe where your kilometre begins and ends, using the landmarks you are familiar with.

How long do you estimate it would take you to walk one kilometre? Test it out and record your actual time.

Connecting Non-Standard Units with Standard Units

Non-standard units such as hand spans, strides and ATM cards can be calibrated (connected to standard units) so you can use them to estimate when standard measuring equipment is not available.

Whole Class Activity 4

Use a ruler or tape measure to find the length of the following non-standard units. Measure each one twice to make sure you have your measurement correct.

Non-standard Unit	Measurement with a Standard Unit
Hand span	
ATM Card	
Finger next to thumb	
A4 Paper	

Compare your measurements with two other students.

Which measurements were the same?

Which measurements were different?

Choose a non-standard unit to measure across one of the classroom windows.
Use the measurement to cut a paper streamer to fit.

Choose a calibrated scale to measure the same window. Use the measurement to cut a second streamer to fit.

Compare the two streamers. What is the difference between the two lengths?

Why are standard units used if we can measure accurately with non-standard units?

Whole Class Activity 5

Strides are a useful non-standard unit for measuring distances longer than one metre.
For this activity you will need 2 pens, a calculator and tape measure.

Follow the link and use the Measured Walk method for working out how long 1 of your strides is.

https://www.walkingwithattitude.com/articles/features/how-to-measure-stride-or-step-length-for-your-pedometer

Record your information on the table below. Repeat the measurement 3 times.

Attempt	Total Distance Walked	Divide by 10	Length of Stride
1			
2			
3			

Approximately, how long is your stride?

Use your stride to measure the length of two classroom walls. Record the lengths below. Use the numbers of strides to estimate how long the wall is in a standard unit.
Note: You can use parts of a stride, e.g., half a stride or quarter of a stride.

Wall	Length in strides	Calculation	Length in standard unit
1			
2			

Practice Exercise 2

1. On a blank sheet of paper, draw 3 lines for each measurement below, using only benchmarks.

a) 5mm
b) 3cm
c) 10cm
d) 1cm
e) 15mm
f) 5cm

Use a ruler to check your lines. For each measurement circle the line that is the most accurate.

2. For each object below, use a benchmark to make an estimate, then use standard units to measure exactly.

Object	Benchmark	Estimate	Standard Measurement
Pencil case			
Door height			
Chair height			
Mobile phone			
Bag			

3. Using your stride, mark out these distances.

a) 1 metre
b) 3 metres
c) 5 metres
d) 10 metres

Use a tape measure or trundle wheel to check your distances. For each measurement, circle the distances that are the most accurate.

4. Use your benchmarks to decide if their estimate below is reasonable or unreasonable. Justify your choice. If the estimate is unreasonable provide a more reasonable estimate.

a) Tara estimates she can walk 3 kilometres in 15 minutes.
This estimate is reasonable unreasonable.
Justify:

b) Sann estimates that 10 paperclips linked together would be 30cm long.
This estimate is reasonable unreasonable.
Justify:

c) Tegan estimates that the car windscreen is 1000mm wide.
This estimate is reasonable unreasonable.
Justify:

d) Tristan estimates the rug in his room is 4 metres long and 1 metre wide.
This estimate is reasonable unreasonable.
Justify:

Interpreting Length Measurements With Decimals

The standard units for measuring length are based on the metre unit. Prefixes are used to show how all other length units are related to the metre. There are relationships between the commonly used units that are useful to remember;

- 10 **milli**metres makes 1 centimetre
- 1000 **milli**metres makes 1 metre
- 100 **centi**metres makes 1 metre
- 1000 metres makes 1 **kilo**metre

Sometimes we read or write measurements as decimal numbers. The decimal point separates the whole units from the parts of the unit.

1.5 metres is 1 whole metre and half of the next metre. A metre can be subdivided into centimetres or millimetres. So, half of a metre can be 50 centimetres or 500 millimetres.

The decimal point can also be used to separate centimetres and millimetres.
1.5 centimetres is 1 whole centimetre and half of the next centimetre, which is 5 millimetres

The decimal point can also be used to separate metres from kilometres.
1.5 kilometres is 1 whole kilometre and half of the next kilometre, which is 500 metres.

Whole Class Activity 6

You will need: Paper streamer (1 metre each), Measuring tape, Marker pen

Accurately cut a paper streamer 1 metre in length.
Fold the streamer in half and mark the halfway point with a line.
Measure the length of each half with the measuring tape.
Write half a metre = 0.5m = 50cm to the left of your halfway mark.
Record the measurement on the data table below.

Fold the paper streamer into quarters. Mark each quarter with a line.
Measure the length of each quarter with the measuring tape.
Write one quarter of a metre = 0.25m = 25cm to the left of the first mark.
The end of the second quarter is already marked, as this is half of a metre.
Move to the third quarter mark and write the length in words, metres and centimetres.
Record the measurement on the data table below.

What is the measurement at the end of the fourth quarter?

Join with another class member, and lay the tapes side by side.
If you add another quarter of a metre to the first metre, how long would this be?

How could you write this as words, decimal measure and in cm?
Complete the next 2 rows of the table.

Convert each amount to mm.
What operation do you use to convert m to mm?

What operation do you use to convert the decimal metre to centimetres?

Words	Decimal Measure	Number of cm	Number of mm
Quarter			
Half			
Three quarters			
One and a quarter			
One and a half			

Use your tape to find items that fit the following categories.

- Less than 0.25 m
- More than 0.5 m
- Between 0.75 m and 1.25 m

Practice Exercise 3

1. For each decimal measure write the whole and part units.

   a) 7.5 cm is the same as ___7___cm and __5___ mm

   b) 23.25 km is the same as ______km and ______m

   c) 132.75 m is the same as ______m and ______cm

   d) 68.5 cm is the same as ______________________

   e) 564.25 m is the same as ______________________

   f) 48.75 km is the same as ______________________

2. Convert the following measurements showing the operation you used to solve the problem.

   a) 10 cm is the same as ___100__ mm________10 cm x 10 = 100 mm____

   b) 2 m is the same as _________ mm ______________________________

   c) 5000 mm is the same as _________ m ______________________________

   d) 3000 mm is the same as _________ m ______________________________

   e) 35 cm is the same as _________ mm ______________________________

   f) 1500 m is the same as _________ km ______________________________

3. Circle the pairs of measurements that describe the same amount of length.

a)	3 cm	30 mm	d)	2 km	200 000 cm
b)	9 m	900 cm	e)	1 800 mm	18 cm
c)	32 cm	3 200 mm	f)	2.75 m	275 cm

4. Order each set of measurements from shortest to longest.

   a) 5 m, 500 cm, 34 mm, 2800 mm, 1 km, 3 cm

   b) 2 km, 3000 m, 800 cm, 1000 mm, 150 m, 700 mm

   c) 8 m, 340 cm, 0.75 m, 2000 mm, 1.5 km, 2000 m

   d) 400 mm, 4 m, 1.25 m, 32 cm, 250 m, 50 cm

5. For each situation write which standard unit is the most appropriate?

a) Measuring the floor to find out how much carpet to order.

b) Measuring the dimensions of a kitchen door so a new one can be made.

c) Measuring how far it is from home to the beach.

d) Measuring the amount of material to cut off the cuff of my jeans so they fit.

e) Measuring how big the space in the wall is where a new window will go.

f) Measuring how big the space for the chicken coop is so I can put fencing around it.

Reflection on Learning

Choose one of the situations below and on a blank piece of paper, write an explanation of how you would measure. Use the Measurement Decisions flow diagram to help you. Include details about the level of accuracy, your choice of unit/s, your choice of measuring equipment, how you would use the equipment and how you would know if the measurement taken was reasonable.

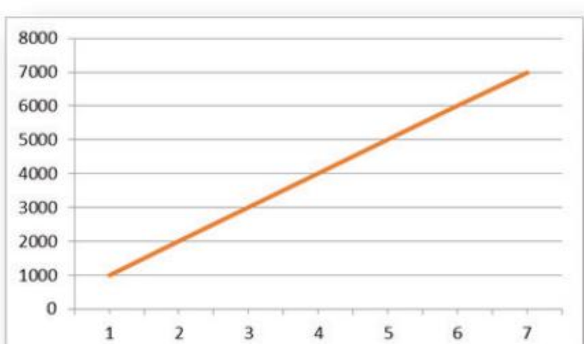
Situation A	Situation B
Henry is at the shops and remembers he needs some ribbon to go around the gift he bought. The gift is a book and is at home. He can buy the ribbon off the roll for 75 cents per metre, or in packets of 2 metres, 3 metres and 10 metres. How will he decide how much ribbon to buy?	Mrs Pilgrim needs to mark out lines for the athletics meet and has to phone through her paint order this afternoon. She can only find a 1 metre ruler. The marking machine uses 4 litres of paint for every 75 metres of lines. Each 4 litre tin of paint costs $55. How will she work out how much paint is needed?

OLNA Practice Questions

1. The lengths of 4 lines are given below. Which one is the shortest?

A. 4 000 mm B. 40 cm C. 400 cm D. 4 m

2. The title and the axes labels have been deleted from this conversion graph.



The graph shows how to convert:

A. Millimetres to Centimetres B. Centimetres to Metres

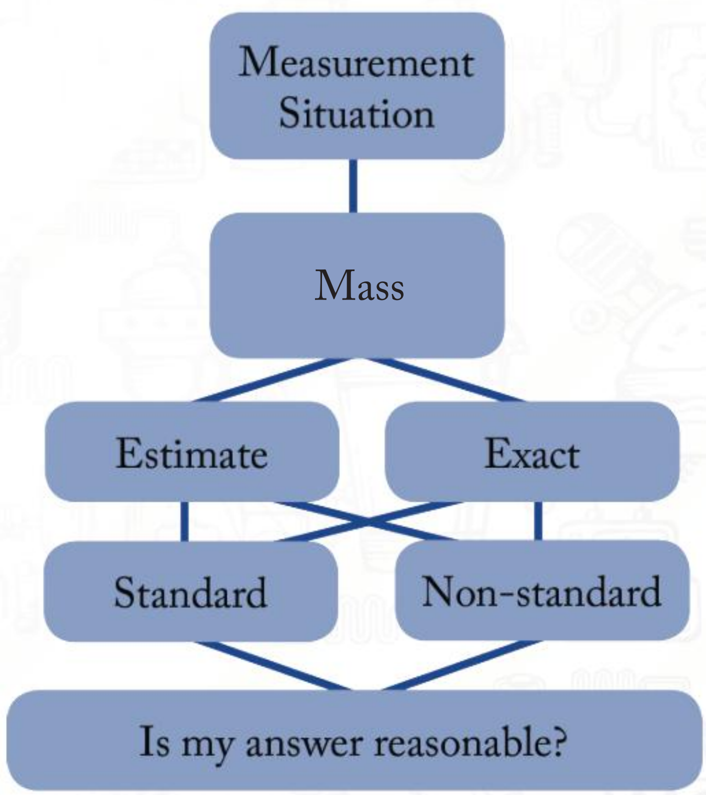
C. Kilometres to Centimetres D. Metres to Millimetres

Topic 3

Standard Mass Units

Mathematics Discussion

In order to use measurement in everyday situations we need to make many decisions. Firstly we decide what to measure. Next we decide whether an estimate or exact measurement is required. The next we work out the unit that best suits the situation. In this section we are focussing on situations that require estimated or exact measurements with standard units, for the attribute of mass. Mass can also be called **weight**, so when we measure the **mass** of something we are working out how much it weighs.



Whole Class Activity 1

Circle the pictures that show mass being measured. Write what is being measured and the unit being used under each picture.






List 5 situations where you would need to weigh an object?

What words do we use to describe the mass of objects?

Mechanical Calibrated Scales

The standard units we use most often to describe the mass or weight are grams (gm) and kilograms (kg). We measure weight with many different types of digital or mechanical scales.
Different weighing scales use different units, for example mechanical bathroom scales often have markings in kilograms, whereas a mechanical kitchen scale shows grams.

Whole Class Activity 2

Look at the dials of the different mechanical weighing scales in the table below.
In a group of 3, each person chooses one scale to study. Describe what the markings and numbers on your scale are showing.

- Are the scales measuring grams or kilograms, or both?
- What do the numbers tell you?
- What do the long lines mean?
- What do the short lines mean?
- Where is the zero?
- What is the maximum this scale will measure?

Share your findings with your group and use the discussion to complete the table.

a) Mechanical Kitchen scale 	Are the scales measuring grams or kilograms, or both? What do the numbers tell you? What do the long lines mean? What do the short lines mean? Where is the zero?
b) Mechanical Bathroom scale 	Are the scales measuring grams or kilograms, or both? What do the numbers tell you? What do the long lines mean? What do the short lines mean? Where is the zero?
c) Mechanical Hanging scale 	Are the scales measuring grams or kilograms, or both? What do the numbers tell you? What do the long lines mean? What do the short lines mean? Where is the zero?

Practice Exercise 1

1. Look at each picture and write the weight shown. Is it grams or kilograms?

a)

b)

c)

d)

e)

f)

g)

h)

Digital Calibrated Scales

Weighing scales can be digital. With a digital scale you may need to choose which unit you want to use, e.g., kg or g. The weight is often shown as a decimal number.

Practice Exercise 1

1. Look at the displays on each of the digital scales below. For each, write:

- If the mass is displayed in grams or kilograms
- In words, how you say the amount.

a) 3.45 	c) 370 
b) 97.6 	d) 83.4 

2. Look at each pair of scales.

- Write the measurement with its unit under each scale
- Place a tick next to the heaviest amount

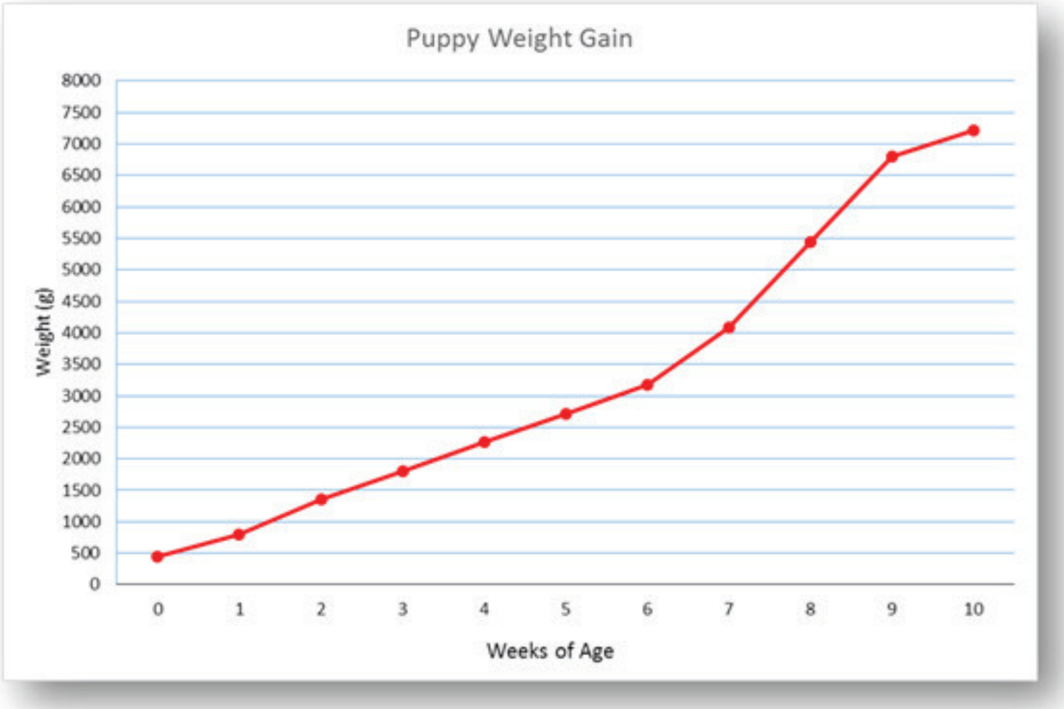
a)

b)

c)

d)

3. Look at the graph below, showing the growth of a puppy over the first 10 weeks of its life. The first measurement shows the weight of the puppy at birth, then every 7 days a new measurement was recorded.



a) What unit is used to record the mass of the puppy?

b) How heavy was the puppy when it was born?

c) How much weight did the puppy gain between week 2 and 4?

d) Approximately how many kilograms is the puppy at 10 weeks of age?

e) How much weight did the puppy gain over the 10 weeks?

f) What do you estimate the puppy will weigh when it is measured at 11 weeks?

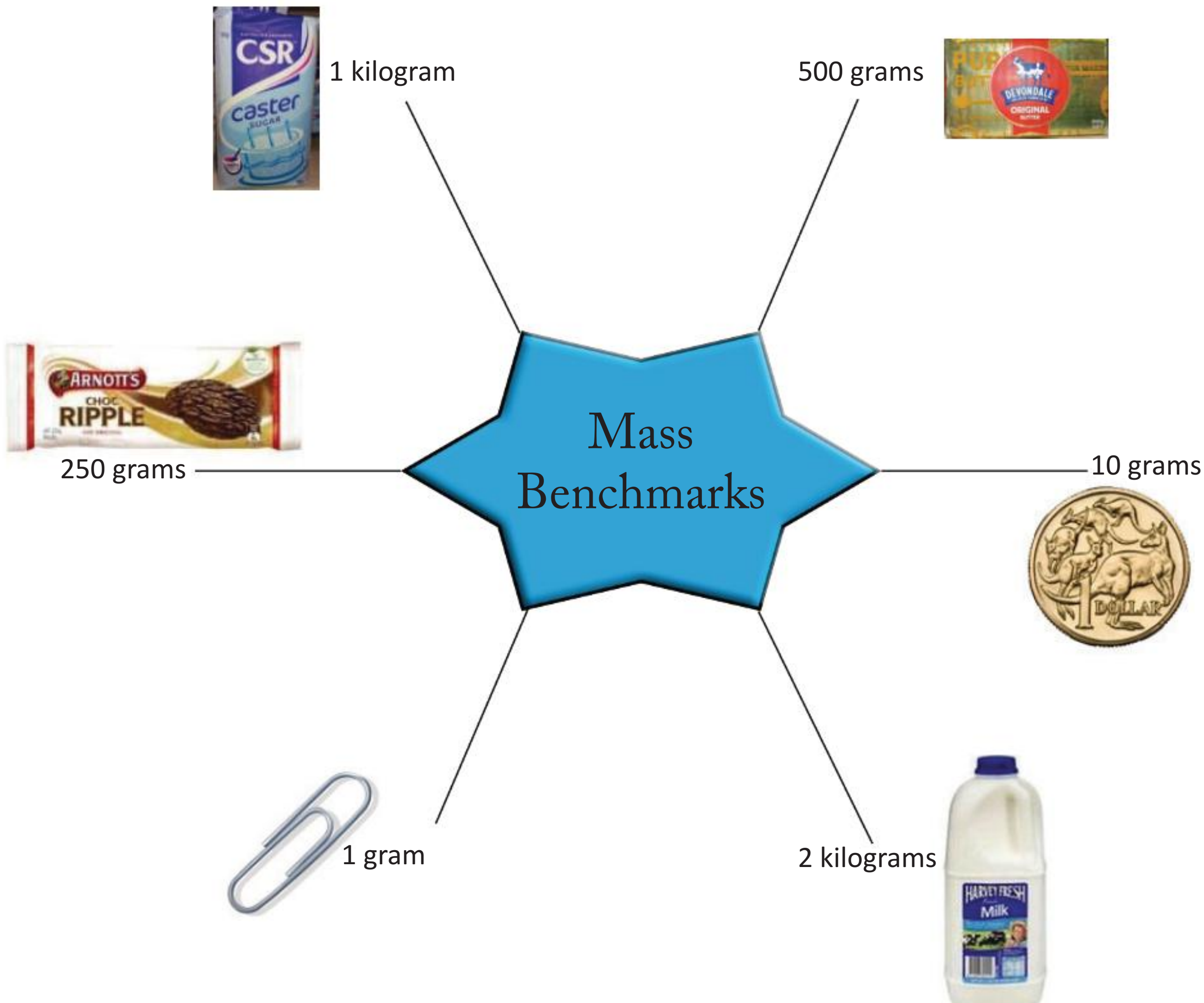
Personal Benchmarks

It is helpful to have an idea of the size of common standard units of weight in order to make accurate estimates and to know that measurements given to you are reasonable. For example, knowing a block of butter is 500 grams gives you a benchmark for estimating grams and kilograms.

We can use our benchmarks to tell how heavy something is by putting the object we know the weight of (like the butter) in one hand and the object we are measuring in our other hand to compare which feels heavier. This is called hefting.

Whole Class Activity 3

Look at the pictures of different items and their weights.
Brainstorm other items that fit into the benchmark categories and write them below.



Practice Exercise 3

For these exercises, you will need access to weighing scales.

1. Below are 3 lines, each with a benchmark weight at each end and a list of objects. Place each object from the list below, on a line where you think it belongs. Base your decision on how heavy you esti mate it to be. After all items are placed on a line, use a scale to check their weights.

50 cent piece	skateboard
Bike helmet	basketball
1 orange	tennis ball
Pair of glasses	dictionary
Pair of sneakers	a DVD

2. For each object, use a benchmark to compare it to, make an estimate of its weight and then use standard units to measure exactly.

Object	Benchmark	Estimate	Standard Measurement
Eraser			
Wallet			
Mobile Phone			
Pen			
Book			

3. Read each student's estimate. Use your knowledge of measurement benchmarks and your own experience to decide if their estimate is reasonable or unreasonable. Justify your choice. If the estimate is unreasonable provide a more reasonable estimate.

a) Tara estimates her school bag weighs at least 80kg.
This estimate is reasonable unreasonable.
Justify:

b) Sann estimates 4 apples are about half a kilo.
This estimate is reasonable unreasonable.
Justify:

c) Tegan estimates the bag of shopping weighs 3 kilos.
This estimate is reasonable unreasonable.
Justify:

d) Tristan estimates the empty soft drink can weighs 10 grams.
This estimate is reasonable unreasonable.
Justify:

Interpreting Mass Measurements with Decimals

The standard units for measuring mass are based on the gram unit. Prefixes are used to show how all other mass units are related to the gram. There are relationships between the commonly used units that are useful to remember;

- 1000 grams make 1 kilogram
- 1000 kilograms make 1 tonne.

Sometimes we read or write measurements as decimal numbers. The decimal point separates the whole units from the parts of the unit.

1.5 kilograms is 1 whole kilogram and half of the next kilogram. A kilogram can be subdivided into grams. So, half of a kilogram is 500 grams.

The decimal point can be used to separate tonnes and kilograms.
1.5 tonnes is 1 whole tonne and half of the next tonne, which is 500 kilograms.

Whole Class Activity 4

How heavy is a tonne?

Search the internet to find out the weight of your favourite car, truck, bike or boat. Does it weight more than a tonne, or less?

Compare your vehicle with others in your group to see which weighs the most and which the least. Write them in order below, from lightest to heaviest.

Whole Class Activity 5

You will need;
1kg of clay (or play dough, from the art room).
Alternatively, 1kg of rice or margarine (from the cooking centre).
A weighing scale

Accurately measure out 1kg of clay.
Divide the clay in half. Make sure they are exactly the same size.
Measure the weight of each half with the weighing scale. Record the measurement on the data table below.

Divide the clay into quarters. Make sure they are exactly the same size.
Measure the weight of each quarter with the weighing scale.
Record the measurements for 1 quarter and 3 quarters on the data table below.

What is the weight of the 4 quarters?

Join with another class member, and lay the quarters side by side.
If you add another quarter of a kilogram to one whole kilogram, how much will it weigh?

How could you write this as words, decimal measure and in kilograms and grams?
Complete the next 2 rows of the table, as you add a quarter of a kilogram each time.

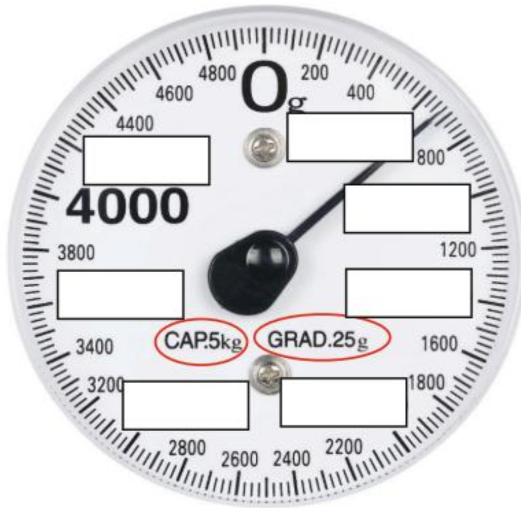
Words	Decimal Measure	Number of kilograms	Number of grams
Quarter			
Half			
Three quarters			
One and a quarter			
One and a half			

Use your clay quarters to find items that fit the following categories.

- Less than 0.25kg
- Between 0.75kg and 1.25kg

Practice Exercise 4

1. a) Some gram amounts on this scale are missing. Write the amount of grams that belong in each box. Consider the meaning of the information inside the red circles.



b) If this scale showed kilograms, which labels might be written differently?

c) How many grams are in 1 kilogram?

d) How would you say 2000 grams in kilograms?

e) How would you say 3500 grams in kilograms?

2. For each weight write the equal amount in unit shown.

a) 1.5kg is the same as __________ g

b) 2000g is the same as __________ kg

c) 3.5kg is the same as __________ g

d) 4250g is the same as __________ kg

e) 1500kg is the same as __________ t

f) 5250kg is the same as __________t

g) 2.5t is the same as __________ kg

h) 3.75kg is the same as __________ g

3. Circle the pairs that show the same measurement.

a) 4kg and 400g

b) 3000g and 3kg

c) 1023kg and 123t

d) 7000kg and 7t

e) 4500g and 4.5kg

f) 0.5kg and 500g

4. Order each set of measurements from lightest to heaviest.

a) 35g, 4005g, 5g, 1000g, 4kg, 1.5kg

b) 2020g, 2.75kg, 200g, 0.25t, 2002g, 2kg

c) 165g, 100.25kg, 1t, 16kg, 2000g, 2000kg

Reflection on Learning

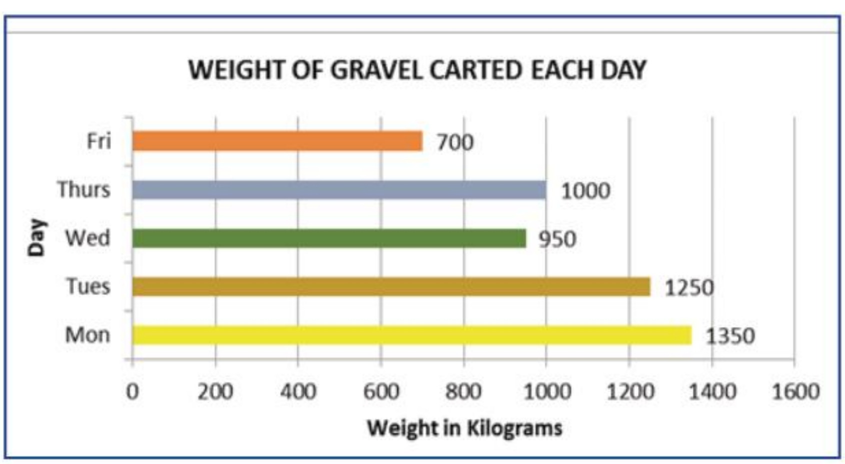
Write a set of instructions explaining how to use this scale to measure 1.75kg of sugar.

OLNA Practice Questions

1. The cost of posting a parcel is based on its weight. Sascha is posting a parcel that she estimates to weigh slightly less than a 1 Litre milk carton. Which weight range will Sascha's parcel fit?

A. Up to 100 grams
B. 101 grams to 600 grams
C. 601 grams to 1200 grams
D. 1201 grams to 2000 grams

2. The amount of gravel carted to a building site during a week is shown in the graph below:



What was the total gravel carted in the week?

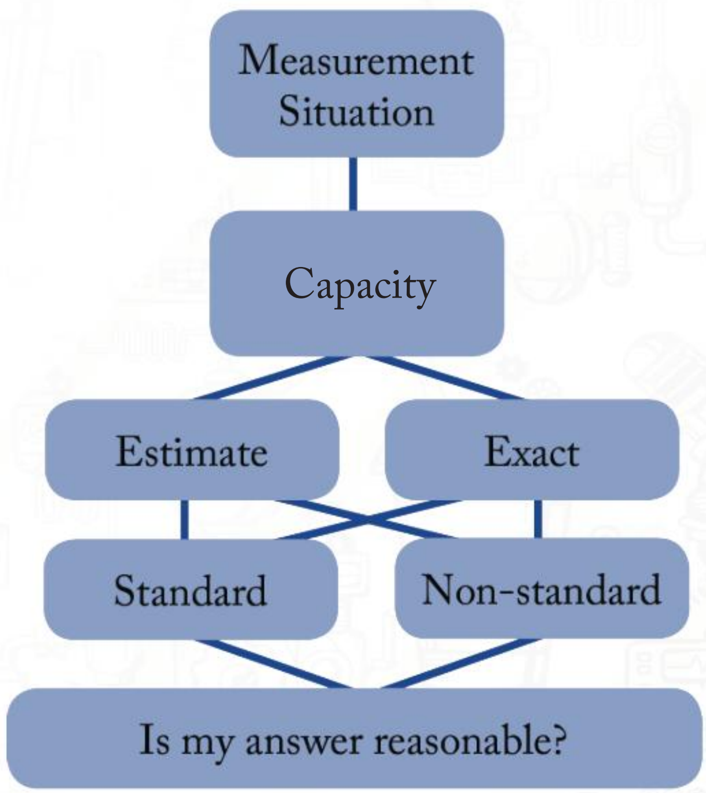
A. 5.25 tonnes
B. 4 250 kg
C. 52 500 kg
D. 0.525 tonnes

Topic 4

Standard Capacity Units

Mathematics Discussion

In order to use measurement in everyday situations we need to make many decisions which are shown by the flow diagram below. In this section we are focussing on situations that require estimated or exact measurements with standard units, for the attribute of Capacity.
Capacity is the measurement of how much something can hold.



Whole Class Activity 1

Below are pictures of containers used to measure capacity with standard units.
Beneath each picture write what it is. Describe how and when you would use it to measure capacity.



Write 3 situations where you would need to measure capacity? For each situation, write the level of accuracy required?

1.
2.
3.

Calibrated Scales

The standard units we use most often to describe the capacity of something are litres (L) and millilitres (mL). There are many different containers for measuring capacity and the scale can show different markings.

Whole Class Activity 2

Look at the scale on the measuring containers in the table below. In a group of 3, each person chooses one container to study. Describe what the markings and numbers are showing on your chosen container.

Share your findings with your group and use the discussion to complete the table.

a) medicine cup  	Are the scales measuring millilitres or litres, or both? What numbers are shown? What do the numbers tell you? What do the long lines mean? What do the short lines mean? What is the maximum capacity this container can be used to measure?

b) measuring jug  	Are the scales measuring millilitres or litres, or both? What numbers are shown? What do the numbers tell you? What do the long lines mean? What do the short lines mean? What is the maximum capacity this container can be used to measure?
c) baby bottle  	Are the scales measuring millilitres or litres, or both? What numbers are shown? What do the numbers tell you? What do the long lines mean? What do the short lines mean? What is the maximum capacity this container can be used to measure?

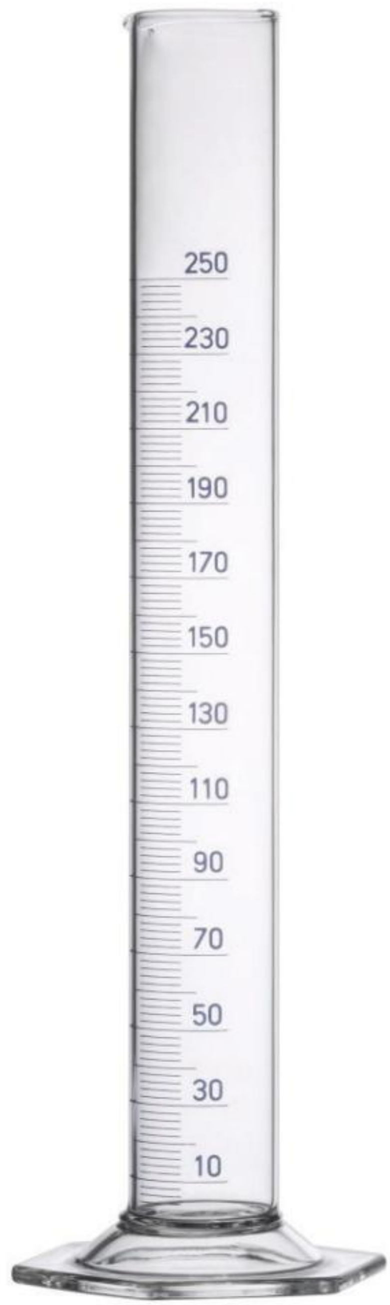
Practice Exercise 4

1. Each container has three measurements next to it. Mark and label the container to show each amount .

a) 1 mL, 3½ mL and 6 mL.

b) 30 mL, 40 mL and 15 mL.

c) 190 mL, 160 mL and 80 mL



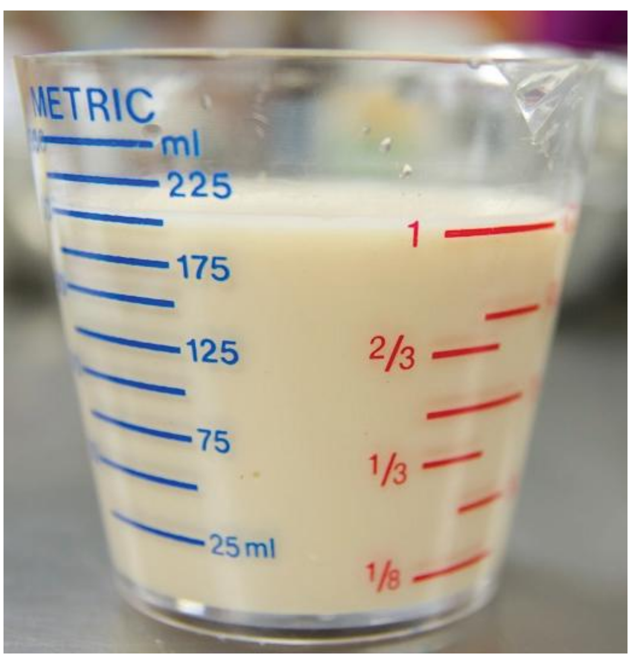
d) 250 mL, 420 mL and 890 mL.

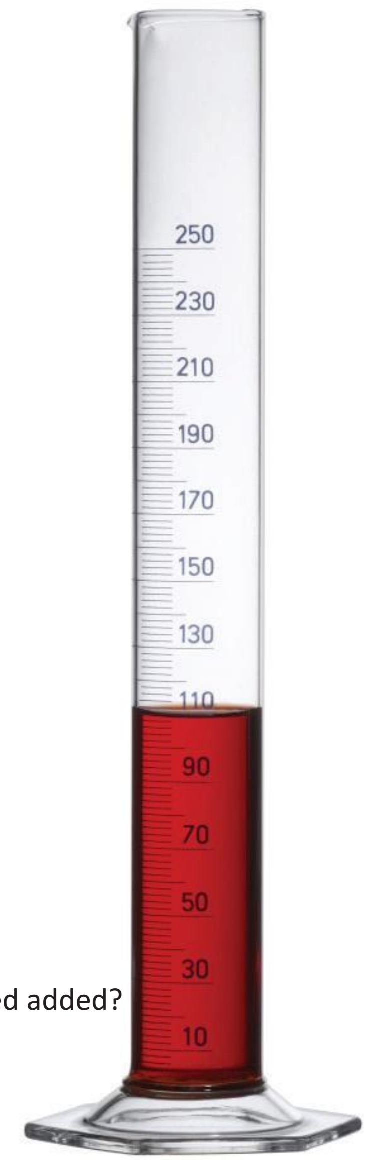
2. Write the amount of liquid in the container and how much there wil be after the action is carried out. Mark where the new level will be.

a) How much oil is there?
How much will there be if 200 mL is poured out?

b) How much water is there?
How much will there be if 250 mL is poured out?

c) How much milk is there?
How much will there be if 50 mL is added?





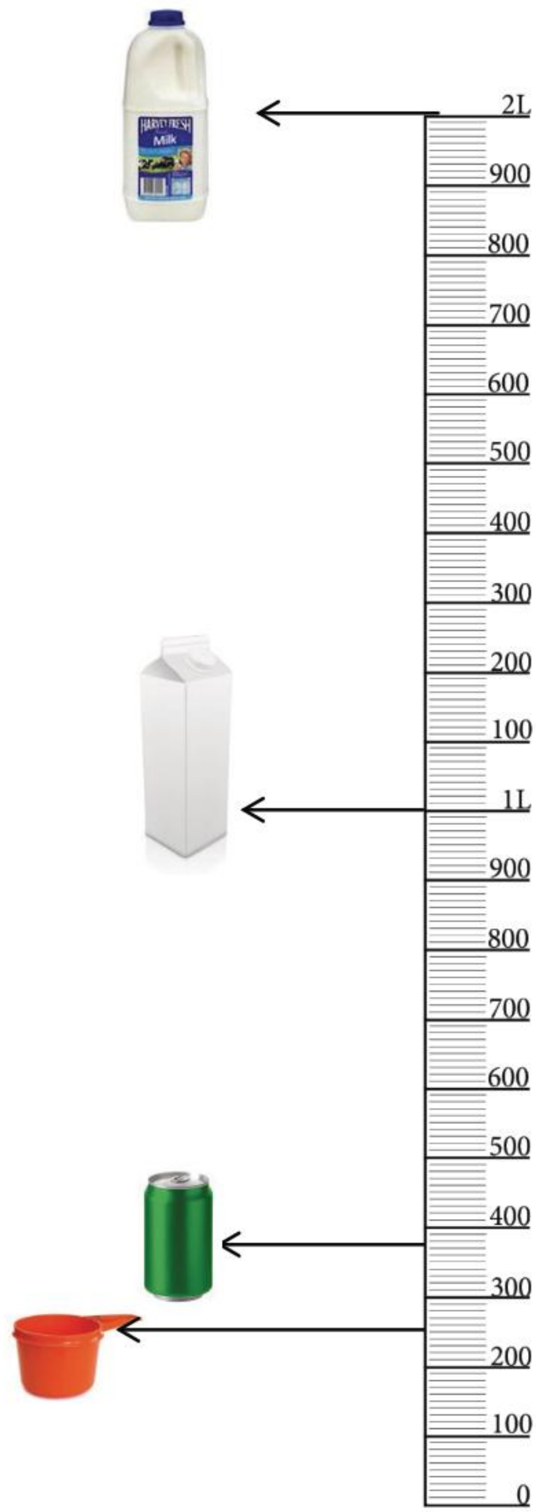
d) How much red fluid is there?
How much will there be if 22 mL is poured added?

Personal Benchmarks

It is helpful to have an idea of the size of common units so you can make accurate estimates and know if a measurement communicated to you is reasonable. For example, knowing a standard measuring cup holds 250 millilitres gives you a benchmark for estimating litres and millilitres.

Whole Class Activity 3

Look at the pictures of different items and their capacities.
Brainstorm other items that fit into the benchmark categories and write them below.



Practice Exercise 5

1. You will need access to a variety of containers to complete this activity.

For each container, use a benchmark to compare it to, make an estimate of its capacity, and then use standard units to measure exactly.

Container	Benchmark	Estimate	Standard Measurement
A			
B			
C			
D			

2. Read each student's estimate. Use your knowledge of measurement benchmarks and your own experience to decide if their estimate is reasonable or unreasonable. Justify your choice. If the esti mate is unreasonable provide a more reasonable estimate.

a) Tara estimates 7mL of rain fell last night.
This estimate is reasonable unreasonable.
Justify:

b) Sann estimates 4 glasses of water is about 4 litres.
This estimate is reasonable unreasonable.
Justify:

c) Tegan estimates the saucepan holds 200mL of soup.
This estimate is reasonable unreasonable.
Justify:

d) Tristan estimates the car's fuel tank can hold 700 litres of petrol.
This estimate is reasonable unreasonable.
Justify:

Interpreting Capacity Measurements with Decimals

The standard units for measuring capacity are based on the litre unit. Prefixes are used to show how all other capacity units are related to the litre. It is important to know the relationships between commonly used units;

- 1000 millilitres make 1 litre
- 1000 litres make 1 kilolitre (kL)

Kilolitres are used to measure the capacities of large containers such as swimming pools and water tanks.

Sometimes we read or write capacity measurements as decimal numbers. The decimal point separates the whole units from the parts of the unit.

1.5 litres is 1 whole litre and half of the next litre. A litre can be subdivided into millilitres so half of a litre is 500 millilitres.

1.5 kilolitres is 1 whole kilolitre and a half of the next kilolitre, which is 500 litres.

Whole Class Activity 4

You will need: 1 litre of water, a measuring jug, 4 empty plastic ice-cream containers.

Accurately measure 1 litre of water into your measuring jug.
Equally divide the litre of water between 2 ice-cream containers.
Measure the capacity of each half with the measuring jug.
Record the measurement on the data table below.

Divide the water into quarters.
Measure the capacity of each quarter with the measuring jug.
Record the measurements for 1 quarter and 3 quarters on the data table below.

What is the capacity of the 4 quarters?

If you add another quarter of a litre to the first litre, how much water will there be?
How could you write this as words, decimal measure and in litres and millilitres?

Complete the next 2 rows of the table, as you add a quarter of a litre each time.

Words	Decimal Measure	Number of litres	Number of millilitres
Quarter			
Half			
Three quarters			
One and a quarter			
One and a half			

Practice Exercise 6

1. Fill in the missing numbers to make each sentence true.

a) 5000mL is the same as _______ L

b) 4000L is the same as _______ kL

c) 7.5L is the same as _______ L and _______ mL

d) 4250mL is the same as _______ L

e) 4.75kL is the same as _______ kL and _______ L

f) 2.25L is the same as _______ mL

g) 9250L is the same as _______kL

h) 8385mL is the same as _______ L and _______ mL

2. Circle the pairs that show the same measurement.

a) 0.5L and 5000mL

b) 230mL and 2.3L

c) 750mL and 0.75L

d) 3.25L and 3250mL

e) 2.5kL and 2500 L

f) 4650mL and 46.5L

g) 5025mL and 5.25L

h) 2300L and 23kL

3. Order each set of measurements from least to most capacity.

a) 0.5L, 505mL, 5kL, 5000mL, 5.5L, 50mL

b) 3.25L, 7.5L, 5078mL, 70mL, 320mL, 5.75kL

c) 85mL, 8000mL, 8.5kL, 5800mL, 8240mL, 5.75L

d) 7.5L, 6L, 750mL, 3.25kL, 3004mL, 3L

Reflection on Learning

Steve is spray painting his car and needs to accurately measure and then mix various quantities of primer, paint and thinner for each coat. This is the measuring jug Steven is going to use and next to it are the capacities Steve is using it to measure out.

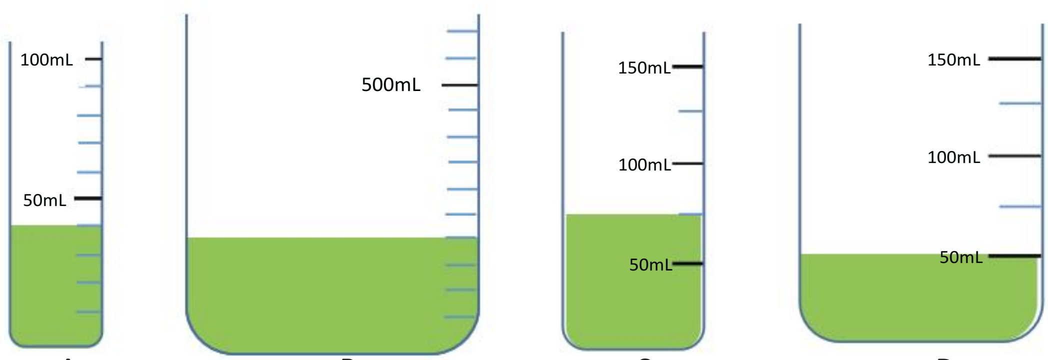
Coat 1: 200mL of thinner added to 400mL of primer,
Coat 2: 1.5L of red paint added to 500mL of thinner
Coat 3: 750mL of yellow paint added to 250mL of thinner.

Explain how Steve should use the jug to measure each of the different amounts.
Use these questions to help you.

- Which numbers does Steve need to use?
- What is the maximum amount this jug will allow Steve to measure?
- How will he use the jug to be as accurate as possible?

OLNA Practice Questions

1. Which container has the MOST liquid?



A B C D

2. Kirstin has 3980mL of cola in bottles. The bottles are in three sizes 330mL, 650mL and 1.5L. All the bottles are full.

How many bottles does Kirstin have?

A. 12 B. 7 C. 4 D. 6

ANSWERS

Section 1 Whole Numbers and Money

Topic 1 The Purpose of Numbers

PRACTICE EXERCISE
1. Answers may vary

2. a) Read each number as a single digit, b) Label

3.a) Order, b) S. Pearson. Shortest time, c) A. Whyte
d) Order (order of registration)

OLNA PRACTICE QUESTION

Score	64	71	69	75	63	72
Ranking	2	4	3	6	1	5

Topic 2 Using Place Value to Read, Write, Say and Compare Whole Numbers

PRACTICE EXERCISE 1
1.

MILLIONS			THOUSANDS			ONES		
H	T	O	H	T	O	H	T	O
					8	7	9	4
				3	0	0	0	9
				2	5	0	7	0
			1	0	5	9	3	4
		1	4	9	0	8	0	0
3	2	0	0	0	6	0	0	4

2.a) 4 327, b) 65 710, c) 18 808, d) 240 542, e) 6 500 764, f) 24 804 538

3. 1) 200 000, 2) 2 000, 3) –, 4) –, 5) 200, 6) –, 7) 20, 8) 2, 9) 200, 10) 200

4.a) Four hundred and nineteen, b) Five hundred and two, c) Eight thousand, seven hundred and twelve, d) Six hundred and three thousand, seven hundred and two, e) Seven hundred and eighty five thousand and nine, f) Two hundred and three million, six thousand and seventy

5.a) 317, b) 806, c) 5 030, d) 18 010, e) 1 707 000, f) 50 004 308

6.a) Eighty two thousand, three hundred, b) Seven million, six hundred and five thousand, c) One thousand, four hundred and twenty five, d) Three hundred and twenty nine thousand, eight hundred and forty seven,
e) Ten point five, five million

PRACTICE EXERCISE 2
1.

COUNTING FORWARDS AND BACKWARDS			
985	2 020	10 035	9 720
990	2015	10 025	9 820
995	2010	10 015	9 920
1000	2005	10 005	10 020
1005	2000	9 995	10 120
1010	1995	9 985	10 220
1015	1990	9 975	10 320

COUNTING FORWARDS AND BACKWARDS			
99 770	100 210	399 970	10 300 350
99 870	100 110	399 980	10 200 350
99 970	100 010	399 990	10 100 350
100 070	99 910	400 000	10 000 350
100 170	99 810	400 010	9 900 350
100 270	99 710	400 020	9 800 350
100 370	99 610	400 030	9 700 350

PRACTICE EXERCISE 3
1. a) < , b) >, c) >, d) <, e) >, f) <
2. a) 4 080, 8 004, 8 040, 8 400, b) 2 400, 20 004, 20 400, 200 040,
c) 37 000, 307 000, 3 070 000, 3 700 000, d) 50 003 005, 50 030 000,
50 350 000, 53 005 000

3.a) 605, 657, 930, 1002, 1116, b) Bars allow visual comparison of numbers of Smarties

4. Answers will depend on date and year of research
5.

COUNTRY	AREA IN SQUARE KM	RANKING
Japan	377 765	4
China	9 560 000	1
South Korea	100 032	5
Lebanon	10 452	7
Israel	20 772	6
Iran	1 640 000	2
India	1 269 219	3

6. Answers will vary
7. a) Incorrect. Most likely to be 3 650 g, b) Incorrect. Far too small,
c) Incorrect. Most likely to be 100 078, d) Incorrect. Far too old,

REFLECTION ON LEARNING
Answers will vary depending on date of research

OLNA PRACTICE QUESTIONS
1. 10 336, 2. Coca Cola

Topic 3 Using Place Value to Read, Write, Say and Compare Money

PRACTICE EXERCISE 1
1.

MILLIONS		THOUSANDS			ONES			CENTS	
T	O	H	T	O	H	T	O	Tths	Hdths
						2	1	0	8
				7	2	0	0	9	0
								6	0
			3	5	6	0	7	7	5
		5	0	4	0	6	0	0	4
1	2	0	3	0	0	0	0	0	5

2.a) $2.08, b) $471.59, c) $50 043.83, d) $130 532.96, e) $980 620.40,
f) $3 000 590.06

3 a) Sixty cents,   b) One hundred and two dollars and thirty five cents, c) Six thousand, three hundred and nine dollars and eight cents, d) Thirty four thousand, six hundred and fifty dollars and ninety cents, e) One hundred and eighty thousand, six hundred and fifty one dollars and seventeen cents., f) One million, seven hundred and eighty nine thousand and five dollars and eighty cents

4. a) 0.62c , b) 0.70c, c) 0.08c, d) $76.25, e) $1 209.40, f) $60 147 110.05

PRACTICE EXERCISE 2
1. a) >, b) <, c) >, d) >, e) <, f) >
2. a) $34.09, $34.90, $34.99, $35.19 , b) $1 315.63, $1 344.60 $1 345.06, $1 365 , c) $211 052, $211 205, $211 250, $211 520, d) $1 450 631.97, $1 450 632.01, $1 450 632.10, $1 450 632.16

3. a) $1.11, $ 7.84, $11.26, $15.18, $16.88, $17.35, b) Height of columns makes ordering books according to size, much easier, c) 'Jesus Calling', $1.11. Too cheap for a book, d) $1.11 will disappear. $7.84 will now be cheapest book and $9.11 will be second cheapest. The rest will remain in the same order

4. a) Eggs $0.3; $3.00; TOTAL BILL: $10.60, b) Hamburger $540; $5.40; TOTAL BILL: $15.65, c) Milk $200: $2.00; TOTAL BILL: $10.27,
d) Coffee $43.50; $4.35; TOTAL BILL: $16.53

REFLECTION ON LEARNING

As Number	As Words	Ranking
$824.99	Eight Hundred and twenty four dollars and ninety, nine cents	1
$702 200.60	Seven hundred and two thousand, two hundred dollars and sixty cents	5
$72 004 620.40	Seventy two million and four thousand, six hundred and twenty dollars and forty cents	7
$400 016.05	Four hundred thousand and sixteen dollars and five cents	4
$6 020.35	Six thousand and twenty dollars and thirty five cents	2
$1 600 425.01	One million, six hundred thousand, four hundred and twenty five dollars and one cent	6
$80 007 078.70	Eighty million, seven thousand and seventy eight dollars and seventy	8
$50 709.95	Fifty thousand, seven hundred and nine dollars and ninety five cents	3

$50 709.95 most likely price for a car.

OLNA PRACTICE QUESTION
1. C

Topic 4 Negative Numbers

PRACTICE EXERCISE 1
1. Check number line with your teacher or classmates
a) -8°, b) 7°, c) 5°, d) 6°

2A. -10, B. 30, C. -40, D. 15, E. 0, F. -25, G. -35, H. 5

3. Check number line with your teacher or classmates
a) Kaitlyn; Joey; Kaitlyn, Dan, Shannon, Peter, Maddie, Joey,
b) Maddie > Dan, Shannon < Peter Kaitlyn < Joey, Peter > Dan

4. a) -12, -7, 0 , 3, 5, 15, b) -$67, -$21, -$9, -$7, $1, $25, $34, $65,
c) -725 000, -876, -24, -5, 200, 4 850, 3 200 000,
d) -$14.75, -$13, -$12.55, -$11.20, $12, $12.50, $13.20

PRACTICE EXERCISE 2

1.a) Ground Level, b) Below Ground, c) 7, d) No, e) Supermarket; Homewares; Fashion; Appliances; Carpark

2.

	2 more	2 less	5 more	5 less	10 more	10 less
6	8	4	11	1	16	-4
1	3	-1	6	-4	11	-9
0	2	-2	5	-5	10	-10
-3	-1	-5	2	-8	7	-13
-8	-6	-10	-3	-13	2	-18

3.a) \$50, b) Week 6, c) \$200, d) Profit \$50, e) Profit \$250, f) Loss of \$200, g) Profit \$150,

4. a) 29th March 2013, b) 27th, 29th, 30th March 2013, c) 10°
d) -10°, e) 24th, 25th, 28th, 26th, 27th &30th (equal), 29th,
f) ≈ -1° based on trend line of graph

REFLECTION ON LEARNING

Week	Balance At Start	Income	Expenditure	Balance
1	\$10	\$60	\$40	\$30
2	\$30	\$80	\$90	\$20
3	\$20	\$50	\$80	-\$10
4	-\$10	\$10	\$20	-\$20
5	-\$20	\$10	\$30	-\$40
6	-\$40	\$50	\$30	-\$20
7	-\$20	\$20	\$2	-\$2

OLNA PRACTICE QUESTIONS

1. D, 2. C

Section 2 Data, Tables and Graphs

PRACTICE EXERCISE 1

1a) 14 points, b) Jermaine Beal and Jesse Wagstaff,
c) Damian Martin, d) Damian Martin, Tom Jervis, Greg Hire,
e) Jermaine Beal

2a) 45, b) 24, c) 54, d) 31, e) 100, f) 1. A low number expected because most people at a pet shop would like either cats or dogs

3a) 35, b) 40, c) 46, d) 105

PRACTICE EXERCISE 2

1a) Answers may vary. Discuss with class, b) Answers may vary. Discuss with class, c) She used more electricity in this period than the last bill and in the same period last year, d) Graph. Allows us to see trends

2a) Column graph. Check with teacher, b) 495 mins
c) Manufacturing Industries and Maths,
d) Graph. Allows a quick comparison

3a) Shows the AFL ladder, b) Title missing. We don't know date or year, c) Clustered Bar Graph, d) Wins decrease, Losses Increase,
e) Table. Gives more detail

PRACTICE EXERCISE 3

1a) Horizontal Axis and Title missing. Answers may vary, b) No. Many possibilities. Open to Interpretation, c) Discuss with teacher or classmates, d) ≈14mm, e) Day 2, f) ≈24mm, g) ≈35–40mm

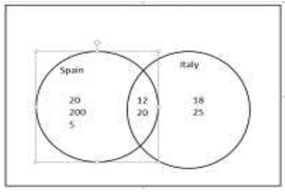
2a) Involves Time, b) Line Graph, c) ≈29 °, ≈ 24 °, d) Unable to tell because temperature is measured every 2 hours. Don't know temperature between measurements, e) Graph. Easier to interpret trends

3a) Line Graph, b) 25 000, c) 4, 7, 8, d) High Sales in weeks 1 and 5 (Could be when new edition is available?) Decrease between1 – 4 and 6 – 9,
e) Shows trend over time

PRACTICE EXERCISE 4

1a) 20, b) 55, c) 95

2



	VISITED SPAIN	DIDN'T VISIT SPAIN	TOTAL
VISITED ITALY	12	18	30
DIDN'T VISIT ITALY	20	50	70
TOTAL	32	68	100

PRACTICE EXERCISE 5

1.a) Ethan and Andrew, b) Kai, Rosie, Hazel, c) Andrew, d) Rosie or Hazel are the shortest. We were not told the height relationship between Rosie and Hazel

2. Answers may vary. Discuss with teacher or classmates

3. Answers may vary. Discuss with teacher or classmates

PRACTICE EXERCISE 6

1. CLUSTERED BAR OR COLUMN GRAPH, a) Adelaide, b) Darwin, c) Table. Requires exact answers, d) No. It doesn't make sense to add all the prices of petrol,

2. LINE GRAPH, a) 230g; 135g, b) ≈150 mins but answers may vary. ,
c) Graph. Shows trends

3. VENN DIAGRAM, a) 2, b) 34, c) 16, d) Yes, Shelly's thoughts correct. Information clear on both table and diagram

OLNA PRACTICE QUESTIONS

1. B, 2. C

Section 3 Addition and Subtraction of Whole Numbers and Money

Topic 1 Understanding and Recalling Basic Addition facts

PRACTICE EXERCISE 1

1a) Completed as a type example, b) 8 + 4 = 8 + 2 + 2, c) 4 + 7 = 7 + 3 + 1,
d) 5 + 9 = 9 + 1 + 4

2. a) 10, 100, 20, 1000, b) 11, 110, 21, 1100, c) 10, 100, 30, 1000, d) 11, 110, 21, 1100

PRACTICE EXERCISE 2

1. a) 9, b) 15, c) 14, d) 17

2. a) 90,29, 900, 9000, b) 150, 25, 1500, 15000, c) 140, 34, 1400, 14000,
d) 170, 270, 1700, 17000

PRACTICE EXERCISE 3

a)

+				TOTAL
	2	4	3	9
	5	8	7	20
	1	3	4	8
TOTAL	8	15	14	37

b)

+				TOTAL
	6	5	7	18
	8	6	3	17
	4	2	9	15
TOTAL	18	13	19	50

c)

+				TOTAL
	60	40	30	130
	80	80	70	230
	40	30	40	110
TOTAL	180	150	140	470

d)

+				TOTAL
	20	50	90	160
	50	60	30	140
	60	20	70	150
TOTAL	130	130	190	450

e)

+				TOTAL
	700	400	300	1400
	500	800	500	1800
	800	200	300	1300
TOTAL	2000	1400	1100	4500

f)

+				TOTAL
	\$7	\$6	\$7	\$20
	\$2	\$9	\$2	\$13
	\$3	\$1	\$7	\$11
TOTAL	\$12	\$16	\$16	\$44

g)

+						TOTAL
	2	3	4	7	8	24
	3	5	1	9	7	25
	4	3	6	1	6	20
	8	5	9	2	2	26
	7	3	4	3	3	20
TOTAL	24	19	24	22	26	115

REFLECTION ON LEARNING 2

+	7	2	9	1	3	5	4	6	8	10
4	11	6	13	5	7	9	8	10	12	14
7	14	9	16	8	10	12	11	13	15	17
6	13	8	15	7	9	11	10	12	14	16
1	8	3	10	2	4	6	5	7	9	11
3	10	5	12	4	6	8	7	9	11	13
9	16	11	18	10	12	14	13	15	17	19
10	17	12	19	11	13	15	14	16	18	20
2	9	4	11	3	5	7	6	8	10	12
8	15	10	17	9	11	13	12	14	16	18
5	12	7	14	6	8	10	9	11	13	15

OLNA PRACTICE QUESTIONS
1. C, 2. B

Topic 2 Addition of Whole Numbers and Money

JALEN'S STRATEGY FOR ADDING NUMBERS
1.a) 49, b) 69, c) 91, d) 66, e) 117, f) 121

2.a) 75, b) 385, c) 119, d) 160, e) 124, f) 155

3.a) $77, b) $139, c) $358, d) $58.50, e) $46, f) $82.20

4.a) 168, b) 558, c) 180, d) 495, e) 415, f) 591

5.a) 87, b) 70, c) 91, d) 170, e) 164, f) 314, g) 364, h) 483, i) $171, j) $22, k) $12.50, l) $36.50

CASEY'S STRATEGY FOR ADDING NUMBERS
1.

PROBLEM	52 + 25
START AT	52
+10	62
+10	72
+5	77

PROBLEM	63 + 24
START AT	63
+10	73
+10	83
+4	87

PROBLEM	54 + 37
START AT	54
+10	64
+10	74
+10	84
+6	90
+1	91

PROBLEM	78 + 31
START AT	78
+10	88
+10	98
+10	108
+1	109

PROBLEM	284 + 35
START AT	284
+10	294
+10	304
+10	314
+5	319

PROBLEM	178 + 44
START AT	178
+10	188
+10	198
+10	208
+10	218
+2	220
+2	222

2. a) 76, b) 107, c) 131, d) 208, e) 634, f) 517

3.a) 68, b) 90, c) 92, d) 129, e) 248, f) 411

4.a) $1.25, b) $2.10, c) $3.10, d) $5.30, e) $91, f) $217

5.a) 93, b) 82, c) 119, d) 131, e) 225, f) 430, g) $1.20, h) $2.35, i) $10.40, j) $542

PADDO'S STRATEGY FOR ADDING NUMBERS
1.a) 37, b) 45, c) 51, d) 71, e) 120, f) 141

2.a) 46, b) 81, c) 81, d) 370, e) 228, f) 232

3.a) $195, b) $191, c) $185, d) $219, e) $211, f) $318

4.a) $43, b) $789, c) $242, d) $22, e) $86.20, f) $20.60

5. a) 44, b) 53, c) 216, d) 121, e) 133, f) 228, g) $271, h) $436, i) $5.10, j) $11

SARAH'S STRATEGY FOR ADDING NUMBERS
1. a) 28, b) 82, c) 102, d) 182, e) 121, f) 226

2. a) 104, b) 316, c) 76, d) 114, e) 584, f) 261

3. a) $8.04, b) $9.40, c) $4.10, d) $491, e) $11.50, f) $28.30

4.a) 65, b) 94, c) 185, d) 240, e) 442, f) 643, g) $8.40, h) $6.70, i) $252, j) $73.50

REVISION: THE BEST STRATEGY
1. a) 59, b) 243, c) 123, d) 257, e) 281, f) 966, g) $134, h) $248, i) $320, j) $2.10, k) $17.60, l) $10.70

PRACTISING STRATEGIES 3
1a) $143, b) $725, c) 63, d) 640, e) 216, f) 71

2a) 125, b) 63, c) Northam, d) 55

OLNA PRACTICE QUESTIONS
1. B, 2. D

Topic 3 Addition of Large Numbers and Money

JALEN'S STRATEGY FOR ADDING NUMBERS
1. a) 6 700, b) 9 800, c) 5 770, d) 29 900, e) 75 000, f) 116 000, g) 393 000, h) 3 900 000

2. a) $6 800, b) $12 900, c) $14 800, d) $81 000, e) $117 000, f) $101 000 000, g) $600 000, h) $1 015 000

CASEY'S STRATEGY FOR ADDING NUMBERS
1. a) 1 150, b) 13 700, c) 35 000, d) 100 000, e) 209 000, f) 730 000, g) 1 185 000, h) 144 000 000

2. a) $6 100, b) $73 000, c) $13 100, d) $119 000, e) $313 000, f) $1 110 000, g) $800 000, h) $126 million

PADDO'S STRATEGY FOR ADDING NUMBERS
1. a) 1 200, b) 5 200, c) 4 380, d) 6 230, e) 59 200, f) 59 415, g) 141 000, h) 2 670 000
2. a) $6 300, b) $4 020, c) $9 390 , d) $4 360, e) $70 800, f) $48 800, g) $153 000, h) $1 857 000

SARAH'S STRATEGY FOR ADDING NUMBERS
1. a) 10 100, b) 9 400, c) 2 230, d) 82 000, e) 5 003, f) 820 000, g) 900 000, h) 4 700 000

2. a) $6 400, b) $8 400, c) $10 300, d) $163 000, e) $930 000, f) $935 000, g) $194 000, h) $6 504 000

REVISION: THE BEST STRATEGY
1. a) 9 900, b) 6 150, c) 13 800, d) 11 009, e) 91 000, f) 212 000, g) 8 150, h) 1 870, i) $1 165 000, j) $62 800, k) $2 070 000, l) $10 840 000

PRACTISING STRATEGIES
1. a) $2 380, b) 3 919 000, c) 500 000, d) 121 000

2. a) 91 500 000, b) False, c) True, d) 2007 and 2008

OLNA PRACTICE QUESTIONS
1. B, 2. D

Topic 4 Understanding and Recalling Basic Subtraction facts

PRACTICE EXERCISE 1
1. a) 9 + ? = 11; 9 + 1 + 1 = 11; 2, b) 8 + ? = 12; 8 + 2 + 2 = 12; 4, c) 9 + ? = 15; 9 + 1 + 5 = 15; 6

2. a) 2, 20, 200, 2 000, b) 4, 40, 400, 4 000, c) 6, 60, 0.60c, 6 000

3. a) 2, b) 8, c) 5, d) 7, e) 4, f) 7

PRACTICE EXERCISE 2
1. a) 3 + ? = 6; 3, b) 8 + ? = 16; 8, c) 7 + ? = 14; 7

2. a) 3, 30, 3 000, $30 000, b) 8, 800, 80, 8 000, c) 7, 70, $7, 7 million

3. a) 5, b) 10, c) 6, d) 9, e) 8, f) 4

PRACTICE EXERCISES 3
1. a) 4 + ? = 9; 4 + 4 + 1 = 9; 5 , b) 8 + ? = 17; 8 + 8 + 1 = 17; 9, c) 7 + ? = 16; 7 + 7 + 2 = 16; 9,

2.a) 5, 50, 500, $5 000, b) 9, 900, 90, 9 000, c) 9, 90, 0.90c, 9 000

3.a) 4, b) 8, c) 9, d) 5 , e) 7, f) 5

PRACTICE EXERCISE 4
1.

PROBLEM	WRITE AS ADD	STRATEGY	SOLUTION
14 – 7	7 + ? = 14	Doubles	7
8 – 3 = ?	3 + ? = 8	Near Doubles	5
15 – ? = 8	8 + ? = 15	Complements to 10	7
17 – 9 = ?	9 + ? = 17	Complements to 10	8
8 - ? = 4	4 + ? = 8	Doubles	4
11 - ? = 5	5 + ? = 11	Near Doubles	6
13 - ? = 8	8 + ? = 13	Complements to 10	5
20 = ? + 10	10 + ? = 20	Doubles	10

2. a) 3, b) 3, c) 5, d) 40, e) 6, f) 10, g) 8, h) 3 000, i) $8, j) $400, k) 7c, l) $9

3. a)

3	2	5
6	1	7
9	3	12

b)

6	2	8
3	9	12
9	11	20

c)

$4	$4	$8
$9	$3	$12
$13	$7	$20

d)

20	80	100
50	40	90
70	120	190

e)

2	1	4	7
2	5	1	8
3	2	0	5
7	8	5	20

f)

300	100	100	500
200	400	200	800
200	400	100	700
700	900	400	2000

REFLECTION ON LEARNING 2

-	3	7	8	2	1	5	9	6	4
10	7	3	2	8	9	5	1	4	6
13	10	6	5	11	12	8	4	7	9
20	17	13	12	18	19	15	11	14	16
12	9	5	4	10	11	7	3	6	8
11	8	4	3	9	10	6	2	5	7
15	12	8	7	13	14	10	6	9	11
17	14	10	9	15	16	12	8	11	13
14	11	7	6	12	13	9	5	8	10
16	13	9	8	14	15	11	7	10	12

OLNA PRACTICE QUESTIONS
1. D, 2. D

Topic 5 Subtraction of Whole Numbers and Money

1. CASEY'S STRATEGY FOR SUBTRACTING NUMBERS

PROBLEM	68 - 23
START AT	68
-10	58
-10	48
-3	45

PROBLEM	114 - 23
START AT	114
-10	104
-10	94
-3	91

PROBLEM	246 - 25
START AT	246
-10	236
-10	226
-5	221

PROBLEM	56 - 34
START AT	56
-10	46
-10	36
-10	26
-4	22

PROBLEM	136 - 47
START AT	136
-10	126
-10	116
-10	106
-10	96
-6	90
-1	89

PROBLEM	523 - 32
START AT	523
-10	513
-10	503
-10	493
-2	491

2. a) 33, b) 61, c) 92, d) 181, e) 139, f) 194

3. a) $1.10, b) $9.80, c) $81, d) $62, e) $2.80, f) $486

PADDO'S STRATEGY FOR SUBTRACTING NUMBERS
1. a) 37, b) 14, c) 36, d) 76, e) 430, f) 65

2. a) 36, b) 48, c) 121, d) 21, e) 39, f) 124

3. a) $59, b) $22, c) $27, d) $3.50, e) $3.10, f) $2.80

4. a) $74, b) $18, c) 0.75C, d) $24, e) $1.20, f) $8.70

LAUREN'S STRATEGY FOR SUBTRACTING NUMBERS
1. a) 47, b) 28, c) 34, d) 45, e) 89, f) 438

2. a) 63, b) 29, c) 87, d) 14, e) 29, f) 90

3. a) $38, b) $3.05, c) $47.01, d) $74, e) $9.95, f) $110.10

JESSIE'S STRATEGY FOR SUBTRACTING NUMBERS
1. a) 38 + ? = 45; 7, b) 87 + ? = 93; 6, c) 57 – 13; 44, d) 57 + ? = 76; 19, e) 82 – 13; 69, f) 190 + ? = 245; 55

JESSIE'S STRATEGY FOR SOLVING MORE COMPLEX SUBTRACTION PROBLEMS
1. a) 100 – 54 = 46, b) 95 – 42 = 53, c) 95 – 33 = 62, d) 126 – 59 = 67, e) 72 – 18 = 54,

2. a) $7, b) $119, c) $8.70, d) $71, e) 0.15c, f) $8.50

REVISION: THE BEST STRATEGY
1. a) 11, b) 92, c) 11, d) 37, e) 86, f) 117, g) 19, h) $234, i) $42.05, j) 0.50c, k) 0.80c, l) $89

PRACTISING STRATEGIES 3
1. a) 23, b) $28, c) 16, d) 8, e) 131, f) 79
2.

	GROWS COCOA	DOESN'T GROW COCOA	TOTAL
GROWS PALM OIL	46	88	134
DOESN'T GROW PALM OIL	19	110	129
TOTAL	65	198	263

a) 88, b) 19, c) 129, d) 198, e) 110

OLNA PRACTICE QUESTIONS
1. C, 2. A

Topic 6 Subtraction of Large Numbers and Money

JESSIE'S STRATEGY FOR SUBTRACTING NUMBERS
1. a) 600, b) 8 000, c) 700, d) 6 000, e) 79 000, f) 39 000, g) 180 000, h) 40 000

2. a) $400, b) $700, c) $850, d) $1 800, e) $6 000, f) $14 000, g) $36 000, h) $85 000

CASEY'S STRATEGY FOR SUBTRACTING NUMBERS
1. a) 5 800, b) 7 000, c) 175 000, d) 480 000, e) 190 000, f) 200 000, g) 199 800, h) 999 960

2. a) $4 800, b) $8 000, c) $290 000, d) $3 500, e) $120 000, f) $980 000, g) $153 800, h) $360 000

PADDO'S STRATEGY FOR SUBTRACTING NUMBERS
1. a) 5 400, b) 4 600, c) 9 140, d) 1 500, e) 2 700, f) 42 500, g) 122 000, h) 1 053 000

2. a) $4 500, b) $13 250, c) $4 460, d) $3 800, e) $42 000, f) $58 000, g) $147 000, h) $1 330 000

LAUREN'S STRATEGY FOR SUBTRACTING NUMBERS
1. a) 5 600, b) 18 000, c) 15 000, d) 29 000, e) 863 000, f) 235 000, g) 150 001, h) 340 000

2. a) $6 300, b) $15 000, c) $3 300, d) $29 000, e) $363 000, f) $427 000, g) $230 001, h) $1 550 000

SOLVING MORE COMPLICATED SUBTRACTION PROBLEMS USING A COMBINATION OF STRATEGIES
1. a) 5 300, b) 21 000, c) $75 000, d) 480 000, e) 1 100 000, f) $670 000, g) 1 260, h) $200 000

PRACTISING STRATEGIES
1. a) $2 500, b) 455 000 VND, c) 9 450 000 VND, d) 1 900 000 VND

2. a) 75 000, b) 42 000, c) 202 000, d) Le Petra's and Café 128, e) 90 000

OLNA PRACTICE QUESTIONS
1. A

Topic 7 Choosing Between Mental and a Calculator to Solve Problems

PRACTICE EXERCISE
1. Best solved by calculator?, 45 890 – 37 902 = ?, 1 452 + 2 397 = ?, 32 876 + ? = 40 001, ? – 75 623 = 23 954, 5 200 000 – 871 345

2a) 36 788 – 24 105; 12 683, b) 7 821 – 1 246; 6 575, c) 4 578 + 376 098; 380 676, d) 34 826 – 487; 34 339, e) $9 803 000 – $7 854 621; 1 948 379

3.a) M; + ; $85, b) M ; - ; 70, c) C ; - ; $97 793, d) M ; - ; $235, e) M ; - ; $85, f) M ; + ; 196, g) C ; - ; $676, h) C ; - ; 254 654

4.a) 83, b) $87, c) 93, d) 47, e) 95 012, f) 26, g) $1 150, h) $6, i) $84, j) $9.25, k) $100.81, l) $89 000,

OLNA PRACTICE QUESTIONS
1. C

Topic 8 Choosing Between Addition and Subtraction to Solve Everyday Problems

PRACTICE EXERCISE 1
1. a) $387.53 + $184; $571.53, b) $299.95 - $150.45; $149.50, c) $135.90 - $55.95; $79.95, d) $212.07 + $62.95; $275.02, e) $500 – $310; $190

2.a) completed, b) $84 - $66; $18, c) 68 + 15; 83, d) 2 393 – 728; 1665, e) 61 – 38; 23, f) $754 - $72.50; $681.50, g) 32 + 15

3.a) 32 + 27; 59, b) $215 - $125; $90, c) $752.55 - $75; $677.55, d) $167 - $79; $88, e) $553 - $372.85; $180.15, f) $125 + $19.50; $144.50

PRACTICE EXERCISE 2
1a) $8.43, b) $11.92, c) $1.68, d) $4.70
2.

AMOUNT IN BANK	DEPOSIT	BALANCE
$62	$19	$81
$81	$29	$110
$110	$42	$152
$152	$69	$221
$221	$92	$313
$313	$93	$406
$406	$94	$500

3.a) $545, b) $477, c) $140, d) $400, e) $1090

4. Answers may vary. Check with your teacher and classmates

OLNA PRACTICE QUESTIONS
1. C, 2. A

Topic 9 Rounding Money to the Nearest 5 Cents

PRACTICE EXERCISE 1
1. Mouse $22.55, Computer $598.80, Clock $15.40, Lamp $38.55

2.a) $33, b) $19.95, c) Five dollars and ten cents, d) Seven dollars

3. a) Cash; Either Supermarket, Eftpos; Supermarket 1,
b) Price items so that they need to be rounded up, to be paid for by cash

4.

PROBLEM	EXACT SOLUTION	ROUNDED PRICE TO NEAREST 5c
0.32c + 0.47c	0.79c	0.80c
0.61c + 0.05c	0.66c	0.65c
$2.68 + $23.89	$26.57	$26.55
$643.34 + $101.88	$745.22	$745.20

5.a) $23.15, b) $23.20, c) $23.10, d) $23.25

6.

PROBLEM	ROUNDED PROBLEM	Amount of change
$1.00 – 0.32c	$1.00 – 0.30c	0.70c
$2.00 – 0.67c	$2.00 – 0.65	$1.35
$10.00 - $1.72	$10.00 - $1.70	$8.30
$10.00 - $2.96	$10.00 - $2.95	$7.05
$50.00 - $23.87	$50.00 - $23.85	$26.15

7.a) $26.10, b) $1.35, c) $12.45, d) $37.70

8. a) $46.80, b) $10, c) $26.25, d) $2.82. No. It could also be $2.80 - $2.84, e) $2.31 - $2.35, f) $7.83 - $7.87

REFLECTION ON LEARNING

1 Calculator $9.95, Compass $1.15, Pins 0.95c, Eraser 0.75c, Scissors $6.85,
2. $1.85, 3. $7.80, 4. $3.15, 5. $8.95, 6. Yes
OLNA PRACTICE QUESTION
1. C

Topic 10 Estimating Strategies

PRACTICE EXERCISE 1
1.

NUMBER	NEAREST $1	NEAREST $10	NEAREST $100	NEAREST $1000
$576.35	$576	$580	$600	$1 000
One hundred and sixty two dollars and one cent	$162	$160	$200	$0
$8 412.67	$8 413	$8 410	$8 400	$10 000
$12 388.50	$12 389	$12390	$12 400	$12 000
$187 533.42	$187 533	$187 530	$187 500	$188 000
$2899999.55	$2900000	$2900000	$2900000	$2900000

2. Coffee; $5; $10; $0, Umbrella; $30; $30; $0, Glasses; $245; $240; $200, Phone; $675; $680; $700, Desk; $2396; $2400; $2400

3 .a) $10 106 000, b) $24 789 000, c) $567 898 000, d) $385 400 000

4. a) $12 000 000, b) $80, c) $10, d) $2200, e) $66 000, f) $20

PRACTICE EXERCISE 2
1. a) Completed, b) $50 - $8.30 = $41.70, c) $680 + $300 = $980,
d) $1 700 - $600 = $1 100, e) $56 000 - $24 000 = $32 000,
f) $180 000 + $212 000 = $392 000, g) $19 - $6 = $13, h) $68 - $37 = $31

2.a) $25, b) $27, c) $26, d) $1400, e) $1900, f) $24, g) $1100, h) $1 200

3. a)

ITEMS	APRROXIMATE COST	EXACT COST BY CALCULATOR
DVD and Single CD	$29	$29.24
DVD and poster	$32	$32.24
ipod and a T-Shirt	$207	$206.85
Double CD and a Guitar	$1229	$1226.50
An ipod and a Guitar	$1390	$1384.90
Speakers, Guitar and ipod	$2100	$2057.40

b) Answers may vary. Check with your teacher and classmates, c) (i) $75, (ii) $93

4.a) $10, b) $110, c) $16, d) $120, e) $15, f) $1100, g) $14, h) $11, i) $12

PRACTICE EXERCISE 3
1. a) Wrong. Rounding estimates cost at approximately $11, b) Wrong. Rounding estimates total cost as under $200, c) Correct., d) Correct,
e) Wrong. Rounding estimates cost at approximately $80

OLNA PRACTICE QUESTION
1.B

Section 4 Time

Topic 1 Days, Weeks and Months

PRACTICE EXERCISE 1
1. a) May, b) Friday 14th May, c) 4:00, d) It's her Nan's birthday on Sunday,
e) Science, f) 3 hours

2.
To Thornlie/Armadale tells you these trains are going along the Armadale train line.
Monday to Friday tells you that this is the train times for Monday, Tuesday, Wednesday, Thursday and Friday.
To Perth tells you these trains are going to Perth.
Sunday and Public Holidays tells you these are the train times for Sundays and Public Holidays.
Beckenham 9912 column tells you the name of the station the train is goes past.
Then at the following minutes past each hour tells you that a train leaves at those times every hour.
Pattern column (T, C) tells you to look for the stations the train stops at for the different patterns.
a) 5:05am, b) 12:00 midnight, c) answers will vary , d) 8:37, 9:07 or 10:07,
e) 8:47, 9:02, 9:17 or 9:32

3. Need to check individually

PRACTICE EXERCISE 2
Order of the events; b, f, c, d, e and a

PRACTICE EXERCISE 3
1. a) 5, b) 11, c) 14, d) 42, e) 60, f) 84, g) 8, h) 36 , i) 10 , j) 23, k) 6, l) 10

2. a) 1 hour and 4 minutes, b) 4 hours and 52 minutes, c) 5 hours and 45 minutes, d) 7 hours and 6 minutes, e) 13 hours and 16 minutes

3. a) 7 days, 3 weeks, 28 days, 1 month, 5 months and 1 year, b) 7 days, 4 months, 35 days, 49 days, 8 weeks and 6 months, c) 1 week, 14 days, 3 months, 14 weeks, 52 weeks and 24 months, d) 7 days, 70 days, 17 weeks, 7 months, 72 months and 7 years

PRACTICE EXERCISE 4
1.a) Start: 7th June 2015, End: 28th June 2015, b) Start: 25th July 2014, End: 4th August 2014, c) Start: 15th March, End 25th March,
d) Start: 8th September 2015, End: 25th October 2015

2. a) 46 days, b) 2 months and 20 days, c) 2 weeks and 6 days

OLNA Practice Questions
1. B:25

Topic 2 Seconds, Minutes and Hours

PRACTICE EXERCISE 1
1. a) 5 minutes past 9, b) 22 minutes past 12, c) 3 minutes to 7 or 6:57,
d) 5 o'clock, e) 10 minutes past 10, f) 22 minutes past 12

2. Check individually

PRACTICE EXERCISE 2
1. a) seven fifteen, 15 minutes past seven or quarter past seven.,
b) one forty-five, forty-five minutes past one or quarter to two.,
c) five-fifty, fifty minutes past five or ten minutes to six.

2. Check individually

PRACTICE EXERCISE 3
1. a) 2 minutes and thirty six seconds, b) nine fifty or ten to ten,
c) 1 hour, 7 minutes and 58 seconds, d) five thirty four,
e) 13 minutes and 10 seconds, f) one twenty-five or twenty five mintues past 5

2. Check individually

PRACTICE EXERCISE 4
1. Answers will vary
2. a) unreasonable, b) reasonable, c) unreasonable, d) unreasonable

3. Answers will vary

PRACTICE EXERCISE 5
1. a) 120 seconds, b) 420 seconds, c) 720 seconds, d) 3 minutes,
e) 5 minutes, f) 11 minutes, g) 2 hours, h) 6 hours, i) 15 hours

2. a) 1 minutes and 10 seconds, b) 5 minutes and 12 seconds,
c) 8 minutes and 53 seconds, d) 10 minutes and 30 seconds,
e) 13 minutes and 47 seconds

3. a) 1 hour and 4 minutes, b) 4 hours and 52 minutes,
c) 5 hours and 45 minutes, d) 7 hours and 6 minutes,
e) 13 hours and 16 minutes

4. a) 32 seconds, 290 seconds, 5 minutes, 30 minutes, 122 minutes and 3 hours, b) 400 seconds, 44 minutes, 2 hours, 230 minutes, 4 hours and 470 minutes , c) 8 minutes, 485 seconds, 1 hour, 65 minutes, 120 minutes and 3 hours, d) 180 seconds, 420 seconds, 2 hours, 180 minutes, 240 minutes and 8 hours

PRACTICE EXERCISE 6
1. a) 3:45, b) 6:25, c) 2 hours and 40 minutes

2. yes

OLNA Practice Questions
1. D , 2. A

Section 5 Length, Mass and Capacity

Topic 1 Making Measurement Decisions

PRACTICE EXERCISE
1. a) appropriate, b) inappropriate, c) inappropriate, d) appropriate,
e) inappropriate

2. a) unreasonable, b) unreasonable, c) unreasonable, d) reasonable,
e) unreasonable

OLNA Practice Questions
C. The capacity is the same and the mass is different.

Topic 2 Standard Length

PRACTICE EXERCISE 1
1. a) measuring tape, b) odometer, c) ruler/measuring tape,
d) ruler/measuring tape, e) odometer, f)trundle wheel, g) measuring tape

2. a) 19cm, b) 7cm, c) 16cm, d) 17cm, e) 42cm

3. a)12.6cm, b)7cm, c)16.6cm, d)9.2cm, e)11.8cm, f)16.6cm, g)9.9cm,
h)12.6cm, line 'd' is the 2nd shortest

PRACTICE EXERCISE 2
1. Check lines with a ruler.

2. Answers will vary

3. Check measurements with a trundle wheel.

4.a) unreasonable, b) reasonable, c) unreasonable, d) unreasonable

PRACTICE EXERCISE 3
1. a) completed for you, b) 23km and 25m, c) 132m and 75cm,
d) 68cm and 50cm, e) 564m and 25cm, f) 48m and 75m

2. a) completed for you, b) 2000mm, 2x1000=2000, c) 5m, 5000÷1000=5,
d) 3m, 3000÷1000=3, e) 350mm, 35x10=350, f) 1.5km, 1500÷1000=1.5

3. Pairs a, b, d and f

4. a) 3cm, 34mm, 2800mm, 500cm, 5m and 1km, b) 700mm, 1000mm, 150m, 800cm, 3000m and 2km, c) 0.75m, 2000mm, 340cm, 8m, 1.5km and 2000m, d) 32cm, 400mm, 50cm, 1.25m, 4m and 250m

5. a) metres, b) millimetres, c) kilometres, d)millimetres/centimetres,
e) millimetres, f) metres

OLNA Practice Questions
1. B: 40cm, 2. D: Metres to Millimetres

Topic 3 Standard Mass

PRACTICE EXERCISE 1
1. a) 60kg, b) 1kg, c) 102kg, d) 65kg, e) 500g, f) 120g, g)75kg, h) 180g

PRACTICE EXERCISE 2
1. a)kg, three kilograms and 45 grams, b)g, ninety seven point 6 grams ,
c)g, three hundred and seventy grams, d)kg, eighty three kilograms and 400 grams

2. a) 86.4kg✓, 838g, b) 1kg and 50 g✓, 1kg, c) 450g, 690g✓, d) 398g, 800g✓

3. a) grams, b) 400g, c) 800g, d) 7kg, e)6800g, f) approximately 8400g

PRACTICE EXERCISE 3
1. Answers will vary
2. Answers will vary
3. a) unreasonable, b) reasonable, c) reasonable, d) reasonable

PRACTICE EXERCISE 4
1. a) 600g, 1000g, 1400g, 2000g, 3000g, 3600g and 4200g, b) 1000g as 1kg, 2000g as 2kg, 3000g as 3kg and 4000g as 4kg., c) 1000, d) 2 kg,
e) 3 and a half or 3.5kg

2. a) 1500g, b) 2kg, c) 3500g, d)4.25kg, e)1.5t, f)5.25t, g)2500kg, h)3750g
3. Pairs b, d, e and f.

4. a) 5g, 35g, 1000g, 1.5kg, 4kg and 4005g, b) 200g, 2kg, 2002g, 2020g, 2.75kg and 0.25t, c) 165g, 2000g, 16kg, 100.25kg, 1t and 2000kg,
d) 3g, 34g, 3004g, 3400g, 3.5t and 3759kg

OLNA Practice Questions
1. C: 601 grams and 1200 grams, 2. A: 5.25 tonnes

Topic 4 Standard Capacity

PRACTICE EXERCISE 1
1. Need to check individually

2. Check markings individually, a) 300mL, 100mL, b) 400mL, 150mL,
c) 200mL, 250mL, d) 110mL, 132mL

Practice Exercise 3
1. Answers will vary

2. a) reasonable, b) unreasonable, c) unreasonable, d) unreasonable

Practice Exercise 4
1. a) 5L, b) 4kL, c) 7L and 500mL, d) 4.25L, e) 4kL and 750L, f) 2250mL,
g) 9.25kL, h) 8L and 385mL

2. Pairs c, d and e

3. a) 50mL, 0.5L, 505mL, 5000mL, 5.5L and 5kL, b) 70mL, 320mL, 3.25L, 5078mL, 7.5L and 5.75kL, c) 85mL, 5.75L, 5800mL, 8000mL, 8240mL and 8.5kL, d)750mL, 3L, 3004mL, 6L, 7.5L and 3.25kL

OLNA Practice Questions
1. B, 2. C