

# FSKNUM014

Calculate with whole numbers and familiar fractions, decimals and percentages for work

Release 1



*Learner guide*

**FSKNUM014**

**Calculate with whole numbers  
and familiar fractions, decimals  
and percentages for work**

Release 1

Learner guide

Aspire Version 1.1



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**FSKNUM014**

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# Before you begin

This learner guide is based on the unit of competency *FSKNUM014 Calculate with whole numbers and familiar fractions, decimals and percentages for work*, Release 1.

## How to work through this learner guide

Your trainer or assessor will tell you which parts of the learner guide you need to read, and which activities you need to finish. The learner guide has the following parts.

Part	How you use it
Learning content	Read each topic. If you do not understand something, talk to your trainer.
Examples	This learner guide has examples of completed documents that may be used in a workplace.
Video clips	Where you see a QR code, you can use a smartphone or tablet to access video clips about the content. For information about how to download an app that will read the QR code or for more help, please visit our website: <a href="http://www.aspirelr.com.au/help">www.aspirelr.com.au/help</a> . 
Learning checkpoints	Complete learning checkpoints to make sure you understand what you have read. Your trainer will tell you which activities to do.
What you have learnt	At the end of the learner guide, there is a list of what you have learnt. You can use this to check if you are ready for the final assessment.

# Words to remember

As you read the learner guide, use this section to write down words you need to remember.

There is a space for you to write the word and a space for you to write down what the word means.

This will help you to learn the words.

Word	What it means





## Your story

Today is your first day of work at Jerry's Garden Services. Jerry is the owner of the company and your supervisor, and you will be responsible for helping him in your role as his assistant.

Jerry has a truck and trailer that he uses to transport supplies as well as his equipment. Supplies are the things Jerry uses to do the gardening work, such as rakes, shovels and hedge trimmers. Customers are the people who pay Jerry to complete the requested gardening work.

You will help Jerry with the gardening tasks, such as:

- mixing fertiliser
- estimating costs
- quoting customers.

Jerry is responsible for giving you tasks, and he also explains what is required in detail. Tasks are things you need to complete in order to do your job properly

Watch this video about your role at Jerry's Garden Services.



## Your tasks

The following table provides additional information regarding the tasks you will need to complete at Jerry's Garden Services.



### Mix fertiliser

Dilute the fertiliser liquid with a specified amount of water to make sure it is the right strength to use on the plants.



### Estimate costs

Make educated guesses on how much the materials costs, and then use your knowledge and experience to estimate more precise figures.



### Prepare quotes for customers

Create a document or document that outlines how much a gardening job will cost. You will need to breakdown how much each service costs and then add it to the total price so customers are informed of how much a service will cost.



## Day 1

On your first day working at Jerry's Garden Services, your supervisor, Jerry, informs you about the tasks you are required to do in order to complete your job successfully.

The first thing Jerry explains is fertiliser and how to use it. Fertiliser is a material that is added to soil to help plants grow. It comes in many forms, however, Jerry's Garden Services uses liquid fertiliser.

To use fertiliser safely, it must be diluted. This means that water needs to be added to the liquid fertiliser to reduce the concentration, or strength, of the chemicals. It is important that the right amount of water is added to the fertiliser to make it the right strength.

If it is not diluted enough, the fertiliser will be too strong, and it will burn the roots of the plants. If it is diluted too much, the fertiliser will be too weak, and the nutrients in the liquid will not help the plants grow.

Therefore, Jerry needs the fertiliser to be diluted to the right strength. To determine this, you will need to make calculations and measurements.

## Your first day of work

Watch this video about your first day at Jerry's Garden Services.



# Numbers and calculations at work

You will need to use numbers at work. This may include reading numbers in documents, listening and understanding when people use numbers, and using numbers when you do a task and talk to people.

You may also need to do calculations at work. Calculations are used to work out an answer to a numerical problem. Depending on where you work, you may need to do different types of calculations. For example, if you work in a hospital you will have to do different calculations than if you worked in a grocery store.

Here are some examples of workplace tasks that may require calculations:

- using job instructions
- reading and following job sheets
- following recipes
- reading catalogues
- comparing costs
- ordering materials
- reading and interpreting tables and charts
- preparing quotes
- talking to customers about quotes
- understanding bills
- understanding pay slips

## Following job instructions

At Jerry's Garden Services, you will often need to follow job instructions. Job instructions explain how to do a task in a step-by-step manner, and they help to make sure the job is done safely, correctly and according to the business's procedures. Job instructions may include numbers and numerical information; this means you may need to do calculations to complete a task properly.

When following job instructions, you need to refer to the correct information and understand how to use the information.

For example, if you work in a hardware store, you may need to prepare paint for a customer. You will need to follow the job instructions to make sure you complete this task correctly. This might include identifying what colours to mix together, working out the total volume of paint required and confirming with the customer if they would prefer gloss paint or standard paint.



## Completing job instructions

Here is an example of how numbers and numerical information are listed on a job instruction sheet at Jerry's Garden Services.

Jerry's Garden Services		
Job instructions: Mixing liquid fertiliser		
Rate = 2 millilitres (mL) per litre (L)		
Step	Notes	First aid
1. Put rubber gloves on your hands.	<ul style="list-style-type: none"> <li>Do not use if it is the temperature is over 30°C.</li> <li>Do not use on dry soil.</li> <li>Do not let the fertiliser come into contact with your skin.</li> <li>Always read the instructions on the label before using the product.</li> </ul>	<ul style="list-style-type: none"> <li>If you spill the liquid on your skin, wash your skin with soap and water.</li> <li>If you splash liquid into your eyes, wash them out with running water and seek medical attention immediately.</li> <li>If you swallow the liquid, seek professional medical advice immediately.</li> <li>Always read the instructions on the label before using the product – it will have medical recommendations to follow.</li> </ul>
2. Fill a bucket with 10 L of water.		
3. Pour 20 mL of fertiliser into the bucket filled with water.		
4. Stir the water around in the bucket with a stirrer to make sure the fertiliser has mixed in completely.		

Numerical information in this job instruction sheet includes the:

- order in which the task should be completed
- quantity of substances that need to be mixed together
- temperature that fertiliser should be used at.

This job sheet doesn't require any calculations, but if you wanted to make a larger amount of the fertiliser, you would need to alter the measurements. Therefore, you would have to make a calculation. For example, if you needed to double the mixture, you would double the amount of water and fertiliser in the mixture. This means you would now need 20 litres of water and 40 millilitres of fertiliser.

## Using mathematical language

It is important to be able to read maths symbols and language in workplace texts and materials; these are commonly found in job instructions, quotes or order forms. You will also need to be able to write the words and symbols, and speak them as well.

In order to successfully perform calculations and solve mathematical problems, you need to understand mathematical language – this includes knowing what words and symbols mean as well as knowing how to use them.

Symbols are often used instead of words in mathematical problems, and they are recognised in many different languages. To understand how to use mathematical language, you need to understand what multiple mathematical symbols mean.

## Mathematical words and symbols

When making calculations, different words may be used. These words may mean the same thing. Here are the symbols used for different types of calculations and some examples of different words that mean the same thing when describing calculations.

Calculation	Symbol	Words	Example
add	+	<ul style="list-style-type: none"> <li>• plus</li> <li>• add</li> <li>• and</li> <li>• sum</li> <li>• total</li> </ul>	<ul style="list-style-type: none"> <li>• 5 plus 3</li> <li>• 5 add 3</li> <li>• 5 and 3</li> <li>• sum of 5 and 3</li> <li>• total of 5 and 3</li> </ul>
subtract	-	<ul style="list-style-type: none"> <li>• minus</li> <li>• take away</li> <li>• subtract</li> <li>• from</li> <li>• difference between</li> <li>• less</li> <li>• less than</li> </ul>	<ul style="list-style-type: none"> <li>• 5 minus 3</li> <li>• 5 take away 3</li> <li>• 5 subtract 3</li> <li>• 3 from 5</li> <li>• difference between 5 and 3</li> <li>• 5 less 3</li> <li>• 3 less than 5</li> </ul>
multiply	x	<ul style="list-style-type: none"> <li>• multiply (multiplied)</li> <li>• times</li> <li>• by</li> <li>• lots of</li> </ul>	<ul style="list-style-type: none"> <li>• 5 multiplied by 3</li> <li>• 5 times 3</li> <li>• 5 by 3</li> <li>• 5 lots of 3</li> </ul>
divide	÷	<ul style="list-style-type: none"> <li>• divide</li> <li>• into</li> <li>• how many lots of ___ in ___?</li> </ul>	<ul style="list-style-type: none"> <li>• 8 divided by 4</li> <li>• 4 into 8</li> <li>• how many lots of 4 in 8?</li> </ul>

## Other common mathematical symbols

The following table includes some other common mathematical symbols and describes what each of them means.

Symbol	Word	Description	Example
%	percentage	A rate per hundred	5 plants are 25% of 20 plants
\$	dollar	Unit of currency	\$5.45 per flower pot
.	decimal point	The dot before the fraction part	0.5 is 5 tenths or $\frac{5}{10}$
/	per	For each	The apples are \$5/kg (\$5 per kilogram)
@	at	At a rate of	3 hours @ \$50 per hour (every hour costs \$50)

## Mathematical language in the workplace

Here is an example of how mathematical language is used in the workplace. The table below shows part of a quote that you would make for a customer outlining the gardening tasks that need to be completed.

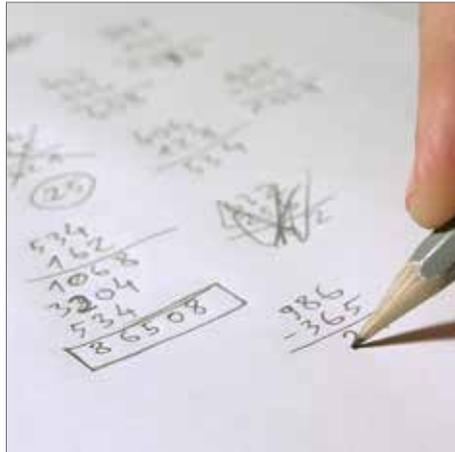
Item	Cost	Explanation
<b>Materials</b>		
5 trailer loads of garden mulch @ \$110/trailer	\$550	5 trailer loads of garden mulch at \$110 per trailer load.
<b>Labour</b>		
Gardener: 10 hours @ \$40/hour	\$400	10 hours of gardening at \$40 per hour.
Supervisor: 3 hours @ \$60/hour	\$180	3 hours of supervision of gardening at \$60 per hour.
<b>Subtotal</b>	\$1,130	Add together the above costs.
<b>GST (goods and services tax) 10%</b>	\$113	Calculate 10% of the subtotal.
<b>Total</b>	<b>\$1,243</b>	Add the GST amount to the subtotal.

## Identifying and interpreting mathematical information

To understand mathematical information, you need to understand the different types of numbers and how they work together.

Numbers may be:

- whole numbers
- decimal numbers
- fractions
- percentages
- rates.



## Whole numbers

Whole numbers are numbers that do not have any decimal parts or fractions. Examples of whole numbers include 1, 10 and 100.

Whole numbers can also be much larger numbers, such as 1,000 and 10,000. Large numbers usually separate the thousands, millions and billions with a comma (e.g. 1,000,000) or a single space (e.g. 1 000 000). If a number has a decimal point or fraction in them, such as 10.5 or  $10\frac{1}{2}$ , it would not be a whole number.

You use whole numbers every day at Jerry's Garden Services to:

- count
- tell time
- shop
- make calculations
- complete work tasks.



## Examples of whole numbers

On the job instruction sheet, whole numbers are used multiple times. Each whole number is circled below.

Jerry's Garden Services		
Job instructions: Mixing liquid fertiliser		
Rate = 2 millilitres (mL) per litre (L)		
Step	Notes	First aid
1. Put rubber gloves on your hands.	<ul style="list-style-type: none"> <li>Do not use if it is the temperature is over 30°C.</li> <li>Do not use on dry soil.</li> <li>Do not let the fertiliser come into contact with your skin.</li> <li>Always read the instructions on the label before using the product.</li> </ul>	<ul style="list-style-type: none"> <li>If you spill the liquid on your skin, wash your skin with soap and water.</li> <li>If you splash liquid into your eyes, wash them out with running water and seek medical attention immediately.</li> <li>If you swallow the liquid, seek professional medical advice immediately.</li> <li>Always read the instructions on the label before using the product – it will have medical recommendations to follow.</li> </ul>
2. Fill a bucket with 10 L of water.		
3. Pour 20 mL of fertiliser into the bucket filled with water.		
4. Stir the water around in the bucket with a stirrer to make sure the fertiliser has mixed in completely.		

## Writing and saying whole numbers

Whole numbers are written in digits or words.

Digits are 0, 1, 2, 3, 4, 5, 6, 7, 8 & 9. These ten digits are used to make up all our numbers.

When you say whole numbers out loud in speech, you must pronounce the words so the other person can easily understand the exact number you are communicating. For example, you would say 'three-hundred and five' not 'three zero five'.

<b>Digits</b>	<b>Words</b>
305	three-hundred and five
22	twenty-two
9	nine
6,374	six thousand, three-hundred and seventy-four

However, when you write the numbers on an invoice or quote, you would normally only include the numbers. If you are unsure, ask your supervisor how they would like you to express written numbers.

## Place value

Our number system is known as the base-ten (base-10) or decimal system – it works by using 10 digits (0, 1, 2, 3, 4, 5, 6, 7, 8 & 9).

Where the digit is located (also known as its **place**) in a number informs us of what the number is. This is called the **place value**.

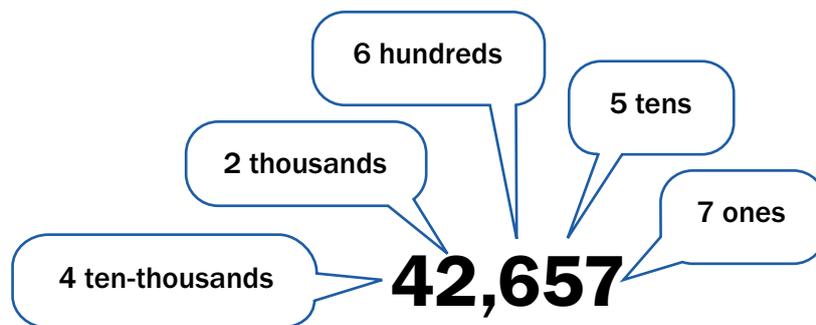


## Place value and whole numbers

In order to understand how to read a whole number, it is important to be able to recognise what each digit in a number represents. The following list explains the position of each number or unit (we will work our way backwards from the right):

- The last digit (located at the end farthest to the right) in a whole number shows multiples of one (1).
- The next number across one space to the left shows multiples of ten (10).
- The next number across one space to the left shows multiples of one-hundred (100)
- The next number across one space to the left shows multiples of one-thousand (1,000)
- The next number across one space to the left shows multiples of ten-thousand (10,000)

This system continues into the millions, billions, trillions and so on. The following whole number is labelled to show you what each digit represents:



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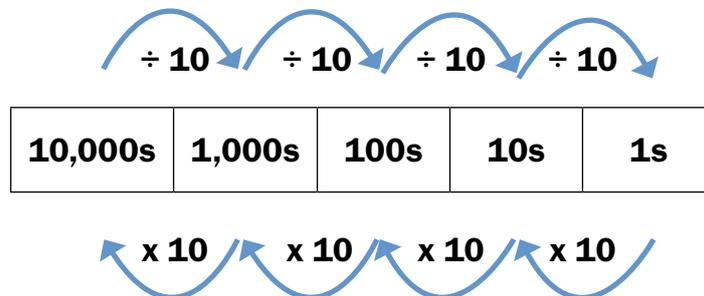
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The following list explains the function of each digit in more detail:

- The number 7 is in the place value of 'ones'. This means that the number 7 has a value in the ones. It is seven (7) ones.
- The number 5 is in the place value of 'tens'. This means that the number 5 has a value in the tens. It is fifty (50) or 5 tens.
- The number 6 is in the place value of 'hundreds'. This means that the number 6 has a value in the hundreds. It is 6 hundred (600) or 6 hundreds.
- The number 2 is in the place value of 'thousands'. This means that the number 2 has a value in the thousands. It is 2 thousand (2000) or 2 thousands.
- The number 4 is in the place value of 'ten thousands'. This means that the number 4 has a value in the ten thousands. It is forty thousand (40,000).

An easy way to remember this is to recall that each digit in a number is related to its next digit by multiples of 10. This may be 10 times smaller or 10 times larger, depending on which direction you go.

For example, each place value multiplies by 10 ( $\times 10$ ) each time you move one number left; the place value also divides by 10 ( $\div 10$ ) each time you move one number to the right. The following diagram illustrates this in more detail:



## Zero as a placeholder

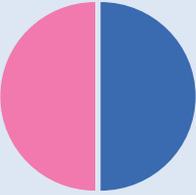
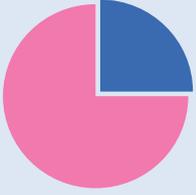
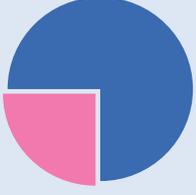
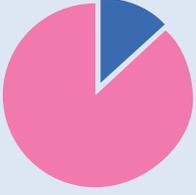
Sometimes there is a zero (0) in a number. Zero is used as a placeholder, which means it is used to represent an empty column in a number. The following table explains the function of zero in more detail:

Number	Function of zero (0)	Value
30	<ul style="list-style-type: none"> <li>Zero holds the place of 1. This means there are no ones in the number</li> </ul>	Thirty
305	<ul style="list-style-type: none"> <li>It holds the place of 10.</li> <li>This means there are no tens in the number.</li> </ul>	Three-hundred and five
3,015	<ul style="list-style-type: none"> <li>It holds the place of 100.</li> <li>This means there are no hundreds in the number.</li> </ul>	Three-thousand and fifteen
35.05	<ul style="list-style-type: none"> <li>It holds the place of a fraction or percentage.</li> <li>This means it is not a whole number.</li> <li>This means there are no tenths in the number (only hundredths)</li> </ul>	Thirty-five point zero five or Thirty-five and five hundredths.

## Fractions

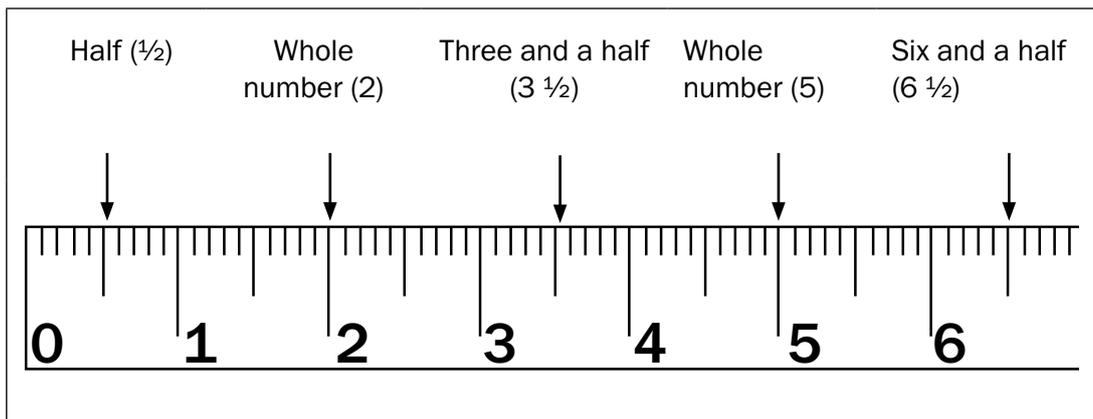
When numbers are divided into parts, the parts are called fractions.

Here are some examples of fractions.

Fraction	What it is	What it looks like
$\frac{1}{2}$	1 half of a whole part	 <p>The light and dark parts are each half (<math>\frac{1}{2}</math>) of the whole.</p>
$\frac{1}{4}$	1 quarter of a whole part	 <p>The dark part is quarter (<math>\frac{1}{4}</math>) of the whole.</p>
$\frac{3}{4}$	3 quarters of a whole part	 <p>The dark part is three quarters (<math>\frac{3}{4}</math>) of the whole.</p>
$\frac{1}{8}$	1 eighth of a whole part	 <p>The dark part is 1 eighth (<math>\frac{1}{8}</math>) of the whole.</p>

Fraction	What it is	What it looks like
$\frac{1}{10}$	1 tenth of a whole part	 <p>The dark part is 1 tenth (<math>\frac{1}{10}</math>) of the whole.</p>

Here's another way of representing whole numbers and fractions. The image below is from a ruler or tape measure. The lines between the whole numbers show the fractions like a  $\frac{1}{2}$ .



## Writing fractions

Fractions are written with one number over another number like for three quarters:

$$\frac{3}{4} \quad \text{or sometimes like this} \quad \frac{3}{4}$$

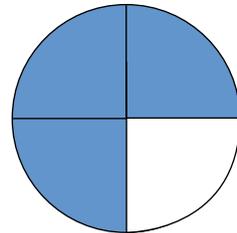
The bottom number of a fraction (called the denominator) tells you how many parts the whole has been broken or cut up into, while the top number (the numerator) tells you how many of these parts you have.

<b>numerator</b>	→	<b>3</b>
<b>denominator</b>	→	<b>4</b>

This circle has been broken up into four equal parts.

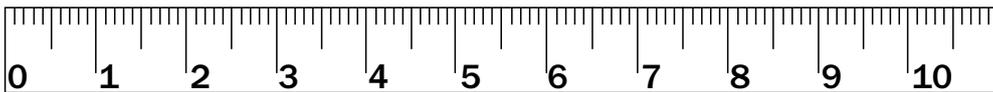
Each part shows  $\frac{1}{4}$  (one quarter).

Three of the quarters are shaded, which equals  $\frac{3}{4}$ .



Each unit on this ruler has been broken up into 10 parts.

Each small unit shows  $\frac{1}{10}$  (one tenth).



## Using fractions

On the invoice for gardening services, a fraction is used for the amount of time worked. This is circled.

Jerry's Garden Services		
Invoice		
<b>To:</b> Mr Ford 45 Fourth Street Desert Springs Northern Territory 0899	<b>From:</b> Jerry's Garden Services 14 River Street Pearl Springs Northern Territory 0898	
<b>Job completed:</b>		
<ul style="list-style-type: none"> <li>• Deliver and plant 3 palm trees</li> <li>• Deliver 1.5 cubic metres (m<sup>3</sup>) of garden mulch</li> </ul>		
Task/Item	Cost	Total cost
Provide 3 palm trees	\$150.00 each	\$450.00
Plant 3 palm trees	2 $\frac{1}{2}$ hours @ \$75.00	\$187.50
1 load of mulch (1.5 m <sup>3</sup> )	1.5 m <sup>3</sup> @ \$72	\$108.00
<b>Sub total</b>		<b>\$745.50</b>
<b>GST 10%</b>		<b>\$74.55</b>
<b>Total amount owing</b>		<b>\$820.05</b>
<b>Deposit of <math>\frac{1}{4}</math> of the total amount owing</b> Required before commencement of work		<b>\$205.13</b>
<b>Balance</b>		<b>\$614.92</b>
<b>Date:</b> 26 June		
<b>Invoice prepared by:</b> Jerry Green		
<b>Balance due within 7 days of the completion of work.</b>		

## Using fractions at work

You may use fractions at work and in your everyday life without even realising it.

Here are some examples of how and when you may use fractions.

### **Cooking**

#### **Measuring out ingredients**

- $\frac{1}{2}$  cup,  $\frac{1}{4}$  cup,  $\frac{1}{3}$  cup in a recipe

### **Shopping**

#### **Selling shoes**

- A person's shoe size is  $8\frac{1}{2}$

#### **Selling food**

- Measure and sell  $\frac{1}{2}$  a kilogram of salami.

#### **Calculate cost of a deposit**

- $\frac{1}{4}$  of the total cost

### **Travelling to and from work**

#### **Measuring time**

- The trip takes  $1\frac{1}{2}$  hours

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## Decimal numbers

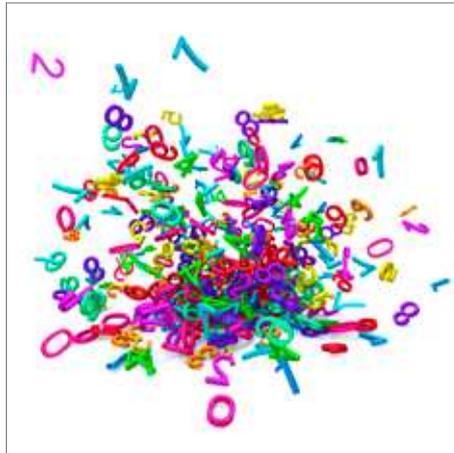
Decimal numbers are made up of a whole number part and a fraction part.

Here are examples of decimal numbers:

- 5.75 grams is how much something weighs.
- \$12.95 is how much something costs.
- 27.5 °C is the temperature outside.

The numbers on the left side of the decimal point are whole numbers.

The numbers on the right side of the decimal point are decimal fractions; for example, tenths, hundredths and thousandths.



## Setting out decimal numbers

Here is an example of how decimal numbers are set out for the number 8,523.64.

<b>8,523.64</b>						
Thousands	Hundreds	Tens	Ones	Decimal point	Tenths	Hundredths
8	5	2	3	•	6	4

The 8,523 on the left of the decimal point is the whole number part.

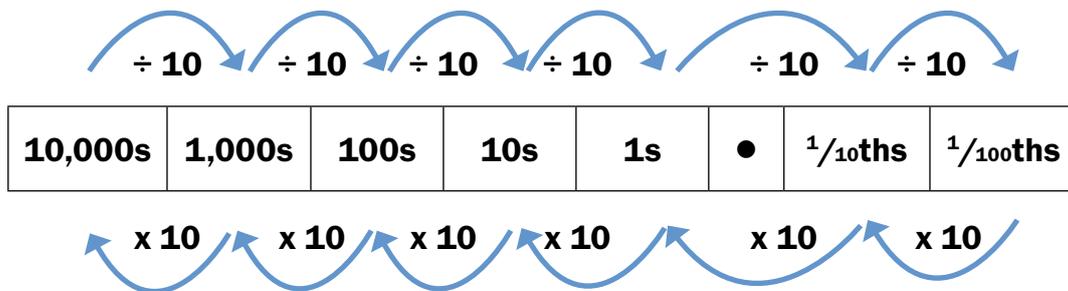
The 64 on the right of the decimal point is the decimal fraction part of the number – 64 hundredths.

So the number is eight-thousand, five-hundred and twenty-three and sixty-four hundredths.

### Place value and numbers

Just like with whole numbers, each digit in a decimal number is related to its next digit by being 10 times bigger or 10 times smaller – the place value goes up by 10 times as you go left ( $\times 10$ ) or down by 10 times as you go to the right ( $\div 10$ ).

You divide by 10 when you go across into the decimal fractions from the left to the right. The first decimal place after the decimal point is therefore one divided by 10, which is tenths ( $\frac{1}{10}$ ths), and then the second decimal place is ten times smaller again, the hundredths ( $\frac{1}{100}$ ths).



**FSKNUM014**

Calculate with whole numbers and familiar fractions, decimals and percentages for work

## Using decimals

On this invoice, there are a number of decimals, including some that are amounts of money. Some of the decimals are circled below.

Jerry's Garden Services		
Invoice		
<b>To:</b> Mr Ford 45 Fourth Street Desert Springs Northern Territory 0899	<b>From:</b> Jerry's Garden Services 14 River Street Pearl Springs Northern Territory 0898	
<b>Job completed:</b>		
<ul style="list-style-type: none"> <li>• Deliver and plant 3 palm trees</li> <li>• Deliver 1.5 cubic metres (m<sup>3</sup>) of garden mulch</li> </ul>		
Task/Item	Cost	Total cost
Provide 3 palm trees	\$150.00 each	\$450.00
Plant 3 palm trees	2 ½ hours @ \$75.00	\$187.50
1 load of mulch (1.5 m <sup>3</sup> )	1.5 m <sup>3</sup> @ \$72	\$108.00
<b>Sub total</b>		<b>\$745.50</b>
<b>GST 10%</b>		<b>\$74.55</b>
<b>Total amount owing</b>		<b>\$820.05</b>
<b>Deposit of ¼ of the total amount owing</b> Required before commencement of work		<b>\$205.13</b>
<b>Balance</b>		<b>\$614.92</b>
<b>Date:</b> 26 June		
<b>Invoice prepared by:</b> Jerry Green		
<b>Balance due within 7 days of the completion of work.</b>		

## Saying decimals

You can say decimals in two different ways:

**as digits: e.g. 7.6 is seven point six**  
**5.25 is five point two five**

or

**as fractions: e.g. 7.6 is seven and six tenths**  
**5.25 is five and twenty-five hundredths.**

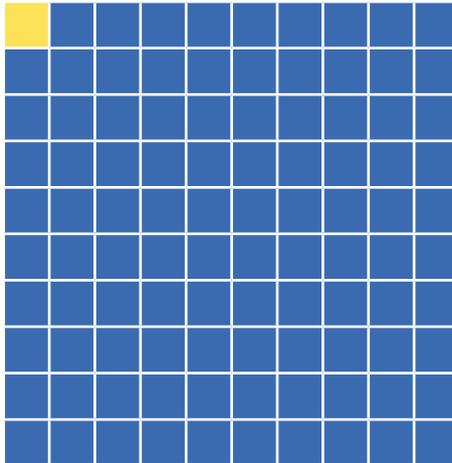
## Percentages

Percentages or percent are a way of showing a rate or amount out of 100. Percent means **per hundred** or out of a hundred. If the % symbol is after a number, it means that number is a part of 100.

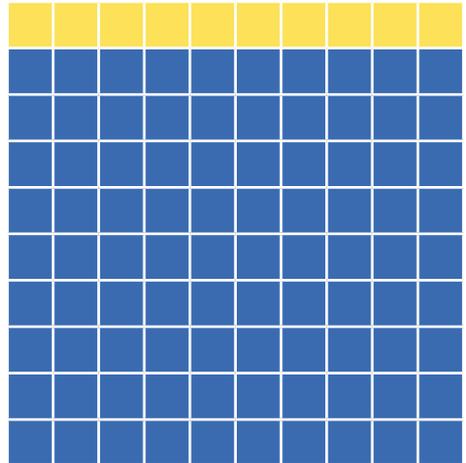
For example:

- 1% is 1 part of 100
- 10% is 10 parts of 100
- 25% is 25 parts of 100
- 50% is 50 parts of 100
- 75% is 75 parts of 100
- 100% is all the parts of 100.

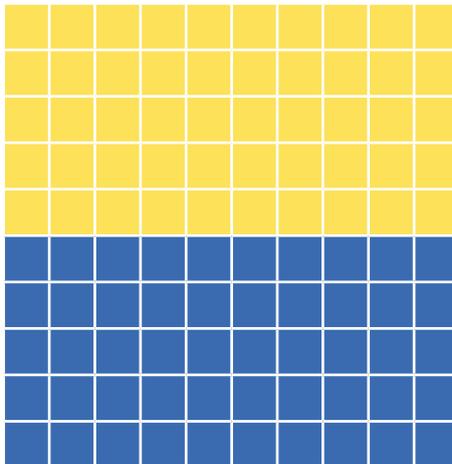
This is what 1% looks like.



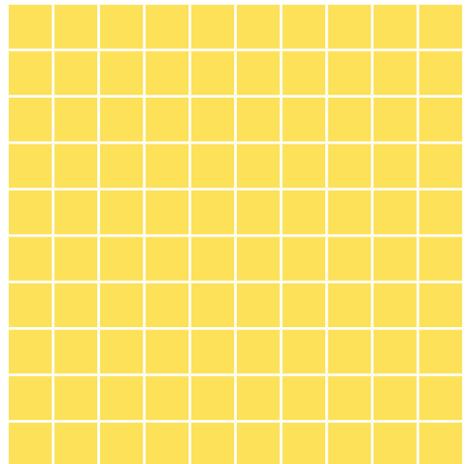
This is what 10% looks like.



This is what 50% looks like.



This is what 100% looks like.



## Using percentages

On the invoice for gardening services, a percentage is used for the GST, the government's Goods and Services Tax. This is circled.

Jerry's Garden Services		
Invoice		
<b>To:</b> Mr Ford 45 Fourth Street Desert Springs Northern Territory 0899	<b>From:</b> Jerry's Garden Services 14 River Street Pearl Springs Northern Territory 0898	
<b>Job completed:</b>		
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<b>Date:</b> 26 June		
<b>Invoice prepared by:</b> Jerry Green		
<b>Balance due within 7 days of the completion of work.</b>		

## Using percentages at work

You may use percentages at work and in your everyday life.

Here are some examples of how and when you may use percentages.

At work	Out of work
Calculating GST (goods and services tax) for a customer. <b>Example:</b> There is a GST tax of 10% to be added when you pay for items in a shop.	Calculating price when something is on sale <b>Example:</b> There is a 30% discount on the price of the shoes when they are on sale.
Calculating the deposit the customer needs to pay before you begin the work. <b>Example:</b> Pay 25% of the cost before work begins.	Working out how much you need to pay when splitting a bill <b>Example:</b> Pay 20% or 50% of what is on the bill.



## Interpreting decimals, fractions and percentages

Decimals, fractions and percentages are just different ways of showing the same value.

We often change between fractions, decimals and percentages, especially with common fractions like  $\frac{1}{2}$  and  $\frac{1}{4}$ . To do this, we change the fractions into tenths and hundredths if that's easy in our heads, or divide them as fractions on your calculator. For percentages, we work out what fraction they are out of 100.

For example, a half ( $\frac{1}{2}$ ) of 10 is 5, so a half will be the same as five tenths ( $\frac{5}{10}$ ) which as a decimal is 0.5 (You can check it on your calculator too if you like — divide 1 by 2). And as a percentage,  $\frac{1}{2}$  of 100 is 50, so  $\frac{1}{2}$  is the same as 50%.

A quarter doesn't work out to be an exact fraction of 10, but it equals 25 out of 100. So a quarter ( $\frac{1}{4}$ ) will be the same as twenty five hundredths ( $\frac{25}{100}$ ), which as a decimal is 0.25.

$\frac{1}{4}$  will be 25% because  $\frac{1}{4}$  of 100 is 25.

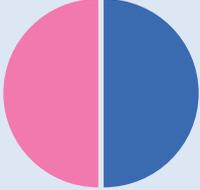
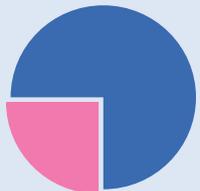
These are called **equivalent** fractions, decimals and percentages.

**FSKNUM014**

Calculate with whole numbers and familiar fractions, decimals and percentages for work

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Here are some examples of how decimals, fractions and percentages show the same value.

What it looks like	Fraction	Decimal	Percentage
	$\frac{1}{2}$	.5	50%
	$\frac{1}{4}$	.25	25%
	$\frac{3}{4}$	.75	75%

## Other common fractions, decimals and percentages

The table below has some other common fractions and their equivalent decimals and percentages.

Fraction	As a decimal	As a percentage
$\frac{1}{5}$	$1 \div 5 = 0.2$	$\frac{1}{5}$ of 100 = 20%
$\frac{1}{8}$	$1 \div 8 = 0.125$	$\frac{1}{8}$ of 100 = 12.5%
$\frac{1}{10}$	$1 \div 10 = 0.1$	$\frac{1}{10}$ of 100 = 10%
$\frac{2}{5}$	$2 \div 5 = 0.4$	$\frac{2}{5}$ of 100 = 40%
$\frac{3}{10}$	$3 \div 10 = 0.3$	$\frac{3}{10}$ of 100 = 30%
$\frac{7}{10}$	$7 \div 10 = 0.7$	$\frac{7}{10}$ of 100 = 70%



## Calculating with common percentages

The most common percentages are 10%, 25%, 50% and 75%.

These are the same as the following fractions:

$$10\% = \frac{10}{100} = \frac{1}{10}$$

$$25\% = \frac{25}{100} = \frac{1}{4}$$

$$50\% = \frac{50}{100} = \frac{1}{2}$$

$$75\% = \frac{75}{100} = \frac{3}{4}$$

When you do calculations with these common percentages or fractions, you can do them by doing simple division (and in some cases multiplication).

$$10\% = \frac{1}{10} = \text{divide by 10}$$

$$25\% = \frac{1}{4} = \text{divide by 4}$$

$$50\% = \frac{1}{2} = \text{divide by 2}$$

$$75\% = \frac{3}{4} = \text{divide by 4 and then multiply by 3.}$$

At work, you may have to calculate percentages. For example, you have to work out a quote for pavers for a customer. The quote comes to \$150.00.

You then have to add the GST, the government's Goods and Services Tax to the amount. The GST is 10%. To work out 10% you divide the \$150.00 by 10 which equals \$15.00. You then add the \$15.00 for the GST to the cost of the pavers, which was \$150. So the cost of the pavers plus GST is \$165.

This is what the sums might look like if you did them with pen and paper.

$$\begin{array}{r} 150.00 \\ \div 10.00 \\ \hline 15.00 \end{array}$$

$$\begin{array}{r} 150.00 \\ + 15.00 \\ \hline 165.00 \end{array}$$

## Comparing numbers

Sometimes, you need to be able to compare different numbers, where the numbers can be written as whole numbers, decimals or as fractions.

If they are decimals, you compare their sizes based on their place values (or think of them on a ruler/number line). For example, is 2345.5 metres bigger than 2312.75 metres or not? They both have 2300 – but the first number then has 45 whereas the second number only has 12 – meaning that 2345.5 is bigger, even though it has fewer digits.

Here is another example with decimal numbers: is 2.34 kg or 2.8 kg bigger?

Both of them have the same whole number part (2), so we need to compare the decimal parts. It might seem that the first is bigger because it has 34 after the decimal point, whereas the other number only has 8. But because they are decimal fractions, you need to compare their place values. If you add a 0 to the end of 2.8 (2.80) so it has the same number of decimal places as the first number, you can then see that the first only has 34 hundredths whereas the second one has 80 hundredths, making the second number bigger.



**Fractions**

While it is easy to compare fractions like  $\frac{1}{4}$  and  $\frac{1}{2}$ , it is more difficult to compare fractions like  $\frac{4}{7}$  with  $\frac{5}{9}$  or with 0.6? For one thing, you have an intuitive understanding of what fractions like  $\frac{1}{4}$  and  $\frac{1}{2}$  look like relative to each other. Whether you like to think of pizzas, apples, or something else, you know that  $\frac{1}{2}$  takes up twice as much area as  $\frac{1}{4}$ .

When comparing decimal numbers with fractions or fractions with fractions, it is easiest if you compare them all as decimals, by changing any fractions into decimals.

Example: which is bigger:

$$\frac{3}{8} \quad \text{or} \quad \frac{2}{5}?$$

Convert each fraction to a decimal. You can use a calculator.

$$(3 \div 8 \text{ and } 2 \div 5)$$

$$\frac{3}{8} = 0.375, \text{ and } \frac{2}{5} = 0.4$$

So  $\frac{2}{5}$  is bigger.

## Rates

Numbers are used in rates. A rate is used to compare two different units of measurement.

Here are examples of the way numbers can be used to show familiar rates.

Rate	What it means	Example
km/hr	Kilometres per hour	60 km/hr A car is travelling at 60 km per hour
\$/kg	Dollars per kilogram	\$5.00/kg Potatoes cost \$5.00 per kg
\$/m	Dollars per metre	\$13.00/m Wire costs \$13.00 per metre
mL/L	Millilitres per litre	20mL/L Liquid fertiliser rate of 20 mL per litre
\$/m <sup>3</sup>	Dollars per cubic metre	\$72/m <sup>3</sup> Mulch costs \$72 per cubic metre
L/100 km	Litres per 100 kilometres	7.5L/100 km A car uses 7.5 litres of petrol to go 100 km
\$/L	Dollars per litre	\$2.50/L Juice costs \$2.50 per litre

## What has happened on Day 1

On your first day of work at Jerry's Garden Services you have learned about:

- using calculations in workplace texts
- using calculations in workplace tasks
- interpreting mathematical information
- interpreting decimals, fractions and percentages
- using strategies to solve problems.

## Learning Checkpoint: Day 1

1. What information are found in instructions for a job?  
Tick the correct answer.
  - A description of your job
  - How to do a job or task
  - What needs to be done for a customer.
2. Mr Anderson orders 3 plants that cost \$75 each. You tell him it will cost \$50 for you to plant them for him. What is the correct calculation to work out how much Mr Anderson needs to pay you? Tick the correct answer.
  - $3 \times \$75 + \$50 =$
  - $\$50 \times 3 + \$75 =$
  - $\$75 + \$50 \times 3 =$
3. Find the sum of the following equation:  $600 \div 8 = ?$   
Tick the correct answer.
  - 75
  - 4800
  - 592
4. What is the sum of this equation  $123 + 0 = ?$   
Tick the correct answer.
  - 123
  - 0
  - 1230
5. What is the meaning of the following maths symbol: %?  
Tick the correct answer.
  - Dollar
  - Percentage
  - Decimal

6. Which of the following equations is correct?

Tick the correct answer.

$\frac{1}{2} = .05 = 50\%$

$\frac{1}{4} = 4 = 40\%$

$\frac{1}{10} = .1 = 10\%$

7. Find the sum of  $526 \div 36$ . Tick the correct answer.

14

22

6

8. Which of the following numbers are not whole numbers?

Tick the correct answer.

20

$15\frac{1}{2}$

13.75

9. How does adding a zero to the end of a number change its place value? Tick the correct answer.

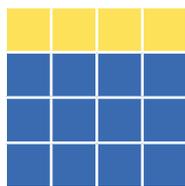
Makes the number 100 times bigger

Makes the number 10 times bigger

Makes the number 1000 times bigger

10. What fraction does the shaded area represent?

Tick the correct answer.



$\frac{1}{16}$

$\frac{1}{4}$

$\frac{4}{12}$

11. What is the correct value of '7' in the number 37,504?  
Tick the correct answer.
- 7 ones
  - 7 tens
  - 7 hundreds
  - 7 thousands
  - 7 ten thousands
12. What is the clearest way to communicate the number 748.21 out loud? Tick the correct answer.
- Seven four eight point twenty one
  - Seven-hundred and forty-eight and twenty-one
  - Seven-hundred and forty-eight point twenty-one
  - Seven-hundred and forty-eight and twenty-one hundredths
13. Which of the following numbers represents the highest value?  
Tick all the correct answer.
- $2\frac{1}{4}$
  - 2.375
  - 2.1
  - $2\frac{1}{3}$
14. An employee called Jason worked 7.5 hours and another worker called Jules worked  $7\frac{3}{4}$  hours. Which employee worked the longest hours? Tick the correct answer.
- Jason
  - Jules
  - They worked the same amount.

15. Number each percentage from 1 to 6 in order from lowest to highest.

	10.01
	0.8
	10.1
	14.6
	1.5
	0.23

16. What does the following rate 55mL/L mean?

Tick the correct answer.

- 55 litres
- 55 millilitres
- 55 metres for each litre
- 55 millilitres for each litre

17. The label in a shop expresses a price at the following rate: \$3/m. What does this mean? Tick the correct answer.

- \$3 for each metre
- \$3 for each millilitre
- \$3 for each roll of matting





## Day 2

On the second day working at Jerry's Garden Services, Jerry is preparing a quote for work on Mrs Ford's yard. Mrs Ford wants palm trees planted along her fence beside her driveway.

Mrs Ford would also like Jerry to plant some hydrangea flowers in front of the palm trees. She does not know how much this job will cost, so she needs Jerry to give her a quote.

Jerry shows you how to prepare a quote and explains which calculations you need to do to finalise the amount.

## Solving a mathematical problem

Quotes can be approached like a mathematical problem: you need to work out what the tasks are and how to solve them.

When you solve a mathematical problem, you need to be able to:

- understand the problem and decide what maths to do. This may include reading numbers and maths symbols and words. To understand the problem, you need to understand why you are doing the calculation. This will help you to know which type of calculation to do
- accurately do the maths required
- write and talk about the answer (you may also need to talk about how you did the calculation).

The following table includes some examples.

<b>Problem</b>	<b>Understanding the problem</b>	<b>Solving the problem</b>
<ul style="list-style-type: none"> <li>• How many gardening jobs has Jerry's Garden Service had in the last 6 months?</li> </ul>	<ul style="list-style-type: none"> <li>• Find the number of gardening jobs done each month for the last 6 months.</li> </ul>	<ul style="list-style-type: none"> <li>• Add the total number of gardening jobs together.</li> </ul>
<ul style="list-style-type: none"> <li>• You need to calculate the cost of planting 10 pots with plants.</li> </ul>	<ul style="list-style-type: none"> <li>• Decide how many plants you need per pot.</li> <li>• Find out the cost of the plants.</li> <li>• Decide how much potting mix you will need.</li> <li>• Find out the cost of potting mix per bag.</li> </ul>	<ul style="list-style-type: none"> <li>• Multiply the number of plants by the number of pots by the cost per plant.</li> <li>• Multiply the number of bags of potting mix by the cost per bag.</li> <li>• Add the two numbers.</li> </ul>

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Problem	Understanding the problem	Solving the problem
<ul style="list-style-type: none"><li>• You place a large order for soil and mulch and receive a 10% discount on the total price.</li><li>• You want to know how much the discount will be.</li></ul>	<ul style="list-style-type: none"><li>• Decide how much soil and mulch you need to buy in <math>m^3</math>.</li><li>• Find out the cost of the soil and mulch per <math>m^3</math>.</li></ul>	<ul style="list-style-type: none"><li>• Multiply the amount of soil needed by the cost of the soil.</li><li>• Multiply the amount of mulch needed by the cost of the mulch.</li><li>• Add the price of each item together.</li><li>• Calculate the 10% discount.</li><li>• Subtract the discount to find what you should pay.</li></ul>

When you solve real world problems, like the ones above, you will often need to do a number of different mathematical operations (+, -,  $\times$ ,  $\div$ ). This part of the Learner guide looks at each of the operations separately and provides information on problems that require a number of operations.

# Calculations

To solve a maths problem, you will need to decide what type of calculation to do.

Calculations are what you do to work out an answer to a mathematical problem. When you are doing calculations with numbers, you might have to:

- add (+)
- subtract (-)
- multiply (x)
- divide ( $\div$ ).

These are called mathematical or arithmetical operations.

To solve problems using numbers, you need to understand and use the right operation.

You can add, subtract, multiply and divide whole numbers, fractions, decimals and percentages.



## Addition

Addition is the mathematical operation used to join two or more numbers or quantities together. Here is an example of addition:

<b>9</b>	<b>+</b>	<b>30</b>	<b>= 39</b>
			

$$9 + 30 = 39$$

Addition joins 9 and 30 together to make 39.

You can also say 'the sum of 9 and 30 is 39'.

## Subtraction

Subtraction is the mathematical operation used to take one number away from another number or quantity; it can also be used to work out the difference between two numbers or quantities.

For example, a customer wants to buy a paintbrush that is \$8. The customer gives you a \$20 note. To work out how much change you need to give the customer, you need to subtract \$8 from \$20:

$$\mathbf{\$20 - \$8 = \$12}$$

<b>\$20</b> (The amount the customer gives you)	-	<b>\$8</b> (The amount the customer owes)	=	<b>\$12</b> (The change you need to give back to the customer)
				

This is the same process as asking what is the difference between \$20 and \$8.

$$\mathbf{\$20 - \$8 = \$12}$$

**Note:** Subtraction is the opposite of addition.  
For example, if  $7 + 8 = 15$ , then  $15 - 8 = 7$ .

## Multiplication

Multiplication is just a quick way of adding the same amount a number of (or multiple) times.

For example:

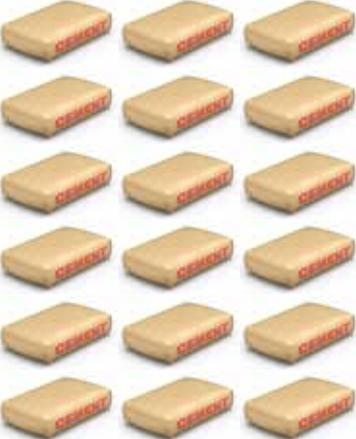
$$6 + 6 + 6 = 18$$

is the same as

$$3 \text{ lots of } 6 = 18$$

or

$$3 \times 6 = 18$$

$3 \times 6$			=	18
				

## Division

Division is splitting or sharing an amount into several equal parts.

For example, if you need to work out how many lots of six exist in the number 18, you would use division.

You can write this as:

$$18 \div 6 = 3$$

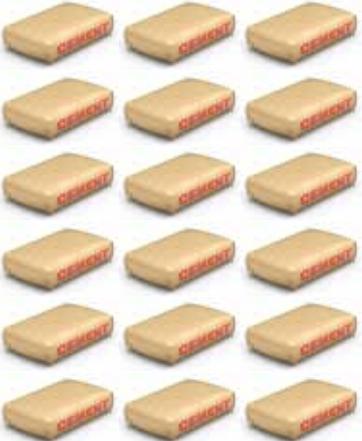
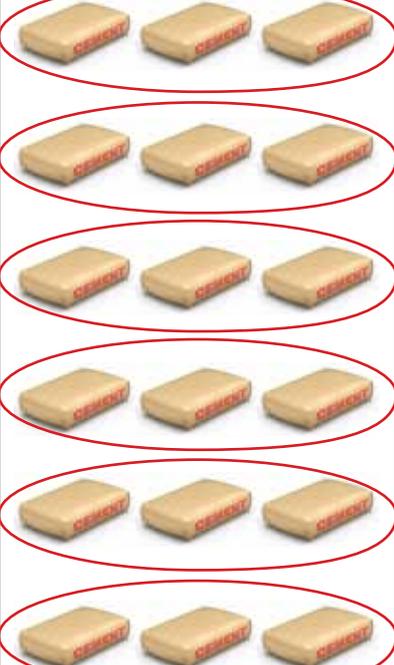
Here is what 18 divided by 6 looks like. You may prefer to phrase this as ‘how many lots of 6 go into 18?’

<b>18</b>	<b>÷</b>	<b>6</b>	<b>= 3</b>
			
			
			

Or, if you want to split 18 into 6 equal parts, you write it as

$$18 \div 6 = 3$$

This is what it looks like.

18	÷	6	= 3
			

**Note:** Division is the opposite of multiplication.  
For example, if  $7 \times 8 = 56$ , then  $56 \div 8 = 7$ .

## Working with fractions and percentages

When you do calculations with fractions and percentages, you usually end up doing some dividing and multiplying.

On Day 1, you found out about equivalent fractions, decimals and percentages as well as how to change fractions into decimals and percentages. This will help you when you calculate with fractions and percentages.

Remember, when you do calculations with these percentages or fractions, it is the same as doing simple division and multiplication.

The following table includes examples of calculating with fractions.

Problem	Calculation	Answer
What is $\frac{1}{5}$ of 250?	<ul style="list-style-type: none"> <li>Divide 250 by 5.</li> <li><math>250 \div 5 = 50</math></li> </ul>	50
What is $\frac{2}{3}$ of 21 metres?	<ul style="list-style-type: none"> <li>Divide 21 by 3 to find <math>\frac{1}{3}</math></li> <li><math>21 \div 3 = 7</math></li> <li>Multiply the 7 by 2 to find <math>\frac{2}{3}</math></li> <li><math>7 \times 2 = 14</math></li> </ul>	14 metres
Mr Ford needs to pay a deposit of $\frac{1}{4}$ of the total price. The total price is \$820?	<ul style="list-style-type: none"> <li>Divide \$820 by 4.</li> <li><math>820 \div 4 = 205</math></li> </ul>	\$205

The following table includes examples of calculating with percentages.

Problem	Calculation	Answer
What is 50% of 250?	<ul style="list-style-type: none"> <li>• 50% is the same as <math>\frac{1}{2}</math> so you divide by 2.</li> <li>• Divide 250 by 2.</li> <li>• <math>250 \div 2 = 125</math></li> </ul>	125
What is 75% of 60 metres?	<ul style="list-style-type: none"> <li>• 75% is the same as <math>\frac{3}{4}</math> so you divide by 4 to find <math>\frac{1}{4}</math></li> <li>• Divide 60 by 4</li> <li>• <math>60 \div 4 = 15</math></li> <li>• Multiply the 15 by 3 to find <math>\frac{3}{4}</math></li> <li>• <math>15 \times 3 = 45</math></li> </ul>	45 metres
You have to work out a quote for pavers for a customer. The quote comes to \$150.00. You then have to add 10% GST to the amount to work out the total cost.	<ul style="list-style-type: none"> <li>• 10% is the same as <math>\frac{1}{10}</math> so you divide by 10.</li> <li>• Divide 150 by 10.</li> <li>• <math>150 \div 10 = 15</math></li> <li>• Add the 15 to 150 for the total price</li> <li>• <math>150 + 15 = 165</math></li> </ul>	\$165

## Calculating your answers

There are many methods you can use to do calculations. You may prefer to:

- use a pen and paper
- do them in your head
- use a calculator or other technology, such as a spreadsheet or cash register.

You can use all three methods if you like – this would make sure you got it right!



## Using a pen and paper

For some calculations, you may need to use a pen and paper.

There are lots of different ways to calculate using a pen and paper. For example, you need to work out the cost of plants for a customer. You do this by breaking down the job into smaller tasks:

- The customer has 4 flower beds.
- Each flower bed needs 7 plants.
- Each plant costs \$5.00.
- You multiply  $7 \times \$5$  in your head, which equals \$35.00 for each flowerbed.

Now you need to multiply  $\$35 \times 4$  flowerbeds to find out the total cost of the plants. You do this using a pen and paper:

$$\begin{array}{r} 35 \\ \times 4 \\ \hline 140 \end{array}$$

The total cost is \$140.00.

Talk to your trainer or supervisor if you don't know how to do such calculations.

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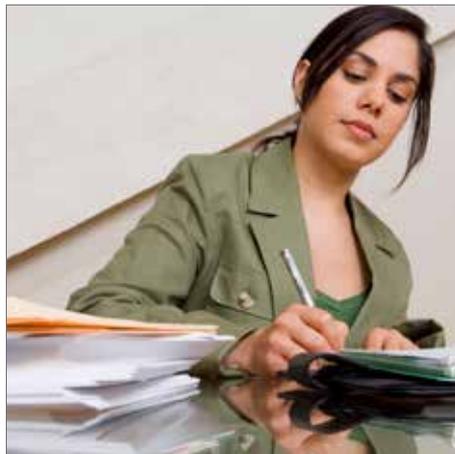
Calculate with whole numbers and familiar fractions, decimals and percentages for work

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Below, you can see examples of adding, subtracting, multiplying and dividing with whole numbers using a pen and paper.

Adding	Subtracting	Multiplying	Dividing
$\begin{array}{r} 1.135 \\ + 4.990 \\ \hline 6.125 \end{array}$	$\begin{array}{r} 7.84 \\ - 5.65 \\ \hline 2.19 \end{array}$	$\begin{array}{r} 17 \\ \times 8 \\ \hline 136 \end{array}$	$\begin{array}{r} 12.55 \\ \div \quad 5 \\ \hline 2.51 \end{array}$

**Remember, when adding or subtracting, line up the decimal points.**



## Working out a sum in your head

Some calculations can be done in your head. This means you can do the calculation without writing it down.

Some people can do calculations quickly and easily in their heads, and they use lots of different methods to do this. However, it's more common to do addition and subtraction in your head, rather than multiplication and division – and it also depends on the size of the numbers you are working with too. Smaller numbers are much easier to calculate quickly in your head than larger ones!

For example, if 5 bags of soil cost \$50, you can easily work out that 10 bags of soil will cost \$100. This is because you know that the total cost of 10 bags is twice as much as 5 bags. You can work out the amount in your head because you only need to double the cost.

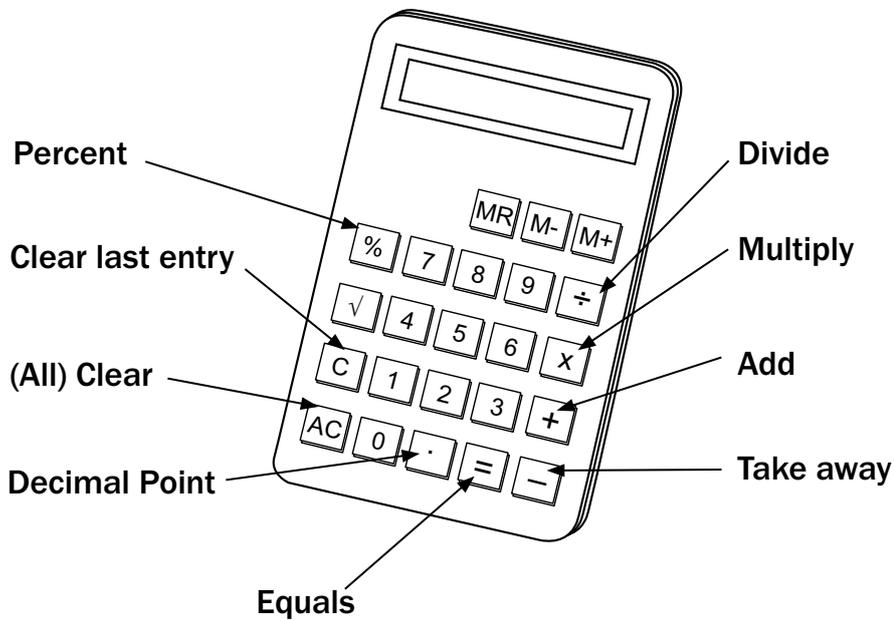
Don't worry if you can't work out all sums in your head. Most people use either a calculator or a pen and paper – or both.



## How to use a calculator

Jerry uses a calculator to work out the cost of quotes for jobs. He uses a calculator because the total amounts need to be correct, and he wants to be able to work information out as quickly and accurately as possible. The main problem with using a calculator is understanding how to use one properly in order to confirm your answer.

Below is a picture of a calculator showing you the buttons you will commonly use.



The following table describes common symbols used on a calculator:

Operation	Button	Meaning
Add	<b>+</b>	Adds the next number to what you have already entered in the calculator
Divide	<b>÷</b> or <b>/</b>	Divides the existing number into the next number you enter in the calculator
Multiply	<b>x</b> or <b>*</b>	Multiplies the existing number by the next number you enter in the calculator
Subtract	<b>-</b>	Subtracts the next number from what you have already entered into the calculator
Percent	<b>%</b> or <b>%±</b>	Works out a percentage for you
Clear last entry	<b>C</b> or <b>CE</b>	Clears from the screen just the last number you entered
(All) Clear	<b>C</b> or <b>AC</b>	Clears everything from the calculator
Decimal Point	<b>•</b>	The point that separates the whole number part from the fraction part of a number
Equals	<b>=</b>	Pressing the = (equals) button shows you what the answer is to the calculation

For a number of reasons, typically because of human error, calculators can be wrong – so don't trust them completely. You should always check your answers when using an method.

An important thing to know includes the order of operations when you are adding, subtracting, multiply or dividing, as some calculators don't know them! There's more about the order of operations later in this Learner guide.

## Using a calculator to solve problems

When you use a calculator, you need to press the buttons in the correct order to get the right answer.

Some examples of how to use a calculator for various problems are provided below:

### Adding

If you must add 1.135 metres and 4.990 metres together, you would press the buttons in the following order:

1	.	1	3	5	+	4	.	9	9	0	=
---	---	---	---	---	---	---	---	---	---	---	---

The answer should then show on the screen as:

6.125
-------

Therefore, the sum of 1.135 metres and 4.990 metres is 6.125 metres.

### Subtracting

If **you want to find** the difference between 7.84 and 5.65 metres, you would press the buttons in the following order:

7	.	8	4	-	5	.	6	5	=
---	---	---	---	---	---	---	---	---	---

The answer should then show on the screen as:

2.19
------

Therefore, the difference between 7.84 and 5.65 metres is 2.19 metres.

**Multiplying**

If **you want to find** the total weight of 8 lots of 1.5 kg, you would press the buttons in the following order:

<b>1</b>	<b>.</b>	<b>5</b>	<b>x</b>	<b>8</b>	<b>=</b>
----------	----------	----------	----------	----------	----------

The answer should then show on the screen as:

<b>12</b>
-----------

Therefore, the total weight of the 8 lots is 12 kg.

**Dividing**

If **you want to divide 12.55 metres into 5 equal parts**, you would press the buttons in the following order:

<b>1</b>	<b>2</b>	<b>.</b>	<b>5</b>	<b>5</b>	<b>÷</b>	<b>5</b>	<b>=</b>
----------	----------	----------	----------	----------	----------	----------	----------

The answer should then show on the screen as:

<b>2.51</b>
-------------

Therefore, 12.55 metres divided by 5 is 2.51 metres.

## Order of operations

When you are adding, subtracting, multiplying or dividing a problem, and if a problem requires the use of multiple operations, it is important to know which order to do each operation. Some calculators know the order, but some don't.

A simple example would be the following question: How much is

$$4 + 2 \times 5?$$

- Is it **30**? [ $4 + 2 = 6$  and then multiply by the 5 to get  $6 \times 5 = 30$ ]
- Is it **14**? [by first multiplying  $2 \times 5$  to get 10 and then add the 4, so  $4 + 10 = 14$ ]

The correct answer is 14. If we translate this maths problem ( $4 + 2 \times 5$ ) into a sentence, it would be expressed as '4 added to 2 lots of 5'. You might also encounter this type of problem at a restaurant. For example, 'How much is it if I buy a sandwich at \$4, and 2 hamburgers at \$5 each?'

Look at the first bullet point above. In order to work out an answer of **30**, you would need to put brackets around the 4 and the 2 like this:  $(4 + 2) \times 5$ . This means you first add the 4 and 2 together to get 6, and then multiply 6 by 5 in order to achieve the answer 30.



## BODMAS

In mathematics, we have a rule that explains the order of operations — in Australia this is often called the BODMAS rule. In other countries it's called BOMDAS, BEMDAS, PEMDAS and so on.

The BODMAS rule is:

<b>B</b> rackets	<b>O</b> f <b>D</b> ivision <b>M</b> ultiplication	<b>A</b> ddition <b>S</b> ubtraction
<b>1</b>	<b>2</b>	<b>3</b>

You follow this **order of operations (BODMAS)** as we work through the expression from **left to right**.

1. Work out any calculations in any **brackets** first (**B**).
2. Work through the expression from left to right working out any '**of**', '**division**' and '**multiplication**' calculations (**O, D, M**) – note that 'of' is often used in fraction or percentage calculations, such as ' $\frac{1}{2}$  of' or '50% of'.
3. Finally, work out any '**addition**' and '**subtraction**' calculations (**A, S**).

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Some examples of these operations and their respective order are provided below:

$$4 \times 2 + 7 \times 3 =$$

<b>B</b>	There are no brackets so go to the next step
<b>ODM</b>	$4 \times 2 = 8$ and $7 \times 3 = 21$
<b>AS</b>	$8 + 21 = 29$

$$21 - 8 + 3 \times 5 =$$

<b>B</b>	There are no brackets so go to the next step
<b>ODM</b>	$3 \times 5 = 15$ therefore $21 - 8 + 15$
<b>AS</b>	$21 - 8 = 13$ then $13 + 15 = 28$

$$(5 + 3) \times 7 + 8 =$$

<b>B</b>	$5 + 3 = 8$ therefore $8 \times 7 + 8$
<b>ODM</b>	$8 \times 7 = 56$ therefore $56 + 8$
<b>AS</b>	$56 + 8 = 64$

$$\$75 + \frac{1}{4} \text{ of } \$80 - \$50 =$$

<b>B</b>	There are no brackets so go to the next step
<b>ODM</b>	$\frac{1}{4}$ of $\$80 = \$20$ therefore $\$75 + \$20 - \$50$
<b>AS</b>	$\$75 + \$20 = \$95$ then $\$95 - \$50 = \$45$

## Using maths at work

The example below of a part of an invoice shows the different calculations that are needed to solve the problem. In this problem, adding, multiplying and dividing are used. The calculations include percentages and rates. It also shows the maths language and symbols used to solve the problems.

Item	Cost	Explanation
<b>Materials</b>		
5 trailer loads of garden mulch at \$110/trailer	\$550	Each trailer load costs \$110. The job has 5 loads: $5 \times 110 = \$550$
<b>Labour</b>		
Gardener: 10 hours @ \$40/hour	\$400	Each hour the gardener works, it costs \$40 for labour. The gardener has worked 10 hours: $10 \times 40 = \$400$
Supervisor: 3 hours @ \$60/hour	\$180	Each hour the supervisor works, it costs \$60 for labour. The supervisor has worked 3 hours: $3 \times 60 = \$180$
<b>Subtotal</b>	\$1,130	To find the subtotal, add each of the above separate costs: $\$550 + \$400 + \$180 = \$1,130$
<b>GST (goods and services tax) 10%</b>	\$113	To work out the 10% GST, calculate 10% of \$1130. Because 10% is the same as 1/10, you need to divide \$1130 by 10: $\$1,130 \div 10\% = \$113$
<b>Total</b>	<b>\$1,243</b>	To get the final total including the GST, add the GST amount (\$113) to the subtotal: <b><math>\\$1,130 + \\$113 = \\$1,243</math></b>

## What has happened on Day 2

On your second day of work at Jerry's Garden Services you have learned about:

- solving mathematical problems
- arithmetical operations (+, −, ×, ÷)
- working with fractions and percentages
- using a calculator
- the order of operations.



## Learning Checkpoint: Day 2

1. Here is an order form for plants. What mathematical operations would you need to use to find the total? Tick the correct answer.

Item description	Number	Quantity	Total
Silver Wattle	2	\$12.50	
Coastal Banksia	2	\$35.25	
Flax Lilly	5	\$12.50	
White Correa	3	\$2.00	
Spiky head mat rush	5	\$2.00	
<b>Subtotal</b>			
<b>GST</b>			
<b>TOTAL</b>			

- Division, addition and multiplication  
 Multiplication and addition  
 Subtraction and division  
 Multiplication and division
2. Work the following problem out in your head. What is the cost for the White Correas? Tick the correct answer.
- \$2  
 \$3  
 \$5  
 \$6

3. Use a calculator to work out the subtotal figure?

Tick the correct answer.

- \$124.50
- \$154.00
- \$174.00
- \$194.25

4. A client needs to pay a 25% deposit on an invoice for \$1050.00. How much deposit must they pay? Use a calculator to work this out. Tick the correct answer.

- \$250.00
- \$262.50
- \$25.50
- \$184.25

5. Use a calculator to find the sum of  $\frac{3}{10}$  of 791?

Tick the correct answer.

- 23.73
- 237.3
- 273.3
- 2636.6

6. When you do a calculation with more than one step, which mathematical operation should you do first?

Tick the correct answer.

- Subtraction
- Addition
- Division

7. What is the answer to the following equation:  $52 - 9 \div 3$ ?

Tick the correct answer.

14.33

49

40

46

8. What is the answer to the following equation:  $2 + 3 \times (6 + 7)$ ?

Tick the correct answer.

27

37

41

65





## Day 3

On the third day working at Jerry's Garden Services, Jerry asks you to prepare an invoice for Ms Jacobs. He explains to you that it's a good idea to estimate the amount before you work it out; this means if the amounts differ significantly, you can think about whether you have made an error when doing the calculations. This will help you become more efficient at this task in the future.

He also explains that when you have finished preparing the invoice, you should check your calculations again to ensure the information is correct.

## Estimating a calculation

Before you do a calculation, think about what sort of answer you expect to get by doing a rough estimate.

An estimation is an approximation or educated guess. An educated guess is a guess based on knowledge and experience, rather than just a number you assume might be correct.

You do this by doing a quick and rough calculation to get an idea of what the answer should be. Remember, it is not an accurate answer – just a rough estimate.

Usually, you round off the numbers into easier, simpler numbers so that you can add, subtract, multiply or divide the numbers quickly with whatever method you prefer. You usually round numbers to the nearest whole numbers or to the nearest 10, 100 or 1,000.



## Rounding off

Rounding off is very important, especially when you read answers off your calculator.

For example, sometimes an answer on your calculator gives you too many digits and you don't want to use them all. This is often true when you are using your calculator to calculate measurements or financial sums. A calculator screen might show you the following answer for a price of an item:

**26.4375**

When paying for an item with cash, only the first two decimal places are used – this refers to the number of cents in the total price. Therefore, you may want to round this answer to the nearest number of cents (here it is 44 cents), or to the nearest number of dollars (here it is 26 dollars).

A handy tip to remember is that the number 5 always rounds up.

## Accuracy

To round off numbers, first you need to decide what you are rounding off to – what we call the accuracy.

You may need to round off to:

- the nearest whole number (with money, this means the nearest dollar)
- the nearest second decimal place (with money, this is to the nearest cent)
- the nearest 5 cents (Australia no longer uses 1 cent or 2 cent pieces).

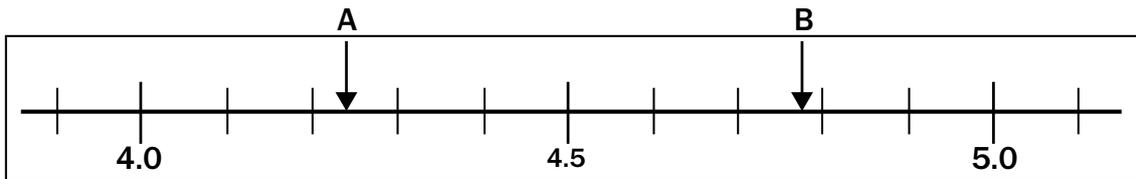
## Rounding up or down?

To round a number off, you need to determine if you are more than halfway towards the next number up. With the number 26.4375, if you are rounding to the nearest whole number, you need to decide if the number is closer to the 26 or 27.

- If you are past halfway you are closer to the next whole number, so you **round up** to that next number – in this case 27.
- If you are less than halfway, you **round down** to the lower whole number – in this case 26.

### Think of a ruler or number line

You can clearly see how this works if you look at the diagram of a ruler below.



The ruler shows numbers from 4.0 cm to 5.0 cm:

- Marker A is at 4.24 cm.
- Marker B is at 4.775 cm.

You need to decide which nearest whole number A and B will be rounded to.

Both A and B are between 4 and 5, so the decision when rounding them off to the nearest whole number is whether they are closer to 4 or closer to 5.

By looking at the ruler, you can see that A is closer to 4, as it is not past halfway (since 4.5 is halfway), so you round 4.24 down to a whole 4.

B is closer to 5, as it is past halfway, so you round 4.775 up to a whole 5.

## Rounding rules

The following table includes a brief summary about whether you should round up or round down:

<b>Rule 1: Rounding down</b>
If the next digit (the number to the right) after the rounding off number is 0, 1, 2, 3, or 4, it means you <b>round down</b> to the nearest whole number.
<b>Rule 2: Rounding up</b>
If the next digit after the rounding off number is 5, 6, 7, 8 or 9, it means you are past halfway and you need to <b>round up</b> to the next whole number.



## Rounding off money

### Rounding to the nearest dollar

When you round off to the nearest dollar, you follow the same rounding rules.

For example,

\$125.2976 would **round down** to \$125, because the next digit after the decimal point is a 2.

\$34.7001 would **round up** to \$35, because the next digit after the decimal point is a 7.

### Rounding off to the nearest cent

When rounding off to the nearest cent, you follow the same rules again. The original number on our calculator was:

**26.4375**

If we round it to the nearest cent, we need to decide whether it rounds down to \$26.43 or rounds up to \$26.44.

Therefore, we need to look at the next digit after the cents column, which is a 7.

Because 7 is past the halfway point, the answer will be rounded up to \$26.44.

### Not enough digits

Depending on the calculator you are using and its setting, it may not provide enough digits when you are calculating monetary sums. For example, a calculator screen might show you this answer for the number of dollars:

58.2

The calculator doesn't know it's working out money, so a 0 needs to be added 58.2 so you know the total figure is referring to \$58.20.



## Rounding off measurements

Sometimes you may need to round a measurement to the nearest number. This might be to the nearest metre or kilometre.

### 1. Round off 342.75 metres (m) to the nearest 10 m.

You need to decide if 342.75 is closer to 340 or 350 metres. Is 42.75 m closer to the nearest ten up (50) or down (40)? Because 42.75 is less than halfway between 340 and 350, you would **round down** to 340.

### 2. Round off 23,654 km to the nearest 1000 kms.

You need to decide if 23,654 is closer to 23,000 or 24,000. Is 654 closer to the next 1,000 up or not? Because 654 is more than halfway to the next 1000, you would **round up** to 24,000.



## Practice rounding

To help develop your rounding skills, round off the following numbers in the table provided below:

<b>Number</b>	<b>Accuracy</b>	<b>Rounded value</b>
\$12.17	Round to nearest dollar	
\$56.173	Round to nearest cent	
325.78333 m	Round to whole metres	
4,758.5 L	Round to nearest hundred litres	
30,149 ha	Round to ten hectares	
10,375 mL	Round to tenths of millilitres	

## Rounding estimation

Here are some examples of estimating using rounding.



**20 L Liquid fertiliser:  
\$143.50 each**



**Shovel:  
\$52.20 each**

What is a rough estimate for how much it would cost to buy one 20 L container of liquid fertiliser @ \$143.50 and one shovel @ \$53.20? Rounding off these two prices to the nearest \$5, the liquid fertiliser is slightly less than \$145, and the shovel is slightly more than \$50. Therefore, an estimate of the total cost would be  $\$145 + \$50$  which is \$195 (the actual total is \$195.70).



**Bag of soil: \$1.99 each**

What is a rough estimate for how many bags of soil you will need to complete 2 jobs? First you need to identify what is required for each task.

You need 3.6 bags of soil for job 1, and 6.2 bags for job 2.

You estimate the number of bags you'll need by rounding 3.6 bags to 4 bags and rounding down 6.2 to 6 bags.

$$4 + 6 = 10$$

If you compare this with the exact answer of 9.8 bags, you'll discover your estimate was pretty close.

Does rounding work in this instance? It depends on whether you can take the remainder of the bag of soil from job 1 to use at job 2. You need to use your common sense in this instance.

## How to break down calculations into parts

When making calculations, you can use a number of steps to find the answer. This means you do the calculation in parts.

For example, you want to work out how much money you will earn this week. First you have to break down this task into parts:

- You are paid \$20 for every hour you work.
- You work 8 hours a day.
- You work 4 days this week.

To calculate how much you will earn, use the following steps in the table:

Step	Instruction	Answer
1	<ul style="list-style-type: none"> <li>• Work out how many hours you work in a week.</li> <li>• Multiply the number of hours you work each day (8) by the number of days you work in a week (4).</li> </ul>	$8 \text{ (hours)} \times 4 \text{ (days)} = 32 \text{ hours}$
2	<ul style="list-style-type: none"> <li>• Multiply the total hours you have worked by the amount of money you are paid for every hour.</li> </ul>	$32 \text{ (hours)} \times \$20 \text{ (per hour)} = \$640$
<b>Total pay</b>		<b>\$640</b>

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A more complex example of doing a calculation is to work out how much to invoice Mr Ford for. Look at the following invoice:

<b>Jerry's Garden Services</b>		
<b>Invoice</b>		
<b>To:</b> Mr Ford 45 Fourth Street Desert Springs Northern Territory 0899	<b>From:</b> Jerry's Garden Services 14 River Street Pearl Springs Northern Territory 0898	
<b>Job completed:</b>		
<ul style="list-style-type: none"> <li>• Deliver and plant 3 palm trees</li> <li>• Deliver 1.5 cubic metres (m<sup>3</sup>) of garden mulch</li> </ul>		
<b>Task/Item</b>	<b>Cost</b>	<b>Total cost</b>
Provide 3 palm trees	\$150.00 each	\$450.00
Plant 3 palm trees	2 ½ hours @ \$75.00	\$187.50
1 load of mulch (1.5 m <sup>3</sup> )	1.5 m <sup>3</sup> @ \$72	\$108.00
<b>Sub total</b>		<b>\$745.50</b>
<b>GST 10%</b>		<b>\$74.55</b>
<b>Total amount owing</b>		<b>\$820.05</b>
<b>Deposit of ¼ of the total amount owing</b> Required before commencement of work		<b>\$205.13</b>
<b>Balance</b>		<b>\$614.92</b>
<b>Date:</b> 26 June		
<b>Invoice prepared by:</b> Jerry Green		
<b>Balance due within 7 days of the completion of work.</b>		

Now break the invoice down into parts so you can complete several simple calculations. An example is included below:

Step	Explanation	Calculation & answer
1	<ul style="list-style-type: none"> <li>Work out the cost of 3 palm trees</li> <li>Multiply the number of palms (3) by the cost of a palm tree (\$150)</li> </ul>	$3 \text{ (palm trees)} \times \$150$ (cost of a palm tree) $= \$450$
2	<ul style="list-style-type: none"> <li>Work out the cost of planting the palm trees</li> <li>Multiply the number of hours worked (<math>2\frac{1}{2}</math>) by the amount charged per hour (\$75)</li> </ul>	$2\frac{1}{2} \text{ (hours)} \times \$75$ (per hour) = $2.5 \times \$75$ $= \$187.50$
3	<ul style="list-style-type: none"> <li>Work out the cost of a <math>1.5 \text{ m}^3</math> load of mulch</li> <li>Multiply the cost of <math>1 \text{ m}^3</math> (\$72) by the amount in a load 1 load (<math>1.5 \text{ m}^3</math>)</li> </ul>	$1.5 \text{ (m}^3) \times \$72 \text{ (per m}^3)$ $= \$108$
4	<ul style="list-style-type: none"> <li>Work out the cost of the items</li> <li>Add the cost of the palms (\$450), the cost of planting the palms (\$187.50) and the cost of the load of mulch (\$108)</li> </ul>	$\$450 + \$187.50 + \$108$ $= \$745.50$
5	<ul style="list-style-type: none"> <li>Work out the 10% GST</li> <li>Divide the cost of the items (\$745.50) by 10 (10% is the same as <math>\frac{1}{10}</math>)</li> </ul>	$\$745.50 \div 10 = \$74.55$
6	<ul style="list-style-type: none"> <li>Work out the cost of the items and GST</li> <li>Add the cost of the items (\$745.50) and the cost of the GST (\$74.55)</li> </ul>	$\$745.50 + \$74.55$ $= \$820.05$
7	<ul style="list-style-type: none"> <li>Work out <math>\frac{1}{4}</math> of the total amount, the deposit</li> <li>Divide the total cost (\$820.05) by 4 to get <math>\frac{1}{4}</math></li> </ul>	$\$820.05 \div 4 = \$205.01$ (rounded to the nearest cent)
8	<ul style="list-style-type: none"> <li>Work out the balance to be paid after the job is completed</li> <li>Take the deposit (\$205.01) from the total (\$820.05)</li> </ul>	$\$820.05 - \$205.00$ $= \$615.04$

## Checking calculations

When you've finished a calculation, it is important to check that the answer is correct.

When you do your own calculations, there are some important things to consider. Calculators (or yourself) can sometimes give you the **wrong** answer – for example, you may have made a mistake in how you put in the number into the calculator.

This is why you should always check your answers after you have worked them out. You can do two things:

- Check your answer against your initial estimate; it should be similar or pretty close.
- Think about whether your answer seems correct and reasonable; use your prior knowledge and experience to determine if the number seems about right for the situation.

If your answer is very different from your estimate or doesn't seem reasonable:

- check that you entered or wrote down the correct numbers
- check that the decimal point is in the right place
- make sure you did the operations in the right order
- think about whether you have left out a step.



## Communicating mathematical information

In a workplace, it is important to record and communicate the results of calculations clearly and correctly. You may also need to explain the process you used to get the results. To do these, use the mathematical language that is used in your workplace. Depending where you work, there may be specific words to communicate numerical information and results.

On Day 1, you learned about maths language and how they relate to problems and calculations. At the end of Day 2, you saw an example of how maths language is used to explain both the process and the result of the calculations. Have a look back at these examples of how maths language is used at work.



## Formal and informal maths language

Sometimes, you will need to understand formal maths language to read, write or talk about numbers and calculations (e.g. plus, difference, multiply, divide). Other times, you may use informal language (e.g. total, from, lots of, into). You will also need to understand formal maths symbols (e.g. +, −, ×, ÷).

Depending on where you work, there may be formal words related to the maths that you might need to learn about and use. For example, if you work in a retail setting, you may record sales results in a report using formal language, such as ‘loss and gain’, instead of informal language, such as ‘the sales were up’ and ‘the sales were down’.

For example:

Formal maths language	Informal maths language
Last month, the store had a loss of \$15,000.	Last month, sales were down by \$15,000.
The expected gain for next month is \$25,000.	We expect sales to be up by \$25,000 next month.

You may also need to use words like increase and decrease if you are recording workplace information using percentages.

For example:

Formal maths language	Informal maths language
There was a 20% increase in sales.	Sales were up by a fifth.
The 50% decrease in customers last month was due to the store being renovated.	Customers were down about half last month because the store was being renovated.

You often use formal maths language when you write and informal maths language when you talk.

## What has happened on Day 3

On your third day of work at Jerry's Garden Services, you have learned about:

- estimating before completing a calculation
- breaking a mathematical problem into steps to solve it
- checking the answer to a calculation
- communicating mathematical information using formal and informal language.



## Learning Checkpoint: Day 3

1. You have been given \$150 to buy five bags of potting mix and 10 plants. The potting mix costs \$6.90 a bag and the plants are \$10.50 each. You decide to estimate the cost before you go to the checkout, because you are unsure if you have enough money. What process should you follow in order to estimate the price? Tick the correct answer.
  - Carefully add the amounts up using a calculator.
  - Let the checkout person do the estimation for you.
  - Round the numbers to the nearest dollar amount and add them together in your head.
2. Calculate the cost of the plants and potting mix. Do you have enough money to purchase the items? Tick the correct answer.
  - Yes
  - No
3. Round the number \$809.78 to its nearest dollar? Tick the correct answer.
  - \$800
  - \$809
  - \$809.80
  - \$810

4. To complete the work for Ms Jacobs, you need to buy five bags of potting mix and 10 plants. The potting mix costs \$5.50 a bag and the plants are \$12.50 each. What steps do you need to do to work out the total amount it will cost? Write and record your calculation method and answers in the table below.

Step	Calculation method	Answer
1		
2		
3		

5. What should you do to check if your calculations are correct? There are **two (2)** correct answers. Tick all the correct answers.
- Guess the answer
  - Do the calculation again
  - Check the answer against the estimate
  - Think about whether the answer makes sense.
6. You are told that the cost of supplies are up by 10%. What type of language has been used? Tick the correct answer.
- Formal
  - Informal

7. Look at Question 5. Ms Jacobs asks you to explain how you calculated the cost of the potting mix and plants. Which of the following would best communicate to her how you worked out the cost? Tick the correct answer.
- I added the costs together for a sum of \$152.50.
  - I multiplied the number of each item by the cost of each item, and then multiplied them again by two and got a total \$152.50
  - I multiplied \$5.50 by 5 and that comes to \$27.50. One plant costs \$12.50 and you needed 10. \$12.50 by 10 comes to \$125. I added the two amounts together for a sum of \$152.50.

## What you have learned

Well done. Since you have started working at Jerry's Garden Services, you have learned about:

- identifying and interpreting whole numbers, routine fractions, decimals, percentages and common rates
- solving mathematical problems
- calculations using arithmetical operations (+, −, ×, ÷)
- working with fractions and percentages
- using a calculator
- the order of operations
- estimating and rounding off
- checking the answer to a calculation
- communicating mathematical information using formal and informal language.

You are now ready for the Final Assessment.

