

# Numeracy Intermediate Workbook 2ed.

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### Numeracy Intermediate: Workbook 2ed.

By Michael Carolan

DELIVER Educational Consulting (978-1-925172-42-3)

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- Literacy - Intermediate 4ed (2019)
- Literacy - Senior 2ed (2019)
- Numeracy - Foundation 2ed (2019)
- Numeracy - Intermediate 2ed (2019)
- Numeracy - Senior 2ed (2019)
- Personal Development - Foundation (2018)
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[www.deliverededucation.com.au](http://www.deliverededucation.com.au)

[michael@deliverededucation.com.au](mailto:michael@deliverededucation.com.au)

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Contact: [www.deliverededucation.com.au](http://www.deliverededucation.com.au) [michael@deliverededucation.com.au](mailto:michael@deliverededucation.com.au) (03) 9939 1229

Carolan, Michael

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### New editions of VCAL Work Related Skills and Personal Development Skills titles for 2020 and beyond.

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- ✓ PDS Activity Planner - Foundation, PDS Activity & Project Planner - Intermediate, and PDS Project Planner - Senior.

In 2019 new editions of VCAL Numeracy and Literacy titles were released.

- ✓ Numeracy - Foundation 2ed, Numeracy Intermediate 2ed (units 1&2), Numeracy Senior 2ed (units 1&2).
- ✓ Literacy - Foundation 2ed, Literacy Intermediate 4ed, Literacy Senior 2ed.

In 2019 new editions of VCE Industry and Enterprise for 2019 were released.

- ✓ I&E Unit 1: Workplace Participation 4ed, I&E Units 1&2: Towards an Enterprising You 5ed, and I&E Units 3&4: Towards an Enterprising Australia 4ed.

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- ☐ Work Placement Journal & Work Experience Journal
- ☐ Personal Development Activity Planner: Foundation; Personal Development Activity & Project Planner: Intermediate; and Personal Development Project Planner: Senior
- ☐ Community Services Foundation & Intermediate
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- ⇒ \*Work Related Skills - Senior 3ed Workbook/text & Activities booklet (2020)
- ⇒ Literacy - Foundation Workbook/text 2ed & Activities skills booklet. *Lit-Foundation also available as an e-version (2019)*
- ⇒ Literacy - Intermediate Workbook/text 4ed & Activities skills booklet. *Lit-Intermediate also available as an e-version (2019)*
- ⇒ Literacy - Senior Workbook/text 2ed & Activities skills booklet *Lit-Senior also available as an e-version (2019)*
- ⇒ Numeracy - Foundation Workbook/text 2ed & Skills Development Booklet (2019)
- ⇒ Numeracy - Intermediate Workbook/text 2ed (for units 1&2) & Activities booklet (2019)
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& Activities booklet (2019)

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- > I&E Unit 1: Workplace Participation 4ed (& e-version) (2019)
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- > Career Pathways 2ed
- > Work Experience Journal
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- > \*Personal Development Activity Planner: Foundation (2020)
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- > Career and Enterprise ATAR 12
- > Career and Enterprise Foundation 12
- > Career and Enterprise Foundation 11

View PDF samples on the website. Any questions please feel free to contact me.

DELIVER Educational Consulting

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Career and Enterprise Foundation 12 (2016)	_____ @ \$49.50	_____ @ \$595	_____
Career and Enterprise General 11 (2016)	_____ @ \$55	_____ @ \$660	_____
Career and Enterprise General 12/ATAR 11 (2016)	_____ @ \$59.50	_____ @ \$660	_____
Career and Enterprise ATAR 12 (Jan 2017)	_____ @ \$59.50	_____ @ \$770	_____

<b>Careers, Work Education &amp; Personal Development</b>	<b>Printed text</b>	<b>e-version master</b>	<b>Total</b>
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<b>*WRS Senior 3ed.</b> (Updated 2020)		_____ @ \$42.50	_____ @ \$27.50	_____ @ \$275	_____ @ \$99	or _____ @ \$330	na
<b>Totals</b>		_____	_____	_____	_____	_____	_____

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## Advice to students

- ✓ Use this resource to build, develop and apply skills to assist your numeracy development. Complete the tasks in the spaces and pages provided.
- ✓ Use the pro-formas and self-reflections as part of your Numeracy program.
- ✓ You will also need to maintain your own workbook to complete other tasks given to you by your teacher. You may need to collect and keep copies of resources, handouts and evidence of your numeracy skills in your own workbooks.
- ✓ You might also use your *Activities Portfolio* to complete tasks as directed by your teacher. This portfolio will give you a body of work to keep as a reference. It will also enable you to review and improve upon numeracy and transferable skills.
- ✓ You might be directed to complete some or even all of the assessment tasks listed opposite.
- ✓ Throughout this workbook there are a number of quick-reference *Numeracy Superskills*. Use the table opposite to locate these.
- ✓ When dealing with problems related to visual numeracy it is a good idea to draw a diagram.
- ✓ Remember that your development of numeracy skills will provide you with the tools for a more successful personal, social and work life. So best wishes with your numerical journey.

Projects I am required to organise and participate in for Numeracy Intermediate are...

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## Assessment Tasks

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# Working The Numbers 1

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## Activities 1: Working The Numbers

	p.	Due date/Done?	Comment
1.02A <b>Work it out</b>	3	<input type="text"/>	<input type="text"/>
1.04A <b>Basic calculations 1</b>	5	<input type="text"/>	<input type="text"/>
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1.10D <b>Mental work</b>	11	<input type="text"/>	<input type="text"/>
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1.17C <b>Percentage calculations</b>	18	<input type="text"/>	<input type="text"/>
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1.19A <b>Numbers as words</b>	20	<input type="text"/>	<input type="text"/>
1.20B <b>Slippery numbers</b>	21	<input type="text"/>	<input type="text"/>
1.22A <b>Working the numbers</b>	23	<input type="text"/>	<input type="text"/>
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Comments:



## 1.01 Introduction

### Numeracy 101

You come into contact with numbers all the time. So it is vital that you develop skills to be able to deal with any numerical information and mathematical problems that you encounter.

Although this might sound a bit complicated it doesn't need to be! Put simply, numeracy refers to being able to effectively understand and deal with mathematical issues in order to improve your quality of life.



Image: Artem Efimov/  
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As a normal part of your day-to-day personal, social and employment activities you have to use numeracy skills in a range of situations. You probably don't realise just how much you rely on these skills of numeracy to get by in life.

However, some people will (quite loudly and even proudly) announce that they are innumerate; that is, they don't understand and can't do mathematics. And I'm talking about well-educated professionals as well. They seem to have, what they believe, is an acceptable 'fear' of being effectively numerate.

The funny thing is that these people seem to be very quickly able to use maths and calculate if their pay is too short or if their superannuation is not adding up.

# Preview Population Explosion! Do Not Copy

As at Sep 1, 2018 there were 25,018,471 people in Australia. You can express this better by saying this as, "about 25 million".

As at Sep 1, 2018, there were 7,650,237,012 people in the world. You can express this better by saying, "almost 7.7 billion".

Therefore, out of all the people in the world, only about 25 out of every 7,650 are part of the Australian population.

This equals 0.3267% which is about 0.3 out of every 100 people, or 3 out of every 1,000 people.

China's is the world's most populous country with a population as at Sep 1, 2018 of 1,455,125,169 or about 1.5 billion. This equals about 19% of the world's population.

Therefore, approximately 1,455 out of every 7,650 people in the world are Chinese.

This equals about 19.02% which is roughly 19 out of every 100 people, or 190 out of every 1,000 people.

Find out current populations online at:  
[www.worldometers.info/world-population](http://www.worldometers.info/world-population)



## Working it out

Numeracy goes well beyond simply adding, subtracting, multiplying and dividing. There are many skills associated with numeracy; and just like any skill, numerical skills can be improved and developed.

By the end of this unit you may not end up a mathematical genius, but you will end up improving your ability to work with numbers. This will help make you more confident in your day-to-day lives, and hopefully, more employable.

This unit is focused on you developing the types of numeracy skills that will enable you to work things out for yourself. You will build your mathematical knowledge, learn and apply numerical techniques, learn the language of numeracy and learn how to interpret information. Throughout this whole unit you are going to look at numeracy through the 5 broad skill areas of interpreting, estimating, calculating, predicting and problem-solving.

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Work it out **A**

1. Solve the following numerical problems by writing your answer in the table.
2. For each write a brief explanation or show your workings to support your answer.

	Question	Answer	Justify/explain your answer
a	2...4...6...8...		
b	What do you think would be the average age of the students in your class?		
c	If your boss says he'll give you a 20% pay rise, and you currently earn \$10 per hour, how much will your new hourly rate be?		
d	How many mobile phones do you reckon are currently in your class room?		
e	What percentage of these mobile phones do you think are switched-on?		
f	If you see an ad for a new app that will cut your phone bill by 10% a year, and the app costs \$60, then is it worth it?		
h	If Jacob has twice as many brothers as Naser, who has one, then based on this information, how many male children are there in Jacob's immediate family?		

**Preview  
Sample:  
Do Not  
Copy**

## 1.03 Basic Calculations

### Introduction

Over the course of this year you will investigate a wide range of numeracy topics and undertake varied skills-development and applied activities and tasks.

**Unit 1** focuses on:

1. Numerical Skills and Processes
2. Financial Literacy
3. Planning and Organising
4. Measurement, Representation and Design.

**Unit 2** extends your numeracy development into **workplace** and **industry contexts** through **applied**, project-based learning.

### Making a start

In this first section you will develop the skills to perform a range of numerical calculations. You will build this mathematical knowledge by:

- ⇒ undertaking some basic mental arithmetic
- ⇒ learning the correct order to perform arithmetic operations
- ⇒ applying these mental numerical skills to solve some life problems
- ⇒ practising how to calculate fractions, decimals and percentages
- ⇒ learning how to interpret words and numbers
- ⇒ interpreting numerical information.

This unit culminates in an assessment task that requires you to use a range of numerical skills to an applied situation involving a BBQ.

### Basic calculations

Basic calculations are those calculations that you should be able to do in your head or on paper for more complicated calculations.

It is not simply enough to use a calculator to do basic calculations. You have to know if the answer that the calculator gives you is correct. A calculator will only calculate based on the numbers you enter and people can make errors when entering data. So you have to be able to also predict and estimate.

Some of the basic functions that you already are likely to know include addition, subtraction, multiplication and division. You might also be able to calculate percentages and fractions, as well as being able to measure area, volume and distance.

In this section you are going to recap some of these skills so that you can develop your own skills that rely on numeracy.



**"Easy numbers are easy.  
But what about when the numbers get  
harder?"**

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Arman Zhenikayev  
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Preview  
Sample:  
Do Not  
Copy

**Nearly every occupation requires you  
to have an immediate understanding of  
basic calculations.**



Image: Wojciech Gajda  
iStock/Thinkstock



**Addition (plus or sum)****...shown by a '+' sign**

Addition involves **combining** two numbers into a sum. e.g.

$$1 + 1 = 2$$

$$4.07 + 191.63 = 195.70$$

$$1/2 + 1/3 = 5/6$$

$$\$1.04 \text{ billion} + \$10 \text{ million} = \$1.05 \text{ billion}$$

Addition also involves combining more than two numbers. e.g.

$$1 + 1 + 2 = 4$$

$$17.4 + 19.8 + 12.8 = 50$$

$$1/2 + 1/3 + 1/6 = 1$$

$$12c + 87c + \$1.01 = \$2$$

$$93 + 126 + 57 + 100 = ?$$

NUM  
SUPER  
SKILLS**Subtraction (take-away or minus)****...shown by a '-' sign**

Subtraction involves taking one number away from another, which essentially is finding the **difference** between 2 or more numbers. e.g.

$$2 - 1 = 1$$

$$4.15 - 2.85 = 1.30$$

$$1/2 - 1/3 = 1/6$$

$$\$50 - \$27.95 = \$22.05$$

$$2 - 1 - 1 = 0$$

$$4.15 - 2.85 - 1.40 = -0.10$$

$$1/2 - 1/4 - 1/12 - 1/12 = 1/12$$

$$\$50 - \$25 - \$30 = -\$5$$

$$250 - 70 - 9 - 35 = ?$$

NUM  
SUPER  
SKILLS

Preview

Sample:

Basic calculations 1

A

When making calculations on paper it is good to set out your problem in a way that is easy to read and follow. Use the examples below then complete the problems.

e.g. What is the sum of the following numbers?

$$45 + 567.5 + 2,000 + 11.5 = ?$$

⇒ Set the problem out clearly.

⇒ Numbers should be right justified at the point of any decimal.

⇒ Here 'carrying' is included at the bottom. This could also be shown at the top. Your teacher will show you a preferred method.

$$\begin{array}{r} 45 \\ 567.5 \\ 2,000 \\ + 11.5 \\ \hline 2,628.5 \end{array}$$

1. So what is the sum of the following numbers?

$$73 + 256 + 1,500 + 11.5 = ?$$

e.g. What is the sum of the following numbers?

$$100 - 52 + 58.5 - 75 - 80 = ?$$

What might be the best way to set out this calculation? Your teacher will advise you.

2. So what is the sum of the following numbers?

$$100 - 52 + 58.5 - 75 - 80 = ?$$

## 1.05 Basic Calculations

### Multiplication (times)

...shown by a 'x' or '\*' sign)

Multiplication involves repeated addition of the same number to find the **product**. In other words you are adding the same number together for however many times is specified. e.g.

$$3 \times 5 = 15$$

or  $(5+5+5=15)$

$$17 \times 16 = 272$$

*(16+16+16+16 and so on...you get the idea!)*

Multiplication of more than two numbers involves finding the product of the first 2 numbers and then multiplying that answer by the next number, and so on. And you can also use brackets to group parts of the calculation together; but move left to right! e.g.

$$4 \times 7 \times 6 = (7+7+7+7) \times 6$$
$$= 28 \times 6 = 168$$

*(or another way)*

$$4 \times 7 \times 6 = (4 \times 7) \times 6$$
$$= (28) \times 6 = 168$$

So...  $8 \times 12 \times 10 = ?$

### Division (how many)

...shown by a '÷' or '/' sign)

Division involves finding the **quotient** of 2 (or more) numbers. In other words, how many times one number goes into another. e.g.

$$10 \div 5 = 2$$

*(or how many 5's are there in 10; there's 2)*

$$280 \div 2 = 140$$

$$1040 \div 40 = 26$$

Sometimes not all numbers are divisible (or go into each other) equally, which leaves a remainder. You might express this as a decimal or as a fraction. e.g.

$$25 \div 2 = 12.5$$

*(remainder expressed as a decimal)*

$$17 \div 2 = 8 \frac{1}{2}$$

*(remainder expressed as a fraction)*

Division of more than 2 numbers involves finding the **quotient** of the first 2 numbers and then dividing that answer (the quotient) by the next number, and so on. e.g.

$$140 \div 14 \div 10 = ?$$

$$(140 \div 14) \div 10 = ?$$

therefore...  $10 \div 10 = 1$

So...  $456 \div 4 \div 6 = ?$

NUM  
SUPER  
SKILLS

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## B Basic calculations 2

Complete the following in your workbooks. Your teacher will show you a preferred method for setting out and solving multiplication and divisions calculations.

a.  $12 \times 8 =$

b.  $12 \times 13 =$

c.  $27 \times 36 =$

d.  $10 \times 5 \times 15 =$

e.  $36 \times 2 \times 14 \times 3 =$

f.  $62 \times 37 \times 15 \times 1 =$

g.  $48 \div 8 =$

h.  $64 \div 8 \div 4 =$

i.  $120 \div 10 \div 2 =$

j.  $770 \div 5 \div 4 =$

k.  $140 \div 2 \div 10 \div 2 =$

l.  $650 \div 25 \div 16 \div 4 =$

## Quick quiz C

1. First, complete the quiz below just using your powers of mental arithmetic. Estimate your score.
2. Then complete this quiz using a calculator. Estimate your score.
3. After your teacher has given the correct answers, discuss how the class performed on their mental arithmetic versus the use of a calculator.



(Your teacher might choose to do this quiz with the class as an oral activity.)

- |                               |           |
|-------------------------------|-----------|
| 1. $27 + 94 =$ _____          | 1. _____  |
| 2. $136 + 76 + 39 =$ _____    | 2. _____  |
| 3. $271 + 29 + 700 =$ _____   | 3. _____  |
| 4. $14 - 9 =$ _____           | 4. _____  |
| 5. $117 - 49 =$ _____         | 5. _____  |
| 6. $117 + 48 - 64 =$ _____    | 6. _____  |
| 7. $14 - 27 =$ _____          | 7. _____  |
| 8. $5 \times 11 =$ _____      | 8. _____  |
| 9. $14 \times 13 =$ _____     | 9. _____  |
| 10. $27 \times 20 =$ _____    | 10. _____ |
| 11. $6 \times 5 + 5 =$ _____  | 11. _____ |
| 12. $6 + 5 \times 5 =$ _____  | 12. _____ |
| 13. $28 \div 4 =$ _____       | 13. _____ |
| 14. $195/10 =$ _____          | 14. _____ |
| 15. $128 \div 4 + 20 =$ _____ | 15. _____ |
| 16. $128 + 4 + 20 =$ _____    | 16. _____ |
| 17. 10% of 240 = _____        | 17. _____ |
| 18. 15% of 250 = _____        | 18. _____ |
| 19. $1/4 + 1/2 + 1/8 =$ _____ | 19. _____ |
| 20. $0.5 + 1/2 =$ _____       | 20. _____ |

Estimated Score: \_\_\_\_\_ Actual Score: \_\_\_\_\_

Estimated: \_\_\_\_\_ Actual: \_\_\_\_\_

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## 1.07 Working Together

### Round numbers

At this stage of the unit you are expected to be able to perform these basic calculations in your head; and on paper for the more difficult ones. It is important that you are able to do these calculations in your head because this allows you to **estimate** and **predict** more accurately. This can enable you to make better informed numerical decisions on-the-go in your personal, working and social lives.

In order to assist with these mental calculations you should use **rounding** to help you make estimates. Then afterwards you can check the estimate on paper or with a calculator. Rounded estimates are very useful when shopping, giving quotes, planning a dinner or a party, comparing deals and many other times. Why so?

### Rounding time

Linly is talking with a used car dealer who says that to pay off a car (a 2011 VE II Commodore) he will have to pay \$200 a month for 48 months.

This is a pretty straightforward calculation to work out in your head:

$$48 \times \$200 = \$9,600$$

Linly can quickly decide if he thinks this deal is good value or not, based on the specifications and purchase price of the car. What do you think?

However, Linly's friend Selma is told by another car dealer that she will have to make 42 payments of \$229. This is a bit harder to work out mentally because the numbers are not 'round'.

So without doing the maths, who do you think is paying more? Linly or Selma?

Have a quick class vote. Then calculate the answers below. Your teacher will show you how best to set out the calculation on paper.

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### A Who's paying more?

Use the information in the example above to work out who is paying more.

Linly: Calculation	Selma: Calculation

### Rounding estimates



To make the calculation easier, Linly estimated that the car he was looking at would cost about \$10,000. That is  $50 \times \$200$ . He rounded the 48 up to 50. This makes it easier for him to do the calculation quickly in his head.

Selma also estimated that the car she was looking at would cost her about \$10,000. She rounded 42 down to 40 and \$229 up to \$250 (just to be safe.)

In reality they are both pretty close and they have both over-estimated. In their case (working out total price of a car) it's a good thing to over-estimate. Why so?

They have a cousin Albrut who likes to use rounding. He was told that a car he was looking at would cost \$220 a month for 44 months. Albrut rounded the monthly payment down to \$200 and the number of payments to 40 months, and calculated a cost of \$8,000. On Facebook he posted that he's got a bargain! What has he done wrong? Give your answer and show your calculations below.



## Preview

### Rules on Rounding

- ⇒ Round to nice and friendly numbers that are more easily calculated in your head. *e.g. 5, 10, 20, 50, 100.*
- ⇒ Remove all fractions and decimals when rounding. *e.g. 1.5 becomes 2, 1.4 becomes 1. (But be careful not to round down bad things by too much and underestimate!)*
- ⇒ Round up for bad things (*e.g. costs, time, quotes, materials, expenses, etc.*). This means that you are playing it safe and over-estimating potential costs.
- ⇒ Round down for good things (*e.g. income, revenue, time saved, etc.*). This also means that you are playing it safe and under-estimating potential benefits.

## Sample:

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NUM  
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### Rounding B

1. What has Albrut done wrong with his rounding? Show your calculations.
2. What advice would you give him?





## 1.09 Working Together

### C Round it out

1. Use rounding to calculate answers for Ilsa and John.

i. Ilsa reckons that she buys and drinks about three 600ml bottles of Coke a day. Approximately how many millilitres does she drink each week, and each year? How might she be wasting her money?

ii. John works out 3 times a week and performs 3 sets of bench presses each of 10 reps, lifting 25kg, 40kg and 50kg respectively. How much weight does he bench press per workout, and per week?

Preview  
Sample:

2. Problem-solving

- a. Katie earns \$52 for a 4-hour shift and she works 3 weekday evening shifts per week. How much does she earn per week and per hour?
- b. Robert earns \$88 for an 8-hour shift each Sunday plus 25% penalty rate. How much does he earn per week and per hour?
- c. Who has got the better job? List 3-5 reasons but make your decision carefully. Discuss with the class.



Do Not  
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### Working together

So as you have experienced, the more you do mental arithmetic the better you get at it. Performing these basic calculations is a skill that you can learn, train and develop. But use it or lose it!

When I was in primary school I was very fast at doing basic calculations in my head. Throughout high school I become slower at these. When I was working as a sales assistant I became quite fast again. When I was studying business at university I also became quite fast at certain calculations. Now I'm just old with a slow brain! What about you?

Many people who work in retail, trades, hospitality, patient care, management, transport, manufacturing and accounting need

to be well-skilled at basic arithmetic. Why so?



### Mental work

D

1. Choose 2 of these occupation/industry fields listed above (or your own choices) and briefly describe 3 clear examples of when you would need to use mental arithmetic if you were working in that occupation.
2. Give an example of a mental arithmetic calculation that you have done, or would need to do, as part of this job.

Industry/Occupation 1:	Industry/Occupation 2:
i.	i.
ii.	ii.
iii.	iii.
Calculation e.g.	Calculation e.g.

**Preview  
Sample:  
Do Not  
Copy**

## 1.11 Working Together

### Order of operations

In life we naturally follow orders and procedures. Procedures can assist us to accomplish tasks accurately and efficiently. For example:

- ⇒ if you are changing a tyre you need to follow a sequence of operations to do the task properly,
- ⇒ if you are fixing a blocked drain you need to follow a sequence of operations to do the task properly, and
- ⇒ and if you are performing open heart surgery you also need to follow a sequence of operations to do the task properly!

The same goes with arithmetic calculations. You need to follow an order of operations. The basic rules, in order (and as explained below) are:

1. Calculate anything in brackets.
2. Move from left to right and perform any multiplication or division.
3. Move from left to right calculating for any addition and subtraction.



The tasks and responsibilities associated with occupations require workers to follow a well-planned and systematic order of operations.

Image: George Doyle, Stockbyte, Thinkstock

# Preview Sample:

# Do Not

Order, order!

When performing a calculation the order of operation is as follows.

**Firstly**, you must always **evaluate any brackets** before doing anything else:

e.g.  $5 + (10 \times 6) = 5 + 60 = 65$  (and not 90!!!)

**Secondly** you **move from left to right** performing any **multiplication or division**. It doesn't matter which of these you do first as long as you move from left to right. Tip: You can show this as a bracket ( ).

e.g.  $6 \times 5 + 3 \times 13 =$

$(6 \times 5) + (3 \times 13) =$

$30 + 39 = 69$  (and not 429, 624 or 1170!!)

**Finally**, you move from left to right performing any addition or subtraction. (Once again it doesn't matter which of these you do first as long as you move from left to right.)

For example:

$$3 + 9 \times 7 = ??$$

$$3 + (9 \times 7) = ??$$

do this 1st

$$3 + 63 = 66$$

And another:

$$6 \times 9 - 9 \div 3 = ??$$

$$(6 \times 9) - (9 \div 3) = ??$$

do this 1st      do this 2nd

$$54 - 3 = 51$$

And one more:

$$17 - (15 \div 3) + 5 \times 25 = ??$$

$$17 - 5 + (5 \times 25) = ??$$

$$12 + 125 = 137$$

NUM  
SUPER  
SKILLS

1. Perform the following calculations.

a. $3 + 3 + 3 \times 3 =$	
b. $3 + (3 + 3) + 3 =$	
c. $(3 + 3) \div 3 + 3 =$	
d. $(3 + 3) * (3 - 3) =$	

2. Estimate answers to the following calculations using rounding. Check your answers.

a. $29 \times 31 - 28 =$	
b. $147 - 52 \div 4 =$	
c. $998 * 10 \div (299 - 47) =$	

3. Davey has a \$5 note a \$2 coin and 3 \$1 coins. He has to buy 25 packets of Gooba Noodles which are 12c each. 4-packs of noodles are \$1.97 per pack. Which purchase option should he make? Why? (show your workings below.)

## 1.13 Fractions and Decimals

### Fractions

A fraction represents a part or a portion of a whole number. Essentially a fraction divides the top number (**numerator**) by the bottom number (the **denominator**).

For example:

⇒ An orange cut equally in two portions =  $\frac{1}{2}$  an orange +  $\frac{1}{2}$  an orange.

If you eat one of these portions you have eaten  $\frac{1}{2}$  of an orange. And 1 divided by 2 =  $\frac{1}{2}$ . (Or, "how many 2s go into 1: a half!") Then if you cut the other half equally you have 2 quarters. Eat one of those and you have now consumed  $\frac{3}{4}$ s and have  $\frac{1}{4}$  left.

⇒ 75 cents = 3 quarters of a dollar or  $\frac{3}{4}$ .

⇒ A pizza sliced in 8 portions =  $8 \times \frac{1}{8}$ . Each slice is  $\frac{1}{8}$ .

A **proper fraction** is one where the number on top (**numerator**) is less than the number on the bottom (**denominator**). This means that the number represented by the fraction will always be less than 1. e.g.  $\frac{1}{4}$ ,  $\frac{1}{2}$ ,  $\frac{3}{5}$ ,  $\frac{2}{3}$ ,  $\frac{5}{7}$ ,  $\frac{7}{10}$ ,  $\frac{19}{20}$  and so on.

An **improper fraction** is one where the number on top (**numerator**) is more than the number on the bottom (**denominator**). This means that the number represented by the fraction will always be more than 1. e.g.  $\frac{3}{2}$ ,  $\frac{4}{3}$ ,  $\frac{5}{4}$ ,  $\frac{7}{2}$ ,  $\frac{11}{3}$ ,  $\frac{27}{4}$  and so on.

### Decimals

A decimal is another way of representing a fraction. Decimals are based on our number system which uses the power of 10s, i.e. 1, 10, 100, 1000, 0.1, 0.01, 0.001, 0.0001).

Some numbers include a decimal point. These represent a whole number, such as 4, plus a fraction of a whole number such as 0.5. Written together this will be 4.5 (or 4 and five tenths). 4.5 can also be written as  $4\frac{1}{2}$ .

For example, Jaz ate 4 Big Macs plus another half a burger before he had to stop with a gut ache. In decimal terms, Jaz ate 4.5 Big Macs!

For really accurate numbers such as in medicine, pharmacy and other technical and scientific areas decimals might go up to the hundredth (i.e. 2 numbers after the decimal point; 0.01); or even to the thousandth, (i.e. 3 numbers after the decimal point 0.001). For this stage of numeracy we can keep decimals to the hundredth, which is two numbers after the decimal point, or 0.01. This is important when dealing with money; and when converting measurements you might also require 2 (or more) decimal places. Why so?

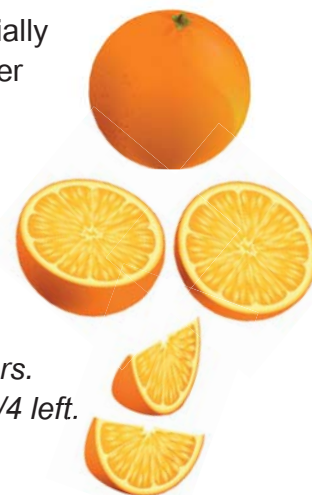


Image: mustahtar/  
Depositphotos.com

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### A Fractions and Decimals

Arrange these fractions in order from lowest to highest. Show each as a decimal.

$\frac{11}{3}$ ,  $\frac{1}{4}$ ,  $\frac{5}{2}$ ,  $\frac{9}{10}$ ,  $\frac{1}{2}$ ,  $\frac{3}{2}$ ,  $\frac{2}{3}$ ,  $\frac{4}{3}$ ,  $\frac{7}{2}$ ,  $\frac{27}{4}$ ,  $\frac{3}{5}$ ,  $\frac{5}{7}$ ,  $\frac{5}{4}$ ,  $\frac{7}{10}$ ,  $\frac{19}{20}$




### Fractions: Addition and subtraction

If the fractions have the same bottom number (**denominator**) then simply add or subtract the top numbers (**numerator**).

e.g. 1  $\frac{1}{2} + \frac{1}{2} = \frac{2}{2} = 1$     e.g. 2  $\frac{3}{4} - \frac{1}{4} = \frac{2}{4} = \frac{1}{2}$     e.g. 3  $\frac{5}{2} + \frac{4}{2} - \frac{3}{2} = \frac{9}{2} - \frac{3}{2} = \frac{6}{2} = 3$

**But**, if the fractions have different bottom numbers (**denominators**) then you will have to find the lowest common **denominator** (or lowest common multiple). After this you can then add or subtract the top numbers.

e.g. 1  $\frac{1}{2} + \frac{1}{4} = \frac{2}{4} + \frac{1}{4} = \frac{3}{4}$     e.g. 2  $\frac{3}{2} + \frac{2}{4} - \frac{1}{8} = \frac{6}{4} + \frac{2}{4} - \frac{1}{8}$   
 $= \frac{12}{8} + \frac{4}{8} - \frac{1}{8}$   
 $= \frac{15}{8} = 1 \frac{7}{8} \text{ or } 1.875$

NUM  
SUPER  
SKILLS

### Fractions: Multiplication and division

#### Multiplication

1. Multiply the top numbers (numerators).
2. Multiply the bottom numbers (denominators).
3. Then if possible, simply the fraction.

e.g. 1  $\frac{1}{3} \times \frac{1}{2} = \frac{1}{6}$     e.g. 2  $\frac{2}{5} \times \frac{2}{3} = \frac{4}{15}$     e.g. 3  $\frac{7}{4} \times \frac{3}{2} = \frac{21}{8}$   
 $\frac{21}{8} = 2 \frac{5}{8}$

#### Division

Now this is a bit trickier; but follow these steps.

1. Invert all the fractions to the right of the  $\div$  fraction (or whole number).
2. Then multiply (yes multiply) the top numbers (numerators).
3. Then multiply (again, yes multiply) the bottom numbers (denominators).
4. Then if possible, simply the fraction.

$\frac{3}{5} \div \frac{2}{5} = \frac{3}{5} \times \frac{5}{2} = \frac{15}{10} = \frac{3}{2} = 1 \frac{1}{2}$

Step 1

Step 2 & 3

Step 4

NUM  
SUPER  
SKILLS

### Calculating fractions & decimals

B

Complete the following calculations showing your workings.

a. $1\frac{1}{2} + 3\frac{3}{4} + 0.5 =$	b. $2\frac{2}{5} + 5\frac{5}{2} =$	c. $5\frac{5}{2} \times 10\frac{10}{2} =$	d. $9\frac{9}{2} - 11\frac{11}{4} \times 0.5 =$
e. $0.7 + 28.8 - 7\frac{7}{2} =$	f. $0.3 + 0.5 \times 3\frac{3}{2} =$	g. $7.25 - 0.75 \times 1\frac{1}{2} =$	h. $3\frac{3}{4} \div 1\frac{1}{4} =$

## 1.15 Percentages

### Percentages

At times people say that they have trouble calculating percentages. But in reality percentages are one of the most straightforward calculations going around. A percentage simply represents a proportion of a whole! Just look at the orange below.



$1 = 100\%$



$1/2 = 50\%$



$1/4 = 25\%$




$1/8 = 12.5\%$

### Percentages

Right now in your class, put up your hand if you feel that you are OK at calculating percentages.

Count the number of people who put up their hand. This is the number of people in your class who are OK at calculating percentages.

Count the number of people in total in your class.

Now you have all you need to calculate a percentage. What's the answer? 

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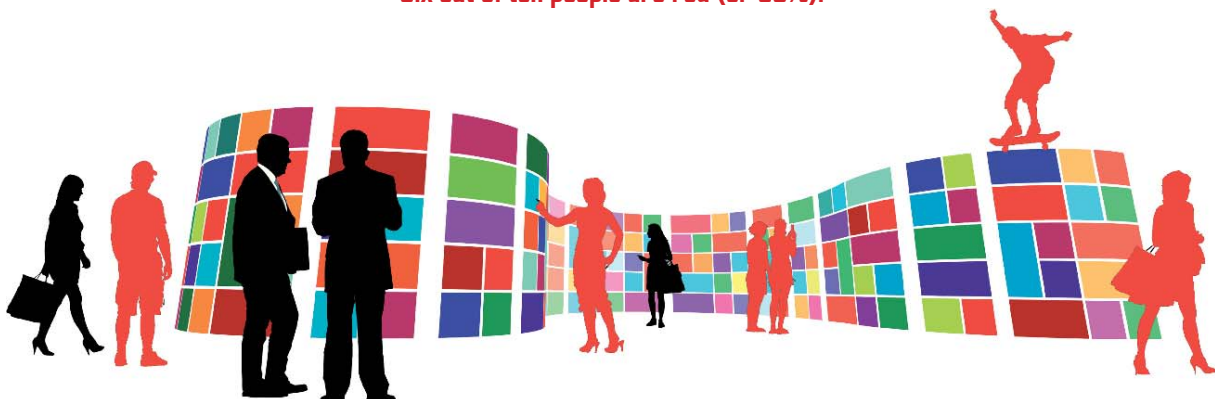
### Proportion

A percentage represents a smaller proportion of a whole. Let's consider these examples.

- ⇒ 7 out of 10 people prefer Burpee Cola. That's 70%.
- ⇒ 33 out of 100 people have never been overseas. That's 33%.
- ⇒ 26 out of 50 people surveyed agreed that Love's and contestants were, "a waste of oxygen". That's 52% (52 out of 100).
- ⇒ Approximately 60% of all adults in Australia are considered 'overweight or obese'. If there are about 15 million adult Australians then that's about 9 million people.



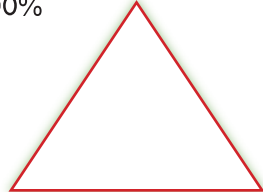
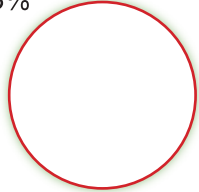

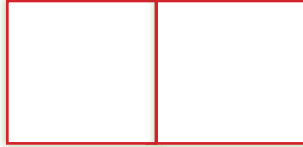
*Image: Adapted from  
Kamaga/iStock/  
Thinkstock*

Six out of ten people are red (or 60%).



## Visual percentages A

Colour in the shapes to indicate each percentage.

i. 25% 	ii. 50% 	iii. 100% 
iv. 12.5% 	v. 40% 	vi. 75% 

### Making percentages easier

Percentages are calculated as a proportion of 100. You cannot have a percentage greater than 100% nor can you have a percentage lower than 0%. If you have a cake and slice it in two you have two slices each of 50%. You cannot create more than 100% of the cake.

When calculating percentages, it is easiest to do are the 10's. It's not that hard to calculate 10% of any number. Quickly, what's 10% of 270? See it's easy!

If you have to work out 5%, then calculate 10% and then halve the amount. If you have to calculate 20% then calculate 10% and then double the number. You get the picture! Or should I say, the number.

Preview  
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## Common percentages B

Fill-in the table below with the correct percentages

	1%	2.5%	5%	7.5%	10%	20%	25%	33%	40%	50%	60%	66%	75%	80%	100%
100															
50															
1,000															
500															
250															
156															

## 1.17 Percentages

### Calculating percentages

If there are 100 people waiting in a queue for Grand Final tickets, and 80 of these are members of Collingwood, then the percentage of Collingwood members in this queue for Grand Final tickets is 80%. See it's easy in words. It's easy in numbers as well. e.g.

$$\Rightarrow \frac{80 \text{ (number of Collingwood members in queue)}}{100 \text{ (total number of people in queue)}} \times \frac{100\%}{1}$$

$$= 0.8 \times 100\%$$

$$= 80\%$$

So to work out percentages you divide the amount or the portion you are focusing on, by the total amount.

This gives fraction or decimal (such as 8/10 or 0.8).

You then multiply by 100% to express this as a percentage.

So if there are 17 Holdens in the car park and there are 51 cars in total, what percentage of cars in the car park are Holdens?

NUM  
SUPER  
SKILLS

# Preview

## C Percentage calculations

Complete the following percentage calculations. Show your workings.

1. What is 20% of 250?	2. What is 25% of 200?
3. When surveyed 36 people out of 50 replied that they would like an iPhone. What % is this?	4. The 2016 Census found that 6,163,667 of Australia's population were born overseas. The total population was 23,401,892. What % was born overseas?
5. GST is charged at 10% on most goods and services. How much GST applies to a purchase of \$550 (GST inc.)?	6. If you get paid \$11.50 an hour and you get a pay rise of 4.5%, what will your new hourly rate be?

Sample:  
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Chew it over D

1. Jonesie buys a pizza and cuts it into 8 equal slices. What percentage of the total pizza does each slice represent?



2. He cuts each of these 8 slices in half. What percentage of the total pizza is each slice?

3. If the pizza weighs 500 grams (gm) and Jonesie cuts quite accurately, what is the approximate weight of each slice when cut into 8 slices; and the approximate weight of each slice when cut into 16?

4. What might be the benefit of Jonesie cutting the pizza into 16 slices? What problems can you predict with this type of slicing?

5. Way back in 2009, local 60gm Mars Bars decreased in size by 11.6%. What was the new weight of a Mars bar? Why would Mars do this? What is the weight now?



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## 1.19 Interpreting Numbers

### Numbers as words

Sometimes you hear or read numbers as words which can create a bit of a problem. When listening to spoken numbers many people start to switch off after hearing three numbers. Most of us are just not skilled enough at mental arithmetic to process more than three numbers at a time. We can get confused.

Sometimes a pushy salesperson can use this confusion to their advantage and try to bamboozle and manipulate you with spoken 'facts' and 'figures'. Some people also don't take this 'spoken number' confusion into account when giving presentations or when explaining complex numerical issues. As a result they bore and confuse their audience.

It is important to develop the skills to be able to interpret words to find out their true numerical meaning.

### A Numbers as words

Write the following sentences as numbers and calculations and then solve each.

<p>e.g. My oldest child is 12, my next youngest is 3 years younger and the next is 2 years older than my 4th who is 5 and my baby is a quarter of the age of the oldest.</p>	<p><i>How many children do I have? What are each of their ages and what is their combined age?</i></p> <p>Oldest = 12, 2nd oldest = <math>(12-3) = 9</math>, 4th oldest = 5, 3rd eldest therefore = <math>(5+2) = 7</math> and the 'baby' = <math>(12 \times 1/4) = 3</math>.</p> <p>a. I have 5 children b. Their ages are 12, 9, 7, 5 and 3. c. <math>12 + 9 + 7 + 5 + 3 = 36</math> years</p>
<p>i. Alo earned \$100 a week for half a year. Alo spent \$50 a week for the whole year. Alo's uncle gave him \$800 for his birthday which he hasn't touched yet. Alo needs to purchase 12 driving lessons @ \$60 each.</p>	<p>a. <i>How much money has Alo had?</i></p> <p>b. <i>How much money has Alo spent?</i></p> <p>c. <i>How much money will Alo have left after paying for the lessons?</i></p>
<p>ii. In this recipe to serve 12, you will need a kilo of butter, and two eggs for every quarter kilo of butter, and 100 grams of sugar for every egg. You will also need 500 grams of flour per 250 grams of butter.</p>	<p><i>How much of each ingredient will you need for 24 people?</i></p> <p>Butter?</p> <p>Eggs?</p> <p>Sugar?</p> <p>Flour?</p>

### What are Words Worth?

Numbers mean very little, if anything, on their own. Instead it's their interpretation that is important. What does it mean to say that your meal has 30 grams of fat? Is that good or bad? How do you know?

When you interpret the meaning of numbers you need to be able to compare them to benchmarks, norms and other standards.

Advertisers and people who are trying to persuade often use slippery words to try and alter the meaning of the numbers.



How many grams of fat would you expect to be in this 1 kg serve of fried chips?

### Slippery numbers B

Are these statements all they're cracked up to be? What else do you need to know? Research online to find out this 'unknown' information and then explain each.



"Michael can run 100m in an amazing 15 seconds flat."

"Our factory-laid eggs each weigh a whopping 40 grams."

"At Scofforamas you get a nice, juicy, quarter-pound steak for just \$12.99."

"Albine's IQ is measured at almost 100."

"Our new 20% lower-fat cheese-flavoured chips have only 18 grams of fat per 50g pack."

"Elvira's blood pressure reading is 110 over 70."

"With our new BigBoy Booster powder you can get ripped in half the time."

(Make up one of your own)

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## 1.21 Working The Numbers

### Numerical skills

Throughout the unit you will also be required to develop a range of numerical skills that relate to specific topics, or that can be applied more generally. You will investigate and use these in greater depth later in the unit and be expected to apply these skills to everyday situations; and in Unit 2 for work-related situations.

#### Proportions and Ratios

A proportion refers to an amount of something as compared to the total amount. Proportions are often measured in percentages, decimals or fractions.  
e.g. What proportion of the cake did Rennie eat? He ate 3 out of 4 slices which is  $\frac{3}{4}$  or 75% or 0.75.

Proportion can also be expressed as ratios. A ratio shows one quantity as expressed in relation to another.

e.g. For the cake I am baking I have to use 0.25 kg of sugar for every kilogram of flour. So the weight ratio of sugar to flour 1:4; and the weight ratio of flour to sugar is 4:1.

Proportion and ratios are important for measurements and for dealing with physical quantities. They can be used to express things in simple sentences.

So people doing practical, manual, design and technical tasks in their professional and personal life use proportions and ratios. They often estimate these using their own experience, expertise and understanding of practical numeracy. Do you?



Image: Vladru /Depositphotos.com

#### Rates

A rate is another type of ratio; but a rate combines 2 items or amounts expressed in different units.

Rates show how much of one quantity is needed or consumed in relation to another. i.e. Something per something else. Got it?

The most common rates you experience use distance and time.  
e.g. 60 km per hour (60kmh). Got it now?

Petrol consumption How about 7 litres per km? See!

Dinner cost? \$20 per kg of beef.

What about a shower?  
10 litres of water per minute.



Image: mouse\_md/Depositphotos.com

#### Angles

Angles are another type of numerical expression that you might naturally calculate.

An angle measures the space or distance between 2 'rays' (these could be lines or objects). The space, or 'turn' is measured in degrees.

e.g. "Dusty lines up for a set shot on a 45° angle."

"Just join those 2 lengths of timber at 90°."

"I reckon on this angle you'll get in the car space."

"The house roof is angled at 30°."



Image: MicrostockAsia/Depositphotos.com

## Working the numbers A

Answer the following. Show your workings. Add 2 more related to your own life.

Numerical situation	This is an example of...	Workings
e.g. At my job I get paid an extra 50% for working on Saturdays.	<ul style="list-style-type: none"> <li>- Calculating percentages</li> <li>- Calculating wage rates</li> </ul>	<p>I get paid \$10 an hour normally.  Saturday = <math>\\$10 + 50\%</math>  = <math>\\$10 + \\$5</math>  Saturday pay = \$15 per hour</p>
a. Alfie is cooking for a dinner party. His carbonara recipe serves 4 but 6 people are coming. So he has to adjust his portions of 500g pasta, 4 eggs, 500ml milk, 500g cheese, 250ml cream, 2 onions and 3 garlic cloves.	<ul style="list-style-type: none"> <li>- Using ratios</li> <li>- Estimating amounts</li> <li>- Measuring amounts</li> </ul>	
b. Rexi is building a dog house for her woofie Colin. She wants it to look good with an angled roof. The doghouse will be a 1m cube; but it will have an angled roof. What angle do you think suits? Approximately how much timber will she need?	<ul style="list-style-type: none"> <li>- Estimating measurements</li> <li>- Calculating measurements</li> <li>- Estimating angles</li> </ul>	
c. Stav has a big bruiser of a car and it really drinks the fuel. Normally it takes about 70 litres to fill the tank and that lasts for about 245kms. How many litres/km and how much to fill the tank at today's prices?	<ul style="list-style-type: none"> <li>- Estimating and calculating fuel consumption rates</li> <li>- Estimating fuel costs</li> </ul>	
d. The speed limit on most of the roads near Li is 50 or 60kmh. But he reckons he travels closer to an average of 30kmh for a whole trip. Li needs to make a 45 minute trip, so how many kms?	<ul style="list-style-type: none"> <li>- Estimating rates and/or ratios</li> <li>- Estimating speed and travel time</li> </ul>	
e.		
f.		

## 1.23 Assessment Task

### AT1 The Big Bossman's BBQ

For this assessment task you are required to use various numerical skills and processes to help plan a BBQ for your boss's clients and families. He has given you this list and wants you to check and see if he has got everything right.

He has invited about 100 clients and their families and so far 50 have accepted. He expects about another 50% to accept. He doesn't know how many clients actually have families, or how many will indeed bring their families along, nor even how many kids they each have! But he doesn't want to be short of food and drink. And he certainly doesn't want to spend too much money!

- The shopping list:
- ☐ 20kg of sausages
  - ☐ 10kg of onions
  - ☐ 10kg of beef patties
  - ☐ 1kg of vegie patties
  - ☐ 1 x 24 pack of bottled water
  - ☐ 20 litres of soft drink
  - ☐ 5 x loaves of white bread
  - ☐ 1 x loaf of brown bread
  - ☐ 4 x 4 litres bottles of sauce
- Note: He has 2 BBQs, gas and oil.

Work in pairs and start planning. Complete the following tasks.

- Predict the most likely amount of guests (adults and kids) that will attend.
- Predict and calculate the proportions and ratios, proportions and ratios.

How many adults ?	How many kids?	How many vegetarians?
How many sausages?	How many sausage each?	Snags: Too few, too many or just right - explain?
How many burger patties?	How many burgers each?	Burgers: Too few, too many or just right - explain?
How many vegie patties?	How many vegie patties each?	Vegie patties: Too few, too many or just right - explain?
How many slices of bread?	How much bread for snags?	How much bread for burgers?
Bread per snag ratio?	Bread per burger ratio?	Bread: Too little, too much or just right - explain?
How many grams of onions?	How many grams of onions each?	Onions: Too little, too much or just right - explain?
How many litres of sauce?	How many litres of sauce each?	Sauce: Too little, too much or just right - explain?
How many cups of soft drink?	How many cups of soft drink each?	Soft drink: Too little, too much or just right - explain?
How much water?	How many bottles of water each?	Water: Too little, too much or just right - explain?

- Identify whether the shopping list prepared by your boss is adequate and suitable. If required, change the list by adding or subtracting amounts. Then recalculate relevant proportions and ratios.

Prepare a written report in point form (as well as your workings) to answer questions 1-3 above. Your teacher might ask you to prepare a report to the class.

**Hey, why not run a BBQ fundraising activity as a WRS or PDS project?**



# Numerical Skills

# 2

## Contents

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Activities 2: Numerical Skills	p.	Due date/Done?	Comment
2.01A Quick estimates	26	<input type="text"/>	<input type="text"/>
2.02B Working estimates	27	<input type="text"/>	<input type="text"/>
2.03C Good estimating	28	<input type="text"/>	<input type="text"/>
2.04D Bad estimating	29	<input type="text"/>	<input type="text"/>
2.06A Mass	31	<input type="text"/>	<input type="text"/>
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2.08C Temperature in action	33	<input type="text"/>	<input type="text"/>
2.09A Average (mean)	34	<input type="text"/>	<input type="text"/>
2.10B Median and mode	35	<input type="text"/>	<input type="text"/>
2.11A Me and data	36	<input type="text"/>	<input type="text"/>
2.12B Data and tables	37	<input type="text"/>	<input type="text"/>
2.14A Bar graphs	39	<input type="text"/>	<input type="text"/>
2.16A Pie charts	41	<input type="text"/>	<input type="text"/>
2.18A Line graphs	43	<input type="text"/>	<input type="text"/>
2.19A Chance and probability	44	<input type="text"/>	<input type="text"/>
2.20B Good luck or lucky!	45	<input type="text"/>	<input type="text"/>
AT2 I Like the Red Ones	46-49	<input type="text"/>	<input type="text"/>
2.25 Self-Reflection	50	<input type="text"/>	<input type="text"/>

Comments:

## 2.01 Estimating

### Estimating accurately


Successful estimating is based on a combination of factors. Basically you need to apply some knowledge, some ability to calculate, and some common sense

 in order to come up with an estimate. Can you do that?

#### A Quick estimates

1. Estimate the following answers but make sure that you do this quickly and without calculations. (All questions relate to Australia.)

2. Work in pairs to calculate the actual answers. Research some of these online.

 3. As a class discuss the results. Who did well and who was way off? Why so?



Question	Estimate	Exact calculation
1 What is the estimated life span of a person of your gender born the same year as you?		
2 Estimate the height of your teacher.		
3 Approximately what height would a child be at aged 5?		
4 What area of carpet do you estimate would be needed to cover this room?		
5 How many hours a week do you estimate that you spend online?		
6 How many hours a week do you estimate that you spend exercising?		
7 Estimate the average amount of an Australian family's first home loan.		
8 Estimate the average weekly income in Australia.		
9 Estimate the % of students in your class who use public transport to get to school.		
10 Estimate the proportion of students aged 16 who have a casual/part-time job.		
11 Estimate how much it will cost per week to run your first car.		
12 Estimate how many weeks it would take you to save up for a car priced at \$5,000.		
13 Estimate your average daily kilojoule intake.		
14 Estimate how long it would take you to walk 5 kms.		

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### At work

Employees develop work-related competencies and skills through training and experience. Some of these competencies and skills rely both directly and indirectly on estimating. Successful work-related estimating often relates to time and money. For example, a plasterer will need to estimate how long it might take to re-plaster a house as part of a renovation, and then use this as the basis for their quote.

Many occupations rely on the ability of workers to estimate.

- ⇒ Tradespeople and others involved in building and construction are required to cost, plan, order materials and factor in their labour (time) when quoting for jobs.
- ⇒ Accountants and other finance professionals are called upon to carefully estimate and budget for expenses (money out) and revenue (money in).
- ⇒ People in hospitality such as chefs and caterers need to estimate the quantity of food they might need for orders and also the amount of staff needed to serve customers.
- ⇒ Retail managers and shopkeepers will need to estimate stock levels, when customers will come in to the stores and how many full-time, part-time and casual staff they will need to roster on.
- ⇒ Drivers and others involved in transport and logistics will have to estimate times for travel and delivery.
- ⇒ Manufacturers will have to estimate inputs and materials, employee labour and the availability of machinery required to produce their goods.

# Preview Sample:

Working estimates

B

Name the occupations shown in the images. Briefly outline examples of estimating that might occur as part of the tasks associated with that occupation.

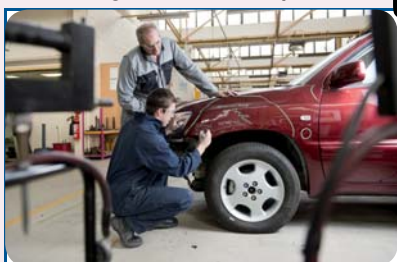


Image: Peter M. Fisher/Fuse/Thinkstock



Image: Goodluz/ iStock/Thinkstock



Image: Purestock/Thinkstock

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## 2.03 Estimating

### C Good estimating



Each of these estimates is based on 'good' numerical logic. Prove that logic by doing the maths. Show your workings and then summarise the 'good' numerical logic in one sentence. But what else might need to be considered? Discuss these.

- i. Brute is washing cars as part of a *Work Related Skills* activity. It takes 20 minutes to wash a standard-sized car with a 'normal' level of dirt. He estimates that he can wash about 12 cars such as these over 4 hours.

e.g.  $12 \text{ cars} \times 20 \text{ minutes} = 240 \text{ minutes}$ .  $240 \text{ minutes} = 4 \text{ hours}$ .

*Brute has made his calculations based on an average, taking into consideration car size and soiling. If he works hard he is likely to be able to achieve his estimate.*

*Other things he might need to consider are:*

☺ *where the cars are located and whether cars need to be moved*

☺ *replacing dirty water and cleaning cloths*

☺ *fatigue and tiredness that may slow his progress, and...*

☺ *Other: \_\_\_\_\_*

- ii. Lertisha is doing facepainting for children at her local child-care centre. It takes her 10 minutes to paint one child's face and the centre will pay her \$2 per child. She estimates she can earn about \$50 for half a day's painting.

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- iii. Ali is making samosas for a multi-cultural lunch as part of a PDS group activity. It takes him 10 minutes to chop ingredients, and 2 minutes to assemble a samosa. He estimates it will take him about 1 hour to prepare and assemble 25 samosas.

## Bad estimating D

Each of these estimates is based on 'bad' numerical logic. Correct that logic by doing the maths. Show your workings and then summarise the bad numerical logic in one sentence. What else might need to be considered? Discuss these.



- i. Barry is a sports coach and his players take about 14 seconds to run 100m. He then says that they should be able to run 1000m in just over 140 seconds.

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Sample:

- ii. Working as fast as she can, Joykin (who has just started as a pizza cook) can assemble and cook one pizza in 15 minutes. Her boss expects her to be able to assemble and cook 15 pizzas an hour. Joykin does an estimate and then argues that this is mathematically impossible, but her boss is right. How so?

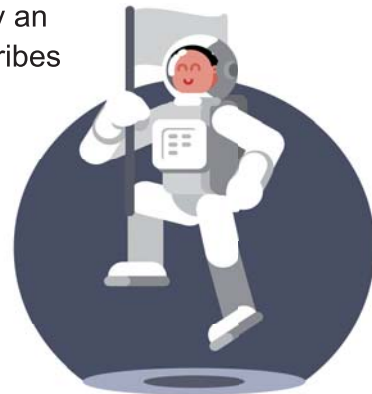
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## 2.05 Measuring Mass and Temperature

### Weight vs mass

In your personal and working lives you will have to undertake and use many measurements. One of the most common measurements you are likely to have to do is to find out the weight or mass of an object such as a parcel, or even a person.

We often use the word 'weight' when describing how heavy an object is, but technically this term is incorrect. Weight describes the force of gravity on an object. You've seen the moon landing film with the astronauts leaping about. They could do this because they weighed much less on the moon than on Earth. The moon is much smaller than Earth and as such has a lower gravitational pull. As a result, objects weigh more on Earth than they do on the moon because of gravity. Given this, do you think objects would 'weigh' more or less on Jupiter than on Earth?



**The new moon diet. Lose up to 50kg instantly - no diet and exercise needed!**

Image: Netkoff/  
Depositphotos.com

### Units of weight (mass)

Mass is the correct term to describe how much matter is in an object. Mass is measured in kilograms (kg). 1,000 grams = 1 kg. We might say that we 'weigh' 100 kg (which is pretty heavy) but really this is our mass which is 100 kg.

For objects with a large mass such as motor vehicles and construction materials we might use tonnes. 1,000 kilograms = 1 tonne. Driving a vehicle with high tonnage is restricted.

For small objects we might use milligrams (1,000 milligrams = 1 gram) such as for medicines and electronics.

We might even use micrograms (1,000 micrograms = 1 milligram) such as for microelectronics and biology.

In jewellery weight is governed by carat. 1 metric carat = 200 milligrams which = 0.2 grams. The size of the carat is the biggest determinant of a gem's price, but other issues such as clarity, cut, colour and the setting of jewellery influence price.

### The great weight debate

Do you weigh too much? If you are heavy that is not a problem in itself, except for the health issues that might arise from carrying too much weight. However, I do have to warn you that if you are already carrying excess body mass then as you get older you are likely to get heavier.

Even though we learned that the correct terminology is mass, our body mass is usually referred to as weight. So have you heard of the Body Mass Index?

The Body Mass Index is an index that compares your height to your weight to calculate a number that indicates whether you are in a 'healthy' weight range. But it does have some limitations. Why not research these?

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## Body Mass Index

The BMI is calculated by dividing your weight in kg by the square of your height in metres.

For example Chris, aged 40, is 75kg and measures 175cm. So therefore:

$$\begin{aligned} \text{BMI} &= \frac{75}{1.75^2} \\ &= 24.5 \text{ (normal)} \end{aligned}$$

There are many online calculators that calculate BMI.

BMI	Description
Under 18.5	Underweight
Between 18.5-25	Normal
Between 26-30	Overweight
Above 30	Obese



NUM  
SUPER  
SKILLS

# Preview

Mass A

- Complete the calculations based on these units of weight.

7 kgs in grams =	2,800 grams in kgs =	1,500 kgs in tonne =
3.5kg + 275g in kgs =	11 kgs - 1,500g in grams =	50g x 50 in kg =

- Estimate and then find out the weight/mass of the following objects.


Object	Estimated mass	Exact mass	Object	Estimated mass	Exact mass
yourself			pair of steel toe workboots		
375ml can of soft drink			a pet (choose breed or animal)		
1kg bag of sugar			passenger car (choose model)		
iPad			latest model Hummer		
your own or a friend's handbag (with contents)			passenger bus (choose model)		
your principal			your choice		

## 2.07 Measuring Mass and Temperature

### Temperature

Temperature can be commonly referred to as the intensity of heat of an object, fluid, surface or other substance. The most common unit of measurement for temperature is Celsius which is a comparative scale, based on the freezing point of water 0°C, and the boiling point of water 100 °C. However, some slight variations to this definition do exist for scientific purposes. Temperature is usually measured by a scaled mercury-based thermometer.

### Temperature in action

 An awareness of temperature scales, and associated safe temperature ranges, is a vital concept for many personal and work-related situations. Can you think of more?

- ⇒ Personal health and wellbeing, such as surface air temperature.
- ⇒ Personal care and safety, such as bathing an infant.
- ⇒ Household situations such as hot surfaces, heating requirements and clothing needs.
- ⇒ Health diagnosis and medicine, such as hypothermia, fever and other conditions.
- ⇒ Food storage and preparation, such as perishables, dairy and meats.
- ⇒ Employee OH&S such as exposure to heat and cold hazards, and fire risk.
- ⇒ Cooking, such as cooking temperatures and times to avoid food poisoning.
- ⇒ Manufacturing, such as engineering, food production and construction.
- ⇒ Transport, such as refrigerated vans for perishables.

Image:  
Wavebreakmedia Ltd;  
Wavebreak media,  
Thinkstock



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Correct temperature is important in the beauty industry. Why so?

### B Temperature

Estimate and then find out the temperature for each of the following.

Item	Estimated temperature	Exact temperature	Item	Estimated temperature	Exact temperature
The current temperature in this room.			Hottest temp ever recorded in Australia.		
The current temperature in Moscow.			Coldest temp ever recorded in Australia.		
A caffe latte.			Car radiator fluid after a long drive.		
A bath suitable for a baby.			A shop fridge for milk.		
Healthy human temperature.			your choice		
A human with a fever.			your choice		

## Temperature in action C

You are required to undertake an investigation into safe temperature ranges in a variety of personal, social/recreational and work-related situations. Complete the tasks specified in the table by describing relevant activities/items. You might also need to undertake some online research.



	Describe activity/item	Safe range/ hazard control	Potential hazards
Personal situations	Cooking of....		
	Electrical item....		
	other...		
	other...		
Social/ recreational situations	A day at the beach...		
	other...		
	other...		
Work- related situations	Working environment...		
	Storage of perishables...		
	other...		
	other...		

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## 2.09 Average

### Mean - Simple average

If I ask you to calculate an average, most of you will simply add up the total and divide by the number of items that you add up. For example, calculate the average price of these shopping items: \$10, \$8, \$6, \$4, \$2.

⇒ Total price = \$30 (sum of all prices)

⇒ Total number of items = 5.

⇒ Average =  $\$30/5 = \$6$ .

Well done! See it's simple isn't it! This calculation is sometimes called the **simple average** or arithmetic **mean**. The mean is the total of all values divided by the number of all values.

Calculating averages is important for activities as diverse as weekly retail sales amounts, health information, safety and even sporting achievements.

Averages allow you to interpret data to provide information that will help your decision-making. Averages can be used to interpret data in tables, often using spreadsheets. (Find out the spreadsheet calculation for average.)

e.g. A football coach looks at Manny Henzel's stats and sees that in the last 4 games he has got 6 possessions, 8 possessions, 8 possessions and 5 possessions. That's an average of just 6.5 per game. What would you recommend the coach do?

e.g. Sandy is trying to clock up hours for her 'L's'. In the first 10 weeks she has averaged only 2 hours per week. At this rate, how long is it going to take her to accumulate her hours?

What do you recommend she should do?



### A Average (mean)

Calculate the average (mean) for each of these data sets.

	Johnny	Jackie	Vinnie	Vonnie	Dot	Mean
Mass kg	76	65	94	45	80	
Height cm	184	166	196	152	175	
Wage \$	12.50	14	15.75	18.90	9.50	
Mark /100	96	66	82	57	74	
Driving hours	0	97	62	35	145	

#### Extension

What do you think might be the mean height of students in your class in cm? Make an estimate. Now as a class come up with a way of finding this mean height.

### The full story?

Sometimes the simple average (the mean) doesn't tell us the full story associated with a set of data.

For example, the average weight of Fred, Ted, Dred, Zed and Ed is 100 kgs. Fred weighs 62kg, Ted, 75kg, Dred, 64kg, Zed, 83kg and Ed (who is training to be a Sumo) is 216kg. But does the simple average (mean) tell the full story? Four of the guys' weight is well under 100 kgs; whereas, big Ed, and his bulky 216kg, pulls the average up to 100kg. So that 100kg simple average doesn't give a good indication of the weights of Fred, Ted, Dred and Zed. And that 100kg mean average doesn't really give an indication of how truly massive Ed is either.



Image: lenmdp/  
Depositphotos.com

### Median

Sometimes a better indication of an 'average' value is the **median**. The median value is the number that sits in the middle of a set of values. This will give you an idea of where a value sits in a line-up. In this case there will be the same amount of values above and below the median.

⇒ So for the example of \$1, \$8, \$6, \$4, \$2, the value in the middle is \$6.

The median price is \$6. (For this e.g. this happens to be the same as the mean.)

The median is the **midpoint** of a set of values. Median prices are used a lot in real estate. Median is a good measure to use when dealing with populations such as finding median height and weight.

### Mode

Another measure of 'average' is the mode. The **mode** is the count of the most frequent value. Consider this example.

You want to find out the most likely price you will pay when buying items. If you buy 5 objects priced at \$1, \$1, \$1, \$1, and \$26 the simple mean will still be \$6. (i.e.  $\$30/5$ ). However the mode is a measure of the most frequently occurring value. In this example \$1 comes up 4 times so the **mode** is \$1. We can say that although the average price is \$6 (the mean), the most likely price you will pay is \$1 (the mode).

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### Median and mode B

Answer the following questions in your workbooks

1. What is the difference between mean, median and mode?
2. Calculate the median average for each of the data sets on p.34. By how much do the median averages vary from the mean averages you calculated?
3. The mode is useful for finding the 'most likely' occurrence from a set of numbers or results. So it is good for counting within a range. Consider this example.

Ms Flintskin has calculated the scores on the Numeracy test and converted these to grades. Calculate the modal average. Now use the scores to calculate mean and median. What are the differences between the average calculations?

Student	Al	Bo	Cy	Di	Em	Fi	Ga	Hu	Iz	Jo	Ka	Le	Mo	Ni	Oj	Po	Ro
Grade	D	E	C	D	C	C	B	C	E	D	B	A	C	D	C	C	C
Score /100	52	31	64	59	62	61	75	68	44	54	72	86	62	52	67	64	61

## 2.11 Data and Tables

### Data makes the world go around

Your life is driven by data. **Data** is all the measurements, records, facts, recordings and other information that can be expressed in numerical and/or written form.

In our contemporary digital world, data is collected, collated, analysed and communicated by varied means and media such as mobile phone usage data and billing, banking and financial information, internet and digital media usage, GPS location tracking, as well as personal data such as personal identity details (**biodata**), location and movement, purchasing histories, income levels, taxation and government information.

Data can be used to create **tables**, **graphs**, **statistics**, **infographics** and **reports** that enable bulk information to be understood, analysed and acted upon. Business, governments and diverse organisations and agencies compile data to inform their production, pricing and distribution of various goods and services. Schools use data to track attendance and report on student achievement. Sporting teams use data to monitor players and to plan, develop and implement better performance strategies.

However, not all data is 'digital'. Straightforward uses of data might involve measuring a room to determine the amount of tiles needed for flooring, listening to the sound of an animal's breathing to pick up possible ailments, and calculating how much time and money you might need when planning a personal holiday.

Although, increasingly there are digital devices to help you to do all these tasks.

So data is really just a set of numbers, or a set of words, or a set of words and numbers. It is the interpretation of data that makes it useful.

Data is often easier to read and interpret when organised in tables, graphs and other visual forms. So it is vital that you can develop these skills for personal and work-related numerical situations.

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Image: royalty/  
Depositphotos.com



### A Me and data

Complete the table by giving brief descriptions of the types of data and information you might need to use in your personal life, and for work-related responsibilities.

Personal examples		Work-related examples	
i.	ii.	i.	ii.
iii.	iv.	iii.	iv.
v.	vi.	v.	vi.



Consider the data listed in this table.

You will need to calculate the total amounts per month, and per student, as well as relevant averages (in this case calculate the mean or simple average).

Monthly wage earnings by student: 2019						
Month	Lu	Adot	Fran	Grace	Mark	Total
Jan	\$70	\$0	\$800	\$180	\$40	
Feb	\$90	\$0	\$600	\$180	\$80	
March	\$120	\$70	\$200	\$180	\$120	
April	\$45	\$110	\$150	\$180	\$160	
May	\$180	\$140	\$0	\$160	\$200	
June	\$120	\$140	\$400	\$180	\$240	
Total						
Average						

1. What data is being shown in the table?  
\_\_\_\_\_
2. Which data is shown in the rows, and which is in columns?  
\_\_\_\_\_
3. The numbers are right-justified. Why is that important?  
\_\_\_\_\_
4. Use the data as evidence to answer the following questions.

a. Who earned the most?	b. Who earned the least?	c. Who has the most even income pattern?
d. Who has the most uneven income pattern?	e. Who got a job in March?	f. Who is likely to have worked more over the summer holidays?
g. Who seems to be getting an extra shift each month?	h. In which month was the average wage earned the highest?	i. What was the average earnings per student for the 6 months.

### Extension

As a class create a table that shows monthly wage earnings for each student. Calculate relevant averages. Comment on what the results show about the working patterns and income earnings of your class as a whole.



## 2.13 Bar Graphs

### Bar graphs

A bar graph is a good way to show numerical information in a visual form. This means that the user can easily look at the size of the bars in order to interpret some information. We look at what each bar represents (the label) and the height of each bar (the scale) in comparison with the other bars. And as always we need to look at the heading to know what the information on the bar graph is representing.

Each bar represents a particular category such as:

- ⇒ a person (spending per month)
- ⇒ a time period (monthly phone usage)
- ⇒ a survey preference (favourite food).

The height of the bars usually represent 'how much' a particular bar is measuring. For example:

- ⇒ total spending in \$ (for each person)
- ⇒ total number of texts (for that billing period, i.e. 1 month)
- ⇒ % of people surveyed whose favourite food is fish (14%).

Comparisons can be made by interpreting and analysing the data shown in the bar graph.

Numerical terms that might be used include; "more", "larger" or "greater than", "less" or "fewer", "smaller" or "less than". We can also use comparison descriptors such as "twice as much", "half as much", "almost the same", "slightly more", "much more" (or "less") and so on. This will help the user to make key points and to interpret and express the visual graph in words.

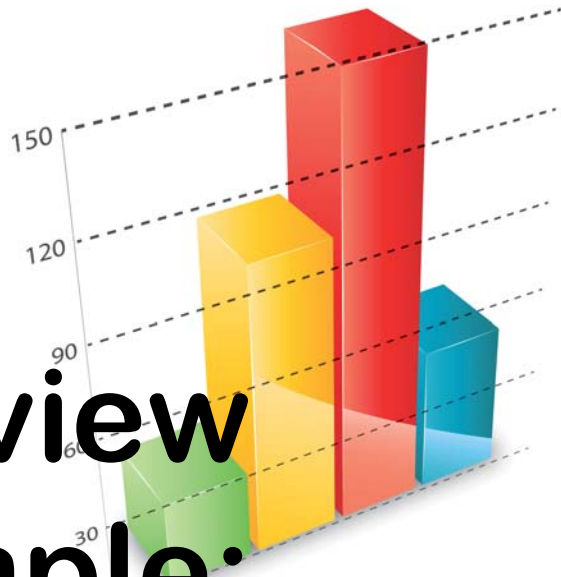


Image: rottenman/  
Depositphotos.com

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### Bar graphs

- ⇒ A bar graph shows a comparison between the data of various categories.
- ⇒ A more complex bar graph can also be used to compare different variables on the same chart by using more than one 'set' of bars.
- ⇒ The components of a bar graph are:
  - **Horizontal (bottom) axis (x):** Plots the categories along the bottom, usually with spaces between the bars.
  - **Vertical (side) axis (y):** Plots the amount along the side, which is usually a number, a count, a percentage, or a \$ amount, shown as an even scale.
  - **Heading and data labels:** These tell the reader what is indicated by the graph so you know what the graph is showing.
  - **Bars:** The height indicates the amount being graphed. The bars can be drawn using the same colour, or different colours, depending on what is represented on the graph.

NUM  
SUPER  
SKILLS

This table shows the average number of text messages sent each day by 6 teenagers.

1. In your workbooks prepare a properly labelled bar graph that shows this information
2. Use comparative words and phrases to describe 3 main points about this data.

Person	Texts/day
Rip	60
Chuck	98
Biff	33
Peg	45
Chase	80
Juice	15

3. Use a computer or tablet to plot the graph, adding visual effects, and print this out. Which graph was easier to construct? Which format was better? Why?



4. This image shows the number of coins spent by people on different types of drinks at a school canteen on a particular day. Each coin represents \$2 (assume each drink is the same price - which is \$2 of course).

- a. Add a heading.
- b. Label the 'bars' with what might be a suitable type or brand of drink.
- c. Interpret the bars to work out the \$ amount spent. Draw a scale on the vertical axis to suit this.
- d. Use comparative words to describe the main points shown by the data.



Image: infocuss/  
Depositphotos.com

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## 2.15 Pie Charts

### Pie charts

Pie charts are another effective way of showing numerical information visually. Pie charts show data and numerical information to represent relative proportions or amounts of a whole. So pie charts are good for showing relative percentages.

The pie represents the whole of the data (100%). Each segment or slice of the pie represents a part (or a %) of that pie.

Segments will usually be different sizes, unless the data is exact for each proportion.

The size of the segment will correspond to the proportion (the % of the total).

Segments will also be coloured which helps the viewer to easily identify each segment.

Pie charts are useful to show survey information based on closed questions and preferential ranking questions, such as 'very high', 'high', etc.

Pie charts might be used together with bar graphs. The bar graph shows the incidence, i.e. how many, whereas the pie segments indicate the relative proportion. Both visuals might suit different uses.

Pie charts are commonly used to represent data and information such as:

- ⇒ proportional spending patterns such as different categories of a budget
- ⇒ sources of income or sales categories, such as hot food, sandwiches, drinks, confectionery, and so on
- ⇒ allocation of time between various tasks, such as sleeping, school, travel, work, sport, and so on
- ⇒ personal preferences, or likes or dislikes, for a group of people, such as a favourite type of music
- ⇒ demographic information such, as country of birth, or type of residence/dwelling.



Image: Albachiaraa/  
Depositphotos.com

### Pie charts

- ⇒ A pie chart shows the relative size of different amounts shown by pie segments of a proportional size.
- ⇒ On a pie chart we can easily see the difference between variables shown by the size (or area) of the pie segments.
- ⇒ The chart should include the segments, a legend, data values (or %) and a heading.
- ⇒ When constructing a pie chart it is important not to have too many segments, otherwise it will be hard to make sense of the data. This might mean you will need an 'other' category to 'catch' all the smaller or less frequent amounts.

NUM  
SUPER  
SKILLS

This table shows how Rip uses his mobile on a normal Sunday. Rip has carefully logged each interaction.

1. In your workbooks prepare a properly labelled pie chart that shows this information.
2. Use comparative words and phrases to describe 3 main points about this data.

Rip	Per day	%
Texts	60	24%
Phone	10	4%
Social media	48	19%
Web pages	25	10%
Music	25	10%
Apps	35	14%
Other	47	19%
Total	250	100

# Preview

3. Use a computer or tablet to plot the graph, adding visual effects, and print this out. Which graph was easier to construct? Which print was better? Why?



# Sample:

# Do Not

4. This image shows a representation of a 'Healthy Eating Pyramid' as a pie chart.

- a. Add a heading.
- b. Label the chart to describe each segment, and estimate the % of each segment.
- c. Use comparative words to describe the main points shown by the chart.
- d. How do you stack up compared to this healthy eating chart? Discuss with the class.



Image: ifong/  
Depositphotos.com





## 2.17 Line Graphs

### Line graphs

One of the most common ways of representing connected data and numerical information in a visual form is to use a line graph.

Line graphs are generally used to display data that is connected over a particular period of time. Spacing the data along the horizontal axis using a scale establishes the duration of each data point. It also indicates the total **time series** that is being measured.

Plotting the data on the vertical axis using dot points establishes the height of the various measures. This indicates how much was recorded at that point in time.

Joining the dots gives us an easy to read lineal representation of the data.

Line graphs are commonly used to represent:

- ⇒ natural phenomena such as weather temperatures
- ⇒ business sales, revenue, expenses and profit amounts over time
- ⇒ personal records of achievements such as fitness data, weight gain or loss, strength increases, and other associated measures
- ⇒ patterns in income, savings and wealth levels
- ⇒ comparisons of different data sets (by using more than one line on a graph).

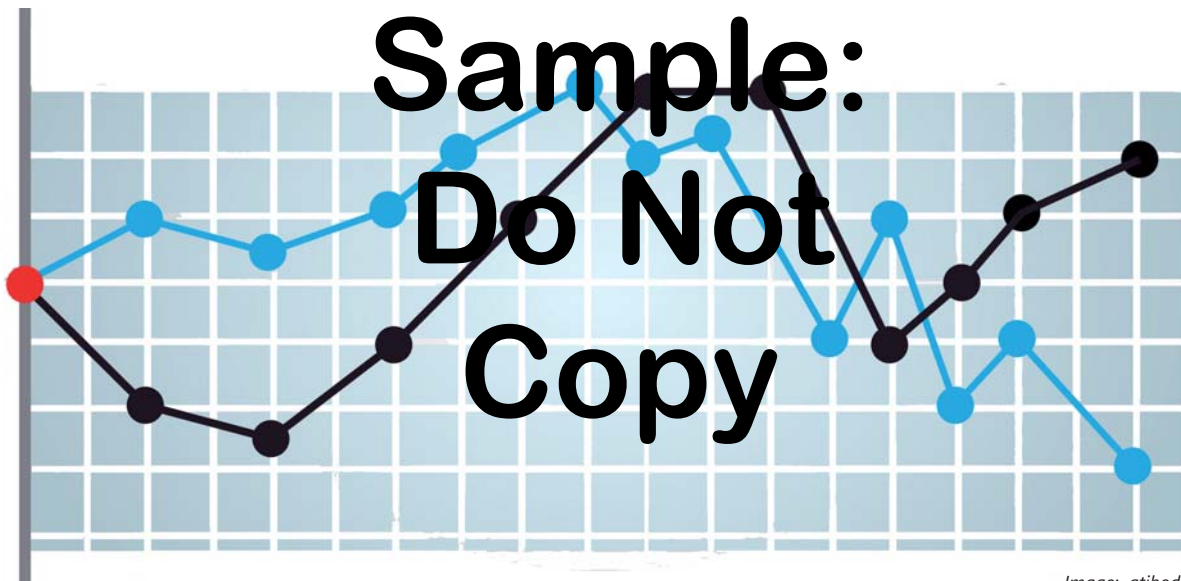


Image: atibody/  
Depositphotos.com

### Line graphs

A line graph represents a variable over an extended period of time (a time series). It allows for a visual representation of data and can also be used to compare different variables on the same chart. The components of a line graph are:

**Horizontal axis (x):** Plots the time series

**Vertical axis (y):** Plots the variable over time

**Heading and data labels:** Tells the reader what is indicated by the graph

**Data line:** Shows the data in visual or graph form.

NUM  
SUPER  
SKILLS



## Line graphs A

Twins Jay and Jilbert are helping their family get on top of the household bills by calculating each week's grocery shopping bill and also by sourcing specials and alternative sellers to try and cut down the bill in the longer term. To support this they are collecting and graphing the shopping expenses over a 3 month period.

1. In your workbooks prepare a properly labelled line graph that shows this information.
2. Use comparative words to describe the pattern of the line (and/or the trend) of the graph. How well did the twins do?

Month/Week	Shopping \$
March W1	\$275
March W2	\$290
March W3	\$284
March W4	\$240
April W1	\$220
April W2	\$190
April W3	\$170
April W4	\$175
May W1	\$150
May W2	\$150
May W3	\$165
May W4	\$140
May W5	\$140

Preview  
Sample:  
Do Not  
Copy

3. Use a computer or tablet to plot the graph, adding visual effects, and print this out. Which graph was easier to construct? Which format was better? Why?



4. This image shows a human representation of a line graph, perhaps for business sales or profit or some other outcome.

Image: SergeyNivens/  
Depositphotos.com

- a. What do you think this graph could measure or show?
- b. As a class come up with ways that you could use people to represent certain data and information in a line or bar graph. Have a try but don't stand on someone's shoulders - that's Photoshopped!




## 2.19 Chance and Probability

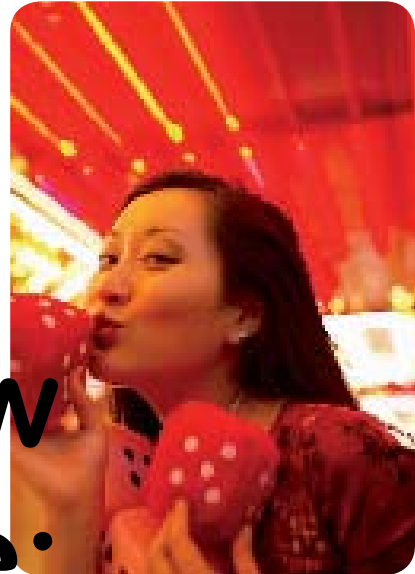
### Good luck

Are you lucky? How do you know? Just what is luck? Perhaps fortunate is a better term to use. So how fortunate are you? Are you likely to lead a fortunate life and build a fortune? Or are you hoping to get lucky and strike it rich through a win on Tattsлото, or through some long-lost, rich relative making you their sole heir?

When highly successful people (who are often very wealthy, although this doesn't need to be a measure of success) are interviewed about their success, they normally cite these factors:

- ⇒ hard work
- ⇒ good planning and goal-setting
- ⇒ good communication and people skills
- ⇒ effective teamwork
- ⇒ high level knowledge and expertise in the field
- ⇒ appropriate timing
- ⇒ passion
- ⇒ persistence, and
- ⇒ surrounding themselves with highly skilled and positive people.

They rarely, if ever, say that luck was a reason for their success, apart from sometimes saying that they were in the right place at the right time, (which really is a measure of good planning rather than luck). So where does this leave you? 



Preview  
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### A Chance and probability

Your teacher will show you how to calculate probability based on chance (if you don't already know). Complete the table below based on what you learn.

<b>Coin</b> Chance of tossing a head? Chance = 1 out of 2 Probability = 50%	<b>Coin</b> Chance of tossing a tail?	<b>2 Coins</b> Chance of tossing 2 heads?
<b>Die</b> Chance of rolling a 6? Chance = 1 out of 6 Probability = 16.7%	<b>Die</b> Chance of rolling a 1?	<b>2 Dice</b> Chance of rolling a 12?
<b>Rain</b> Chance it will rain tomorrow?	<b>Roulette</b> Chance of ball landing on red?	<b>Toast</b> Chance that dropped toast will fall butter side down!

1. What is luck? Give an example. Are you lucky?

---



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2. Your uncle Tomot is a hard-headed man who believes in luck. Last week he walked into the casino and saw that the previous 8 spins on the roulette wheel were black, black, black, black, black, black, black, black. He immediately bet all his money, \$100, on red and won. How much did Uncle T win? Why did he win?

---



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Preview

Tomorrow, Lucky Tomot is going back to the casino. He is going to play the same system as last time. He has taken out all his savings, \$2,643 and family members have also given him some of their own money to bet. He will be spending over \$5,000.

3. Will you give him any of your own money? Why/why not?

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4. How is this story likely to end? Discuss this as a class.

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#### Extension

- a. Play some roulette in class using toy wheels. Give each student a 'pretend' \$100.
- b. Before you start, have a class discussion about what is likely to happen.
- c. How do you think you will go personally? Have you got a strategy you can use?
- d. Carefully record all bets and winnings.
- e. Who are the winners/losers? Why so?

## 2.21 Assessment Task

### AT2 I Like the Red Ones



#### Overview

Do you like M&Ms? What about Smarties? How about Beanies, or even those generic coloured chocolate buttons? What's your favourite colour? Which taste the best? Well you are going to find out.

You are going to form into a pair to investigate the weight, colours and associated averages of these tasty little treats.

To do this investigation properly, within your class there must be at least 2 pairs of students independently investigating each particular brand of treat.

As you complete each of the Stages 1-5, tick off the associated numeracy task. Your teacher will monitor your progress and give feedback.

**ALLERGEN ALERT: DO NOT USE TREATS WITH NUTS IN THEM.**  
**CAUTION: ALL CONFECTIONARY MAY HAVE BEEN MANUFACTURED USING MACHINERY THAT HAS BEEN EXPOSED TO NUT PRODUCTS.**  
**IF YOU ARE ALLERGIC TO ANY OF THE PRODUCTS OR INGREDIENTS NOTIFY YOUR TEACHER BEFOREHAND. YOU WILL NOT HANDLE THE TREATS UNDER ANY CIRCUMSTANCES. YOU CAN INSTEAD BE THE RECORDER OF INFORMATION.**  
**ALL OTHER STUDENTS MUST USE DISPOSABLE BARRIER GLOVES TO HANDLE THE TREATS, AND THEY MUST BE HANDLED IN A HYGIENIC MANNER.**

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#### Stage 1: Estimating

Consider a bag of treats that has individual fun size serves, e.g. M&Ms and Smarties. You are going to need to get up table to record this information.

- |   |   |
|---|---|
| <input type="checkbox"/> a. Find out the colours that are available.                | <input type="checkbox"/> e. Estimate the weight of a fun size serve.                            |
| <input type="checkbox"/> b. Estimate the total number of each colour in a bag.      | <input type="checkbox"/> f. Estimate the total number of treats in each bag.                    |
| <input type="checkbox"/> c. Estimate the number of each colour in a fun size serve. | <input type="checkbox"/> g. Estimate the number of treats in a fun size serve.                  |
| <input type="checkbox"/> d. Estimate the total weight of the treats.                | <input type="checkbox"/> h. Estimate the probability of randomly selecting a particular colour. |

⇒ Task/process information:

**Stage 2: Investigating and recording**

Undertake the following tasks. Record your information in an organised format. Use tables to record your data where appropriate.

- |  |   |
|--|---|
| <input type="checkbox"/> a. Weigh each fun size serve.                             | <input type="checkbox"/> e. Count the colours in each fun size serve.   |
| <input type="checkbox"/> b. Calculate the total weight of treats in the whole bag. | <input type="checkbox"/> f. Calculate the total colours in the whole bag.   |
| <input type="checkbox"/> c. Count the number of treats in each fun size serve.     | <input type="checkbox"/> g. Calculate the probability of randomly selecting a particular colour from a fun size serve and from the whole bag. |
| <input type="checkbox"/> d. Calculate the total number of treats in the whole bag. |   |

⇒ Task/process information:

# Preview

**Stage 3: Comparing and analysing - your results**

You will need to set out your information clearly in a table. Then you will create relevant graphs/charts.

- |   |   |
|---|---|
| <input type="checkbox"/> a. Calculate the <b>mean</b> average of each colour per <b>fun size bag</b> .  | <input type="checkbox"/> d. Calculate the <b>mean</b> average of each colour for the <b>whole bag</b> .   |
| <input type="checkbox"/> b. Calculate the <b>median</b> average of each colour per <b>fun size bag</b> .  | <input type="checkbox"/> e. Calculate the <b>median</b> average of each colour for the <b>whole bag</b> . |
| <input type="checkbox"/> c. Calculate the <b>modal</b> average of each colour per <b>fun size bag</b> .   | <input type="checkbox"/> f. Calculate the <b>modal</b> average of each colour for the <b>whole bag</b> .  |
| <input type="checkbox"/> g. Compare the different averages. Explain which average you think is most useful for this type of analysis.   |   |
| <input type="checkbox"/> h. Create a pie chart that shows the average number (or proportion) of the different colours of treats per whole bag. Which average method will you use and why? |   |

⇒ Task/process information:

Sample:  
Do Not  
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## 2.23 Assessment Task

### Stage 4: Comparing and analysing - Class results

As a class collate the data for each pair's investigation to come up with total figures. Then you will create relevant graphs/charts.

- ☐ a. Calculate the **mean** average of each colour per **fun size bag** for the entire class.
- ☐ b. Calculate the **median** average of each colour per **fun size bag** for the entire class.
- ☐ c. Calculate the **modal** average of each colour per **fun size bag** for the entire class.
- ☐ d. Calculate the **mean** average of each colour for the **whole bag** for the entire class.
- ☐ e. Calculate the **median** average of each colour for the **whole bag** for the entire class.
- ☐ f. Calculate the **modal** average of each colour for the **whole bag** for the entire class.
- ☐ g. Compare the entire-class averages with your own specific averages. Discuss variations in the results. Which is a more useful measure, and why?
- ☐ h. Create a pie chart that shows the average number (or proportion) of colours of treats per whole bag. Which average method will you use and why?
- ☐ i. Go online and find out the average colours per serve from M & M. How do both your own investigations, and the entire class's investigations, compare?
- ☐ j. Recalculate the probability of randomly selecting a particular colour from the whole bag.

⇒ Task/process information:

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### Stage 5: Extension - The milk chocolate melts in your mouth and not in your hand

- ☐ a. Chocolate melts quite easily. At what temperature does this start to happen?
- ☐ b. Did you experience any melting during your investigations? Why/why not?
- ☐ c. Find out and describe why M&Ms were invented. Was this a good idea?
- ☐ d. Is there any difference in the taste of different colours? Which colours do people prefer? You could work out relevant averages for these preferences.
- ☐ e. Why do you think they make different colours for these treats?

⇒ Task/process information:





Tasks - AT2: I Like the Red Ones				
	Re- quired	Due by	Done	Teacher initials
<b>Stage 1: Estimating</b>				
abc Colours in bag and individual serve.	<input checked="" type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
d e Weight of bag and serve.	<input checked="" type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
f g Number in bag and serve.	<input checked="" type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
h Probability of selecting a colour.	<input checked="" type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<b>Stage 2: Investigating and recording</b>				
a b Weight in whole bag and in a serve.	<input checked="" type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
c d Number in whole bag and in a serve.	<input checked="" type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
e f Colours in whole bag and in a serve.	<input checked="" type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
g Calculate probabilities of selecting a colour.	<input checked="" type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<b>Stage 3: Comparing and analysing your results</b>				
abc Mean, median and mode of fun size bag.	<input checked="" type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
def Mean, median and mode of whole bag.	<input checked="" type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
g Comparison of averages.	<input checked="" type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
h Pie chart showing colours.	<input checked="" type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<b>Stage 4: Comparing and analysing class results</b>				
abc Mean, median and mode of fun size for the class.	<input checked="" type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
def Mean, median and mode of whole bag for the class.	<input checked="" type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
g Comparison of your own and class averages.	<input checked="" type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
h Pie chart showing colours for whole class.	<input checked="" type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
i Online research of colours.	<input checked="" type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
j Calculate probabilities of selecting colours.	<input checked="" type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<b>Stage 5: Extension</b>				
	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<b>Reporting</b>				
⇒ Prepare and submit your final report.	<input checked="" type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Additional information:				
Signed: _____ Date: _____				

2.25 Self-Reflection

Self-Reflection Pro-Forma

Which numeracy skills did I develop during this unit?

→

→

→

How have the skills of numeracy helped improve my personal life?

→

→

How have the skills of numeracy helped my development of work-related skills?

→

→

How would I rate my performance using a circle in developing my numeracy skills this unit?

0 not shown	1 low	2 reasonable	3 good	4 very good	5 excellent
----------------	----------	-----------------	-----------	----------------	----------------

What were my strongest areas of performance and what should I work on improving?

My strongest topics/skills were:	But I need to improve my skills in:

Signed: \_\_\_\_\_ Date: \_\_\_\_\_

Teacher initials: \_\_\_\_\_ Date: \_\_\_\_\_

# Money

3

## Contents

3.01 Money .....	52	3.11 Income .....	62
3.07 Discounts .....	58	3.15 Pay Slips.....	66
3.09 Change in Costs .....	60	3.19 Assessment Task.....	70

### Activities 3: Money

	p.	Due date/Done?	Comment
3.01A <b>How much?</b>	52	<input type="text"/>	<input type="text"/>
3.02B <b>Notes and coins</b>	53	<input type="text"/>	<input type="text"/>
3.03C <b>It's all in your head</b>	54	<input type="text"/>	<input type="text"/>
3.04D <b>Calculating money</b>	55	<input type="text"/>	<input type="text"/>
3.06E <b>Percentages</b>	57	<input type="text"/>	<input type="text"/>
3.08A <b>Discounting</b>		<input type="text"/>	<input type="text"/>
3.10A <b>Change in costs</b>	61	<input type="text"/>	<input type="text"/>
3.12A <b>Pay</b>	63	<input type="text"/>	<input type="text"/>
3.12B <b>Pay time</b>	63	<input type="text"/>	<input type="text"/>
3.13C <b>Pay up</b>	65-66	<input type="text"/>	<input type="text"/>
3.16A <b>Pay slips</b>	67	<input type="text"/>	<input type="text"/>
3.17B <b>Pay slip in action</b>	68-69	<input type="text"/>	<input type="text"/>
AT3 <b>Money, Money, Money</b>	70-72	<input type="text"/>	<input type="text"/>

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Comments:

## 3.01 Money

### Money

Do you want some; or do you want some and then some more? Money that is! Well what have you got to trade?

Money is a medium of exchange that makes it easier for us to barter for goods and services. We get paid in money (currency or digital) and this currency is very useful because we can easily break it down into smaller units.

We swap these monetary units, these notes and coins, for goods and services. We earn these notes and coins by exchanging our labour and our skills for income, or by earning income on our investments (capital). We might also receive welfare benefits.

We use these notes and coins to buy goods and services to satisfy our needs (food, water, shelter, clothing, warmth) and our wants (Big Mac, Evian, Toorak Mansion, Prada and LG.) Life is good isn't it!

Money in itself is not a resource and on its own is of no use (except to numismatists). We cannot eat, drink or live in money. However, money is important in that it represents the value of the goods and services that we can buy. Money gives us purchasing power as consumers. And if we haven't got enough money, then there's always credit!



Image: JupiterImages/  
Polka Dot/Thinkstock

Have you ever seen *Survivor*? Money is of no use while the contestants are on the island. And what about the *Survivors in the Family* we do? They don't use money. And if you were just about to head down to nuclear waste, what would you take with you?

### A How much?

Complete the following transactions. Calculate the amounts and list the notes and coins you would provide. (Don't forget about rounding!)

a. Purchase of 3 cans of Blurptobears @ 76c. Handed a \$10 note.	b. Purchase of jeans @ \$59.99, top @ \$39.99 and a belt @ \$15. (gets free with sales over \$175). Handed a \$100 and two \$50s.
c. Order of 2 pieces of flake, 3 potato cakes, 2 steamed dim sims, minimum chips and a 1.25 litre bottle of Coke. What's left from a \$50?	d. Purchase of YPad Narci at \$149.95, a \$20 YTunes card, a \$14.95 YSkin cover, a \$10 set of headphones and a Freddo Frog at 75c. Make change from a \$200 note.

Notes and coins B

Indicate the correct combination of notes and coins needed to make change for each of these transactions. Try to use the least number of currency units.

<p>i. Processing a \$65 sale. Given \$100.</p>	<div style="display: flex; justify-content: space-around; margin-bottom: 10px;"> <span>\$100</span> <span>\$50</span> <span>\$20</span> <span>\$10</span> <span>\$5</span> </div> <div style="display: flex; justify-content: space-around;"> <div><input type="checkbox"/> _____</div> <div><input type="checkbox"/> _____</div> <div><input type="checkbox"/> _____</div> <div><input type="checkbox"/> _____</div> <div><input type="checkbox"/> _____</div> </div> <div style="display: flex; justify-content: space-around; margin-top: 10px;"> <div><input type="checkbox"/> _____</div> <div><input type="checkbox"/> _____</div> <div><input type="checkbox"/> _____</div> <div><input type="checkbox"/> _____</div> <div><input type="checkbox"/> _____</div> <div><input type="checkbox"/> _____</div> </div> <div style="display: flex; justify-content: space-around; margin-top: 10px;"> <div><input type="checkbox"/> \$2</div> <div><input type="checkbox"/> \$1</div> <div><input type="checkbox"/> 50c</div> <div><input type="checkbox"/> 20c</div> <div><input type="checkbox"/> 10c</div> <div><input type="checkbox"/> 5c</div> </div>
<p>ii. Purchase of 3 items at \$25.50 each. Given a \$50 a \$20 and a \$10.</p>	<div style="display: flex; justify-content: space-around; margin-bottom: 10px;"> <span>\$100</span> <span>\$50</span> <span>\$20</span> <span>\$10</span> <span>\$5</span> </div> <div style="display: flex; justify-content: space-around;"> <div><input type="checkbox"/> _____</div> <div><input type="checkbox"/> _____</div> <div><input type="checkbox"/> _____</div> <div><input type="checkbox"/> _____</div> <div><input type="checkbox"/> _____</div> </div> <div style="display: flex; justify-content: space-around; margin-top: 10px;"> <div><input type="checkbox"/> _____</div> <div><input type="checkbox"/> _____</div> <div><input type="checkbox"/> _____</div> <div><input type="checkbox"/> _____</div> <div><input type="checkbox"/> _____</div> <div><input type="checkbox"/> _____</div> </div> <div style="display: flex; justify-content: space-around; margin-top: 10px;"> <div><input type="checkbox"/> \$2</div> <div><input type="checkbox"/> \$1</div> <div><input type="checkbox"/> 50c</div> <div><input type="checkbox"/> 20c</div> <div><input type="checkbox"/> 10c</div> <div><input type="checkbox"/> 5c</div> </div>
<p>iii. Purchase 2 for \$75 and a different item at \$44.99. Given 2 x \$100 notes.</p>	<div style="display: flex; justify-content: space-around; margin-bottom: 10px;"> <span>\$100</span> <span>\$50</span> <span>\$20</span> <span>\$10</span> <span>\$5</span> </div> <div style="display: flex; justify-content: space-around;"> <div><input type="checkbox"/> _____</div> <div><input type="checkbox"/> _____</div> <div><input type="checkbox"/> _____</div> <div><input type="checkbox"/> _____</div> <div><input type="checkbox"/> _____</div> </div> <div style="display: flex; justify-content: space-around; margin-top: 10px;"> <div><input type="checkbox"/> _____</div> <div><input type="checkbox"/> _____</div> <div><input type="checkbox"/> _____</div> <div><input type="checkbox"/> _____</div> <div><input type="checkbox"/> _____</div> <div><input type="checkbox"/> _____</div> </div> <div style="display: flex; justify-content: space-around; margin-top: 10px;"> <div><input type="checkbox"/> \$2</div> <div><input type="checkbox"/> \$1</div> <div><input type="checkbox"/> 50c</div> <div><input type="checkbox"/> 20c</div> <div><input type="checkbox"/> 10c</div> <div><input type="checkbox"/> 5c</div> </div>
<p>iv. Total sales = \$73.11. Given a \$50, 2 x \$10 and 2 x \$2.</p>	<div style="display: flex; justify-content: space-around; margin-bottom: 10px;"> <span>\$100</span> <span>\$50</span> <span>\$20</span> <span>\$10</span> <span>\$5</span> </div> <div style="display: flex; justify-content: space-around;"> <div><input type="checkbox"/> _____</div> <div><input type="checkbox"/> _____</div> <div><input type="checkbox"/> _____</div> <div><input type="checkbox"/> _____</div> <div><input type="checkbox"/> _____</div> </div> <div style="display: flex; justify-content: space-around; margin-top: 10px;"> <div><input type="checkbox"/> _____</div> <div><input type="checkbox"/> _____</div> <div><input type="checkbox"/> _____</div> <div><input type="checkbox"/> _____</div> <div><input type="checkbox"/> _____</div> <div><input type="checkbox"/> _____</div> </div> <div style="display: flex; justify-content: space-around; margin-top: 10px;"> <div><input type="checkbox"/> \$2</div> <div><input type="checkbox"/> \$1</div> <div><input type="checkbox"/> 50c</div> <div><input type="checkbox"/> 20c</div> <div><input type="checkbox"/> 10c</div> <div><input type="checkbox"/> 5c</div> </div>
<p>v. Purchase of 8 @ \$1.20 and 10 @ \$2. Given a \$100.</p>	<div style="display: flex; justify-content: space-around; margin-bottom: 10px;"> <span>\$100</span> <span>\$50</span> <span>\$20</span> <span>\$10</span> <span>\$5</span> </div> <div style="display: flex; justify-content: space-around;"> <div><input type="checkbox"/> _____</div> <div><input type="checkbox"/> _____</div> <div><input type="checkbox"/> _____</div> <div><input type="checkbox"/> _____</div> <div><input type="checkbox"/> _____</div> </div> <div style="display: flex; justify-content: space-around; margin-top: 10px;"> <div><input type="checkbox"/> _____</div> <div><input type="checkbox"/> _____</div> <div><input type="checkbox"/> _____</div> <div><input type="checkbox"/> _____</div> <div><input type="checkbox"/> _____</div> <div><input type="checkbox"/> _____</div> </div> <div style="display: flex; justify-content: space-around; margin-top: 10px;"> <div><input type="checkbox"/> \$2</div> <div><input type="checkbox"/> \$1</div> <div><input type="checkbox"/> 50c</div> <div><input type="checkbox"/> 20c</div> <div><input type="checkbox"/> 10c</div> <div><input type="checkbox"/> 5c</div> </div>
<p>vi. Purchase of 3 x \$2.20, 2 x \$4.75 and 2 x \$5.00. Given a \$20 a \$10 and a 10c.</p>	<div style="display: flex; justify-content: space-around; margin-bottom: 10px;"> <span>\$100</span> <span>\$50</span> <span>\$20</span> <span>\$10</span> <span>\$5</span> </div> <div style="display: flex; justify-content: space-around;"> <div><input type="checkbox"/> _____</div> <div><input type="checkbox"/> _____</div> <div><input type="checkbox"/> _____</div> <div><input type="checkbox"/> _____</div> <div><input type="checkbox"/> _____</div> </div> <div style="display: flex; justify-content: space-around; margin-top: 10px;"> <div><input type="checkbox"/> _____</div> <div><input type="checkbox"/> _____</div> <div><input type="checkbox"/> _____</div> <div><input type="checkbox"/> _____</div> <div><input type="checkbox"/> _____</div> <div><input type="checkbox"/> _____</div> </div> <div style="display: flex; justify-content: space-around; margin-top: 10px;"> <div><input type="checkbox"/> \$2</div> <div><input type="checkbox"/> \$1</div> <div><input type="checkbox"/> 50c</div> <div><input type="checkbox"/> 20c</div> <div><input type="checkbox"/> 10c</div> <div><input type="checkbox"/> 5c</div> </div>
<p>vii. Purchase of \$49.95 and \$54.95. Given 5 x \$20s.</p>	<div style="display: flex; justify-content: space-around; margin-bottom: 10px;"> <span>\$100</span> <span>\$50</span> <span>\$20</span> <span>\$10</span> <span>\$5</span> </div> <div style="display: flex; justify-content: space-around;"> <div><input type="checkbox"/> _____</div> <div><input type="checkbox"/> _____</div> <div><input type="checkbox"/> _____</div> <div><input type="checkbox"/> _____</div> <div><input type="checkbox"/> _____</div> </div> <div style="display: flex; justify-content: space-around; margin-top: 10px;"> <div><input type="checkbox"/> _____</div> <div><input type="checkbox"/> _____</div> <div><input type="checkbox"/> _____</div> <div><input type="checkbox"/> _____</div> <div><input type="checkbox"/> _____</div> <div><input type="checkbox"/> _____</div> </div> <div style="display: flex; justify-content: space-around; margin-top: 10px;"> <div><input type="checkbox"/> \$2</div> <div><input type="checkbox"/> \$1</div> <div><input type="checkbox"/> 50c</div> <div><input type="checkbox"/> 20c</div> <div><input type="checkbox"/> 10c</div> <div><input type="checkbox"/> 5c</div> </div>

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### 3.03 Money

#### In your head

We often do money calculations in our head. It's a skill that many people develop over their lives. So let's explain how to do this in words using an example.

The best way to do this for **addition** is to add the dollar amounts first. Then keep that number in your head:

$$\$5.30 + \$3.80 = \$8 \text{ (i.e. } \$5 + \$3\text{)}$$

Then add the cents amounts:

$$30c + 80c = 110c$$

If the added cents equal more than 100, then you need to add an extra dollar to your dollar calculation, plus the remaining cents:

$$\$8 + 110c = \$8 + \$1 + 10c = \$9.10$$

Otherwise you just add the cents to your dollar amount.

If **subtracting** use the same steps, but by 'taking away':

$$\$5.30 - \$3.80 = \$2 \text{ (i.e. } \$5 - \$3\text{)}$$

Then subtract the cents amounts.

$$30c - 80c = -50c$$

If your subtracted cents amount is less than 0 then you need to take away a dollar from your dollar calculation, and then add the remaining cents:

$$\$2 - \$1 = \$1 \text{ then add } 50c = \$1 + 50c = \$1.50.$$

Otherwise you just add the cents to your subtracted dollar amount.

Now what if I tell you that you can do this quite easily in your head as long as you have a basic grasp how to add and subtract numbers. Do you believe me? Have a go!

In your head add:  $\$6.50 + \$3.50 = ?$

Now do a subtraction:  $\$7.95 - \$2.65 = ?$

Now another subtraction:  $\$6.70 - \$3.90 = ?$

See it's much easier to do this in your head rather than following the correct, but complex, instructions above. It's a natural numeracy skill you have developed, or can develop, through your life experiences. That's why these types of numeracy skills are about applied learning. (And if the calculation gets too complex then just set it out on paper.)



Image: robynmac/  
Depositphotos.com

#### C It's all in your head

Complete the calculations based on money, 'in your head'. Check your answer on paper or using a calculator.

a. 75 cents + \$1.50 =	b. \$10 + \$4.40 =	c. \$125 + \$59.99 =
d. \$11.95 - \$5.50 =	e. \$7.50 + \$0.75 - \$4 =	f. \$1,000 - \$100 + \$500 =



### Calculating with money

When adding and subtracting with money the rules are the same as you learned in Section 1.

1. Do your additions first.

2. And then if needed do your subtraction from that answer.

However, you might be dealing with two different currency units, i.e. dollars and cents, especially if you are working with items that have a small value or cost (such as in a supermarket).

So when working with money it is important to use correct place value to line up your calculation, because a dollar amount has 2 decimals.

e.g. \$1 = \$1.00 = 100 cents... or \$27.50 = \$27 and 50 cents = 2,750 cents.

This means right justifying when you set up your sum to keep all the correct units (and their values) in the appropriate place.

e.g. \$1.57 + \$3.60 +  
72 cents = ?

$$\begin{array}{r} \$1.57 \\ \$3.60 \\ + \$0.72 \\ \hline \$5.89 \end{array}$$

e.g. \$2.50 + \$5.45  
- \$1.80 = ?

$$\begin{array}{r} \$2.50 \\ + \$5.45 \\ \hline \$7.95 \\ - \$1.80 \\ \hline \$6.15 \end{array}$$

e.g. \$5.99 + \$117 -  
\$12.30 = ?

$$\begin{array}{r} \$5.99 \\ + \$117.00 \\ \hline \$122.99 \\ - \$12.30 \\ \hline \$110.69 \end{array}$$

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Calculating money

D

Complete the calculations based on money. These are a bit more complex so you might have to work on paper. Use a calculator to check your answers.

a. \$962 + \$745 add \$27.50 =	b. \$27.95 + \$5.99 + \$49.45 minus \$20 =	c. \$1500 - \$695 add \$50 + another \$50 twice =
d. \$27,500 - \$12,900 add \$1,450 - \$22,500 =	e. \$1,500,000 + \$150,000 +\$15,000 - \$1,500 - \$150 + \$15 + \$1.50 =	f. Add the price of a coke, a salad roll, an apple and a doughnut. Take away a \$5 discount coupon.

## 3.05 Money

### Percentages

As you learned in Section 1, a percentage simply refers to a proportion. It is also another way of representing a fraction. But fractions can be messy when dealing with money so instead we use percentages. Percentages are important for calculating amounts for many personal and work-related situations including:

- ⇒ sales discounts
- ⇒ volume discounts
- ⇒ bulk purchases
- ⇒ GST
- ⇒ price mark-ups
- ⇒ fees and costs
- ⇒ overtime and penalty rates.



Image: marinini/  
Depositphotos.com

#### Example 1

A store is having an end of financial year clearance sale and all stock is to be discounted by 20%; or by 25% if customers buy two or more items. You have your eye on two items. How do you do these calculations?

<u>20% off</u>	<u>25% off for 2 or more</u>
Normal price = \$50	Normal price = \$50 and \$30
Discount = \$50 x 20% = \$10	Discount = (\$50 + \$30) x 25% = \$20
New price = \$50 - \$10 = \$40	New price = \$80 x 25% = \$20
	New total = \$80 - \$20 = \$60

#### Example 2

You are paid \$10 an hour normal time; 25% more for overtime, and time and a half (50%) for working on Saturday. What is the hourly rate for each?

What if you work 20 hours normal, 4 hours overtime and 6 hours on Saturday? How much in total?

<u>Normal rate</u> = \$10	
Overtime rate = \$10 + 25%	= \$10 + (\$10 x 25%) = \$10 + (\$2.50) = \$12.50
Penalty rate = \$10 + 50%	= \$10 + (\$10 x 50%) = \$10 + (\$5.00) = \$15.00

#### Total pay

Rates	= \$10 x 20 hours	+ \$12.50 x 4 hours	+ \$15 x 6 hours
	= \$200	+ \$50	+ \$90
	= \$340		

#### Example 3

GST is calculated at 10% of the price for eligible goods and services.

<u>GST exc to inc</u>	<u>GST inc to exc</u>
Normal price = \$90 (GST exc)	Price = \$99 GST inc
GST = (10% of \$90)	GST = \$99/11
GST = \$9	GST = \$9
GST inc price = \$99 (i.e. \$90 + \$9)	GST exc price = \$90 (i.e. \$99 - \$9)

1. Calculate these fraction amounts as money. Firstly convert the fraction into a percentage. Then calculate the % money amount.

a. $\frac{1}{2}$ of \$75 =	b. $\frac{1}{4}$ of \$150 =	c. $\frac{2}{3}$ of \$300 =
d. $\frac{4}{5}$ of \$2,000 =	e. $\frac{3}{8}$ of \$1,000 =	f. $\frac{3}{4}$ of \$25 =
g. $\frac{9}{10}$ of \$45,000 =	h. $\frac{1}{5}$ of \$99.95 =	i. $\frac{15}{20}$ of \$1,000,000 =

2. Calculate these percentage amounts as money.

a. 40% of \$90 =	b. 130% of \$150 =	c. 65% of \$1,500 =
d. 15% of \$3,000 =	e. 37.5% of \$1.5m =	f. 10% of \$12.95 =
g. 20% of \$90 + 25% of \$500 =	g. 15% of \$500 + 30% of \$150 =	g. 10% of \$9.95 + 15% of \$100 - 5% of \$50 =

3. Write these as numerical expressions, and calculate the answers.

a. Abe has to calculate the GST for a customer's order. The order involves ten items at five dollars, 20 items at 10 dollars and 50 items @ \$20. All these prices are GST exc.	b. Baal has to calculate the GST already included in a supplier's invoice. The order involves five items at \$7.70 dollars, ten items at \$16.50 and 20 items at \$49.50. All these prices are GST inc.	c. Carin buys three items from an online seller. The items are fifty dollars, 125 dollars and \$75. As a special she gets ten per cent discount from the least expensive item. All these prices are GST inc.
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## 3.07 Discounts

### Discounts

Discounts are amounts deducted from the normal or regular price, or cost, of an item. It is important to understand discounts from both the consumer (or customer's) point-of-view, as well as from the point-of-view of businesses.

**Price discounts** are generally used by businesses to encourage consumers either; to buy more from them, to switch their business to them, or to remain loyal to them.

These discounts can include targeted specials, items on sale, seasonal discounts, 2 for 1 offers, loyalty discounts and even discounts for using cash. We could also call these price discounts **retail discounts**, even though the businesses involved might not be retailers in the traditional industry sense (such as electricity suppliers, cafés and hairdressers).

*For example, a clothing store might discount its end of season stock at 50% to clear items in the lead-up to the new season's fashions coming in. Or a sporting goods store sells 2 basketballs for the price of 1.*

**Cost discounts** are used by businesses to encourage other businesses to purchase from them. These discounts occur on the wholesale side (or supply side) of business transactions. Cost discounts (for **retail** or **wholesale** discounts) can include volume discounts, wholesale trade discounts, bulk purchase discounts, early payment discounts and other business-to-business (B2B) discounts.

*For example, a cookbook publisher will give a 40% trade discount to retail bookstores off the RRP (recommended retail price). This 40% then becomes the retailer's margin.*

*Large booksellers such as Big W, T-Mall and others are likely to receive a bigger discount, as they sell higher volumes at lower prices by taking advantage of the benefits achieved by economies of scale.*

*This is also why you'll see higher prices for goods in milk bars as compared to supermarkets.*

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**"I saved like heaps you know, everything was buy 2 and get the 3rd free!"**

**"Did you really Shoana, you just went in for a hair clip!"**



Image: count\_kert/  
Depositphotos.com

### Discounts

Discounts are normally applied as a % reduction to a retail or wholesale price. Most (but not all) discounts are calculated using percentages (see p.16-17).

e.g. i: End of season clearance on dresses - save 50%!

e.g. ii: Buy 2 and save 40% off both.

i. 50% off

Normal price = \$200

Discount =  $\$200 \times 50\% = \$100$

New price =  $\$200 - \$100 = \$100$

ii. 40% off for 2 or more

Normal price = \$30 and \$30

Discount =  $(\$30 + \$30) \times 40\%$

Discount \$ =  $\$60 \times 40\% = \$24$

New total =  $\$60 - \$24 = \$36$

e.g. iii: Order two meals get a third for free! (Offer applies to lowest priced item).

iii. Order two meals get a third free.

Normal price = \$16, \$14 and \$10 = \$40

Total price paid =  $(\$30 + \$0)$

Discount \$ =  $\$40 - \$30 = \$10$  (normal price less price after discount)

Discount % =  $\frac{\$10}{\$40} \times 100\%$   
= 25%

(So, what is the average price of each meal after the discount is applied?)

NUM  
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## Sample:

### Discounting

A

1. In your workbooks calculate the discount amount and the new price(s) on each of these transactions. How much was the total discount %?

a. 'End of season sale: Save 20%.'

Buy:

- Boots \$150 (normal price)
- Jacket \$200 (normal price)
- Shirt \$80 (normal price)
- Hat \$50 (normal price)
- Socks \$6 (normal price)

b. Save 5% when buying 10 or more tins of any food!

Buy:

- 5 of each
- Grit Meechew \$1
- Kitty Kibbles \$1.50
- Feline Fabulicious \$2
- Pussdcat Purrfection \$3

c. Order 3 meals get the 4th free. (Offer applies to lowest price item.)

- Meal 1: \$23
- Meal 2: \$18
- Meal 3: \$25
- Meal 4: \$24

2. In your workbooks calculate the **discount amount(s)**, the **new cost(s)**, the **cost per item** (unit costs) and **total discount savings amount** and % on these B2B transactions.

a. A retailer orders 50 boxes of chocolate bars with an RRP of \$2, from a wholesaler.

The stock has a trade discount of 40%.

Each box has 24 bars.

b. If the retailer buys 60 boxes they will get a further discount of 10% on the total order.

Do you recommend they should go for the larger order?

Use your numeracy skills and explain why or why not.

b. An electronics wholesaler is offered a 30% discount off the \$800 cost price for each unit ordered from a manufacturer for its new smart watch device.

The manufacturer also offers a scaled bulk discount arrangement of:

1-49 units = extra 5% discount

50-99 units = extra 10% discount

100+ units = extra 15% discount

Calculate based on orders of 2, 20, 50, 100 & 500 units.



## 3.09 Change in Costs

### Changes over time

One of the most useful ways that you can apply your numeracy skills is to monitor and calculate change in prices over time. This skill is important to help manage a household or personal budget because people can keep an eye on their spending, and perhaps source less expensive purchasing options. This skill is also important for business enterprises because a key to commercial success is to minimise costs, especially over an extended period of time.

Many people think that all prices go up over time but this is not necessarily true. For a variety of reasons there are many goods, and some services, that have reduced in price or cost over time. Price drops have occurred due to higher levels of supply, improved efficiency and ongoing technological innovation. This can be seen with the prices of many personal items (such as clothing) and household items (such as electrical products); and some services such as personal private transport (due to new competitors such as Uber).

However, many services have increased in price over time, especially electricity, gas and water charges, heating and medical services and home repairs and construction. The price of many staple goods, such as most food and beverage products usually increases over time. Some food items experience price swings due to seasonal factors, such as fresh fruit. And of course who can really know which direction petrol prices are likely to be heading at any one time!



**Petrol is one good that shows price volatility over time. The key is to manage when you fill up so as to avoid price peaks. But how can you do that?**

Image: ginasanders/Depositphotos.com

### Basket of goods

One way to monitor price change over time is to select a basket of staple goods that your household regularly purchases, and record the prices of these goods over time. Using the data you collect you can set up a table and calculate the percentage change in the price of particular goods. You can also do this for the entire basket of goods over time. You can use a line graph to show changes in prices over time.

**Have a look at these shopping baskets.  
Which of these goods would be a staple part of your household's weekly shopping?**



Image: luislouro/Depositphotos.com



## Percentage change

Percentage change is a way of more easily comparing performance for one outcome, or time period, with another. It involves looking at growth (or decline) then calculating this as a proportion of the original. For example:

If you earned \$1,000 in year 1, then \$1,500 in year 2 what is the % change?

$$\begin{aligned} & \frac{\text{amount in year 2} - \text{amount in year 1}}{\text{amount in year 1}} \times \frac{100\%}{1} \\ &= \frac{\$1,500 - \$1,000}{\$1,000} \times \frac{100\%}{1} \\ &= \frac{\$500}{\$1,000} \times \frac{100\%}{1} \\ &= 50\% \text{ (That's a lot of growth!)} \end{aligned}$$

What would be the % change if year 2 was \$3,000; or if Year 2 was \$500?



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# Preview

Change in costs A

1. Choose a basket of goods that your household usually buys (or needs) each week. Choose one retail outlet and monitor the price of these goods over 6 weeks. Record your findings in a table using the following and column headings.

Item	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Totals	% change
Loaf of bread								
Milk								
1kg Bananas								
etc.								

2. Construct line graphs to show the price of each item over time. Note: If you plot too many items on the same set of axis then the graph will get very busy.
3. Calculate the total price of the basket each week. You'll have to take into account the quantity of each item that is purchased weekly.
4. Calculate the percentage change in the price of each item over this period of time.
5. Calculate the percentage change in the total price of the entire basket over this period of time.
6. Comment on your findings; i.e. price rises or falls, or price stability or volatility.
7. Make recommendations based on your findings.

## 3.11 Income

### Income

Income is money that you earn from various sources. The most common form of income is from wages and salaries.

Some people earn profits as a result of them owning and operating businesses.

Other people receive transfer income from the government through various welfare payments.

Many people also earn investment income in the form of:

- ⇒ interest from savings
- ⇒ dividends from owning shares
- ⇒ capital gains from selling assets (shares, property, art, etc.)
- ⇒ rent from investment properties.

These various sources of income allow us to enjoy a **standard of living** whereby we can purchase the goods and services that we need and want to maintain our chosen lifestyle.



Image: Simon Valentine, iStock/Thinkstock

# Preview

# Sample:

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### Wages

- ⇒ Wages are income amounts paid for an employee's labour.
- ⇒ They are determined on an hourly basis.
- ⇒ Wages normally apply in most trades and for semi and lower-skilled employees.

### Salaries

- ⇒ Salaries are income amounts that are usually paid to professionals and very highly-skilled employees.
- ⇒ Salaries are calculated (but not paid) on a yearly (annual) basis.

### Commission/Retainer

- ⇒ A commission is an incentive payment usually based on a proportion of sales, fees or revenue and is often used for people in sales roles.
- ⇒ A retainer is a base level of payment made in conjunction with a commission.

### Payment in kind

- ⇒ Payment in kind refers to non-monetary payments given in return for labour.
- ⇒ For example, a caretaker who is employed at an isolated island resort might receive payment in kind of accommodation and food in addition to their wages.

### Piece rate

- ⇒ A piece-rate refers to a type of payment used when a person (often a sub-contractor) is paid depending on the amount of items (or units) they produce.
- ⇒ For example, someone sewing garments might receive \$2 per garment; or someone delivering pamphlets might receive \$20 per 1,000.

Pay **A**

Match the types of pay from p.62 with the correct description. Complete the numerical calculation (of the example related to this) in your workbooks.

Description	Type of pay	Example & calculation
When a worker gets non-monetary payments given in return for their labour.		Kaytelynne is working as a live-in nanny. On top of her 'pay' of \$400 she receives free board and food worth \$400. Calculate %'s and weekly 'pay'?
Pay set down for a professional role and calculated as an annual amount.		Regina is paid \$67,500 as a manager. How much per week?
An amount given as an incentive for making sales or generating revenue.		Lorelei who works in a high fashion store has registered \$260,000 in sales this year and she got 20% of that as an extra payment. Extra pay 'per week'?
A pay amount based on a designated job classification and 'earned' on an hourly basis.		Per earn \$28,500. How much for a full-time 38-hour week, and how much annually?
A payment amount given per item of production often using sub-contracted labour.		Dashoon get paid \$3 for each delivery for Grubson's Pubs. He can usually do 3-4 deliveries per hour. Hourly rate and how much for 5-hour shift?
A lower base rate paid to a worker (usually in sales jobs) 'topped up' by commissions.		Yusuf works as a car salesperson. He gets a base payment of \$200 per week plus his commission. He normally earns \$100K per year in total. %'s and weekly amounts.

Preview  
Sample:  
Do Not

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Pay time **B**

How much are people in your class being paid for working? List names, jobs and hourly wages below. Use your workbooks if you need more space. Discuss as a class.


### 3.13 Income

#### C Pay up

1. Find out the current full-time median earnings for the 10 occupations listed in the first table. (You could also calculate weekly earnings and approximate hourly amounts based on a 38-hour week).
2. Choose 10 occupations and find the most recent amounts for full-time median earnings. (Note: As at 2018 the current amounts were still based on 2015.)

Use: [www.joboutlook.gov.au](http://www.joboutlook.gov.au) search on an Occupation and then Weekly Earnings.

Occupation	Full-time weekly earnings	Median earnings 2005	Median earnings '2015'	Median earnings 20__	Occupation	Full-time weekly earnings	Median earnings 20__
Accountant		\$1,150	\$1,400				
Plumber		\$850	\$1,142				
Chef		\$708	\$1,050				
Police officer		\$1,100	\$1,600				
Primary school teacher		\$1,000	\$1,300				
Civil engineer		\$1,242	\$1,916				
Sales assistant- general		\$600	\$850				
GP		\$1,500	\$1,850				
Cleaner - commercial		\$600	\$896				
Hairdresser		\$520	\$800				
Average all occupations		na	\$1,230		average all occupations		
Source: Job Outlook 2018, <a href="http://www.joboutlook.gov.au">www.joboutlook.gov.au</a> based on: ABS EBTUM survey August 2015 cat. no. 6310.0					Source:		

3. Calculate how much each of the following people earn for their week's work. What jobs might these people be working in?

i. Nermi works 22 hours and is paid \$11.85/hour.

ii. Abe works 17 hours and is paid \$11 for 12 hours; with 5 hours overtime with an extra 25% loading.

iii. Vesna works two 4-hour casual shifts. The standard rate is \$15 per hour and the casual loading is 25%.

iv. Herriot works a standard full-time week with an hourly wage rate of \$21.50.

v. Ngoc is 15 and works a standard full-time week in a job with an hourly rate of \$21.50. Juniors are paid 40% of the adult rate.

vi. Tahir is a 2nd year apprentice earning \$12 per hour. Next year his wage will increase by 20%.

**Preview  
Sample:**

vii. Barrie works a public holiday and receives time and a half for his 8-hour shift normally paid at \$8.88/hour.

viii. Mertrude is in a supervisory role and works 53 hours. She is paid at \$26.25/hour.

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Copy**

ix. Stacey, 22 is not covered by an award or agreement and is paid at the lowest allowable pay rate for her 38 hours work.

x. Adot is paid a salary of \$78,000 per year. He doesn't get paid overtime. He works an average of 50 hours per week.

## 3.15 Pay Slips

### Pay slip

A pay slip is a hard copy or digital document that must be issued by law for each pay period. Pay slips should include following detailed below.

**Most pay slips are now digital.  
Is that the case for people you know?**



Image: Rawpixel/  
Depositphotos.com

### Pay slip

A pay slip must be issued within one day of the 'payday' in hard or digital format.

Pay slips **must** include the following:

- ✓ employer's name and ABN
- ✓ employee's name
- ✓ pay period and date of payment
- ✓ amounts for gross and net pay
  - ⇒ If the employee is paid on hourly rate (i.e. wage):
    - ⇒ the ordinary hourly rate
    - ⇒ the number of hours worked at that rate during the pay period
    - ⇒ the total dollar amount of payment at that rate for the pay period.
  - ⇒ Or if the employee is paid a salary - the annual gross salary amount.
- ✓ The pay rate that applied on the last day of employment during the pay period.
- ✓ All deductions from the employee's pay:
  - ⇒ amount and description of each deduction (such as income tax and employee superannuation contributions) as well as total deductions made
  - ⇒ any superannuation contributions made by the employer for the employee
  - ⇒ details of the superannuation fund to which contributions have been made.
- ✓ The total gross and net payments made for the pay period.

A pay slip could also (but is not legally required to) include:

- ⇒ All loadings, allowances, bonuses, incentives, penalty rates, other entitlements, leave balances and other information.

<b>M&amp;S Enterprises</b>		<b>ABN: 80 215 2569</b>	<b>Date:</b>	<b>July 16th, 2019</b>
<b>Employee: Jonas Kikkerman</b>			<b>Period:</b>	<b>July 9-13, 2019</b>
<u>Entitlements</u>			<u>Deductions</u>	
Ordinary hourly rate:	Total	Total		
\$17.56	38	\$667.28		
Overtime hourly rate:				
\$26.34	4	\$105.36		
<b>Gross entitlement</b>		<b>\$772.64</b>	Tax deducted:	\$137.96
<b>Net entitlement</b>		<b>\$634.68</b>		
Paid into bank account: 012 522361 BSB 081 265				
Year to date		\$1439.92	Year to date	\$301.30
<u>Employer superannuation contribution</u>				
RESFund		\$73.40	Year to date	\$136.79



1. Use the information from the pay slip opposite to complete this table.

Employer details	
Employee & bank account details	
Pay date/ pay period	
Ordinary hourly rate	
Ordinary hours worked	
Overtime/penalty rate(s)	
Hours worked	
Gross entitlement (pay)	
Tax deducted	
Net entitlement (pay)	
Net pay amount this year	
Employee's super fund	
Amount paid into fund this pay	
Amount paid into fund this year	
Other:	
Other:	
Other:	

2. Do the same for a pay slip of your own, or one supplied by your teacher; or for a pay slip from a worker you know.

## 3.17 Pay Slips

### B Pay slip in action

- Using the model pay slip on p.66 as a guide, or an example from a real employer, complete a pay slip for you based on the following information. (No need to show your true bank account number, just list your bank.)

Employer: Mc Jacks Food Truck  
 ABN: 21 256 253 56  
 Pay period: Sunday-Saturday last week  
 Pay date: This Thursday  
 Hourly rate: \$12.50  
 Hours worked: 16 in total  
 Overtime rate: +25%  
 Overtime hours: 8  
 Tax deducted: 12.5%  
 Super deducted: na

Other information:  
 You have been working 3 weeks  
 Week 1: Same ordinary hours, no overtime.  
 Week 2: Identical as week 3 just gone.  
 Tax deducted: 12.5% each week  
 Note: No superannuation contributions required as under the 30 hour cut-off for employees less than 18 years of age.

Preview  
 Sample:  
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 Copy

ABN:		Date:	
Employee:		Period:	
<u>Entitlements</u>		<u>Deductions</u>	
Ordinary hourly rate:	Total	Rate	
	\$		
Overtime hourly rate:			
	\$		
Gross entitlement	\$	Tax deducted:	\$
Net entitlement	\$		
Paid into bank account:	BSB:		
Year to date	\$	Year to date	\$
	\$	Year to date	\$

2. Complete the 5 missing \$ figures in the following pay slip.
3. What was the average tax rate used for deductions from Siri's pay?
4. Since she has been working, Siri has worked exactly the same hours and overtime hours each week, at the rates of pay shown in the pay slip. She hasn't been working long. Use the pay slip to calculate how many hours she has worked and also how many weeks she has worked.

<b>M&amp;S Enterprises</b>		<b>ABN: 80 215 2569</b>	<b>Date:</b>	<b>Mar 16th, 2019</b>
<b>Employee: Siri Alexa</b>			<b>Period:</b>	<b>Mar 9-13, 2019</b>
<u>Entitlements</u>			<u>Deductions</u>	
Ordinary hourly rate:	Total hours	Total \$		
\$15	20	\$		
Overtime hourly rate (20%):				
\$	4	\$		
<b>Gross entitlement</b>		\$	Tax deducted:	\$55.80
<b>Net entitlement</b>				
Paid into bank account: 017 123223 51 869 083 265				
Year to date		\$1,264.80	Year to date	\$223.20
<u>Employer superannuation contribution</u>				
RESFund		\$31.20	Year to date	\$136.79

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## Application

- a. Find out the pay rates for a job you are interested in.
- b. Use these rates to prepare a pay slip based on you working 20 hours part-time (on a regular basis). Assume this is your 5th week of work.
- c. Use these rates to prepare a pay slip based on you working 38 hours full-time (on a regular basis). Assume this is your 10th week of work.

Note: You are going to need to make some assumptions. One of these is the tax rate for income tax deductions. Take off 10% for the part-time work example and 20% for the full-time work example.

So what other numerical assumptions might/will you need to make? Your teacher will guide you in this.



## 3.19 Assessment Task

### AT3 Money, money, money

#### Overview

To fully complete the requirements for this section of the learning outcome, you have to complete 3 parts for this assessment task. Note: You might already have done some, or most, of the activities for parts B&C, throughout the unit.

#### Part A: Cash transactions

#### Part B: Price investigation over time (or 3.10A)

#### Part C: Pay Slips (or 3.16A & 3.16B)



#### Part A: Cash transactions

For this task you are required to participate in a practical exercise that involves:

- ☐ calculating purchase amounts for **simulated transactions**
- ☐ making correct change as a **worker**
- ☐ checking for correct change as a **customer**
- ☐ calculating and applying **discounts** to transactions
- ☐ making correct change as a **worker after discounts** are applied
- ☐ checking for correct change as a **customer after discounts** are applied.

Prepare a report that summarises your strengths and weaknesses.

Your teacher will observe and record your success in participating in this simulation. (You might use training currency for this activity.)

Name(s):

Key dates:

Tasks - AT3: Working with Money A

Re-  
quired Due by Done Teacher  
initials

#### Part A: Cash transactions

- ⇒ Negotiate the task details with your teacher.
- i. Calculate total purchase amounts.
- ii. Make correct change as a worker.
- iii. Estimate and check change as a customer.
- iv. Make correct change after discounts are applied.
- v. Comment on your strengths and weaknesses.

<input checked="" type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input checked="" type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
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<input checked="" type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

**Part B: Price investigation over time (3.10A)**

You are required to compare the changes in the prices of goods over a period of time. As part of your investigation you will need to complete these tasks.

- ☐ Choose a basket of goods that your household usually buys each week.
- ☐ Select 1 retail outlet and monitor the price of these goods over 4-6 weeks (you can go back in time by using catalogues).
- ☐ Identify if any of the products are **on sale**; and if so, estimate and/or calculate the **discount amount** and **discount %** for these products.
- ☐ Record your findings in a table using appropriate row and column headings.
- ☐ Construct line graphs to show the price of each item over time.
- ☐ Calculate the percentage change in the price of each item over this period of time.
- ☐ Calculate the total price of the basket each week. You'll have to take into account the quantity of each item that is purchased weekly.
- ☐ Calculate the percentage change in the total price of the entire basket over this period of time.
- ☐ Comment on your findings. i.e. Price rises or falls, or price stability or volatility.
- ☐ Develop **3 clear recommendations** for shopping based on the findings from your investigation.

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Name(s):

Key dates:

Tasks - AT3: Working with Money B

Re-quired Due by Done Teacher initials

**Part B: Price investigation over time**

⇒ Negotiate the task details with your teacher	✓			
i. Choose a basket of goods.	✓			
ii. Collect and record prices from a retailer over time.	✓			
iii. Record and calculate any discount amount and %'s.	✓			
iv. Construct line graphs showing item price changes.	✓			
v. Calculate % price changes in items.	✓			
vi. Calculate % price change in basket of goods.	✓			
vii. Comment on your findings.	✓			
viii. Make recommendations.	✓			

## 3.21 Assessment Task

### Part C: Pay Slips (3.16A & 3.16B)

1. List the key information usually found on a pay slip. Use a model or actual pay slip to identify this numerical information.
2. Use a model pay slip, or an example from a real employer, to complete a pay slip 'for you', based on the information for *Mc Jacks Food Truck* (p.68).
3. Find out the pay rates for a job you are interested in.
  - a. Use these rates to prepare a pay slip based on you working 20 hours part-time (on a regular basis). Assume this is your 5th week of work.
  - b. Use these rates to prepare a pay slip based on you working 38 hours full-time (on a regular basis). Assume this is your 10th week of work.

Note: You are going to need to make some assumptions. One of these is the tax rate for income tax deductions. Take off 10% for the part-time work example and 20% for the full-time work example.

So what other numerical assumptions might/will you need to make?

Name(s):

Key dates:

#### Tasks - AT3C: Working with Money C

#### Part C: Pay slips

	Re-quired	Due by	Done	Teacher initials
⇒ Negotiate the task details with your teacher.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
i. List the key information found on a pay slip.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ii. Complete a pay slip.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
iii. Find pay rates for a job you are interested in.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
iv. Use pay rates to prepare a pay slip for part-time.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
v. Use pay rates to prepare a pay slip for full-time.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
vi.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
viii.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Additional information:

Signed: \_\_\_\_\_

Date: \_\_\_\_\_



# Managing Money

# 4

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Activities 4: Managing Money	p.	Due date/Done?	Comment
4.02A Attitudes to money	75	<input type="checkbox"/>	
4.04A Bank statement	77	<input type="checkbox"/>	
4.05B Financial documents	78	<input type="checkbox"/>	
4.06C Bills	79	<input type="checkbox"/>	
4.07D Electricity bill	80	<input type="checkbox"/>	
4.08E Mobile bill	81	<input type="checkbox"/>	
4.10A Surplus or deficit?	83	<input type="checkbox"/>	
4.11B Which savings plan?	84	<input type="checkbox"/>	
4.12C My budget	85	<input type="checkbox"/>	
4.14A Income and wealth	87	<input type="checkbox"/>	
4.16B Simple interest	89	<input type="checkbox"/>	
4.18C Compound interest	91	<input type="checkbox"/>	
4.20D Interest comparison	93	<input type="checkbox"/>	
4.21A Mortgages and loans	94-95	<input type="checkbox"/>	
4.24B 'Easy' money	97	<input type="checkbox"/>	
4.25C Comparing credit	98-99	<input type="checkbox"/>	
AT4 Budgeting 101	100-101	<input type="checkbox"/>	
4.29 Self-Reflection	102	<input type="checkbox"/>	

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Comments:

## 4.01 Financial Literacy

### Money matters

Yes it does! Although money may not be the key to a happy life, financial stress can certainly be a quick road to an unhappy life.

A person with good **financial literacy** is able to develop, use and apply numerical skills to better manage their money and financial obligations.

Consider your own financial position at the moment. Do you work? If so how much **income** do you earn? Is this regular? If you don't work, then from where do you get your money? What is your **wealth** (i.e. your assets)? As a young person still at school, probably not very much at all! Do you have **debt**? How much, and why so? Are you going to have to go into debt in the near future to pay for study, for a car, for personal and/or work purposes, or to move away from home to gain employment?

### Managing money

Managing money is actually quite easy. Just like maintaining a healthy weight. With weight the equation is: Energy (kj) in should = energy (kj) out. Too much in or too little out; you get heavier. Less in or more out; you get leaner.

When managing money the equation is: Money out should = money in.

☹ Too much out (spending) or not enough in (income): you go into debt.

😊 Less money out or more money in: you start building savings (wealth).

Although it's true that the money management equation is easy (just like the weight/energy equation) **managing your money is actually quite hard**. The theory is simple, the actuality is harder to achieve. Contemporary life is expensive and young people, even if they do have a job, generally don't earn much at all! And many things cost so much.

It is important to realise that one side of the financial equation is easier to manage than the other.

You can't do much about the money-in side (**income**) except to try and get a job and build a future career.

That takes time, skills, training, experience, commitment and patience!

However the money-out side (**expenditure**) is the part of the equation you have direct responsibility for.

Unfortunately that takes discipline.

And **financial discipline** is hard.

And it is becoming even harder to achieve financial discipline because people are increasingly using quick and easy digital payment platforms when out shopping or when paying for purchases; and they are also over-using one-touch apps and digital portals when shopping online.



**One real positive about using cash is that it makes it easier to keep track of your spending - and helps you avoid debt!**

Image: selenserger/  
iStock/Thinkstock

## Problems

Problems associated with these changes in behaviour mean that people:

- ☹️ buy too much because the purchase transaction is easier, and is often faceless
- ☹️ lose track of how much they're spending on a day-to-day basis
- ☹️ spend all their own money quickly because they are making lots of smaller transactions that accumulate quickly into a larger amount
- ☹️ overuse credit, especially through digital spending platforms.

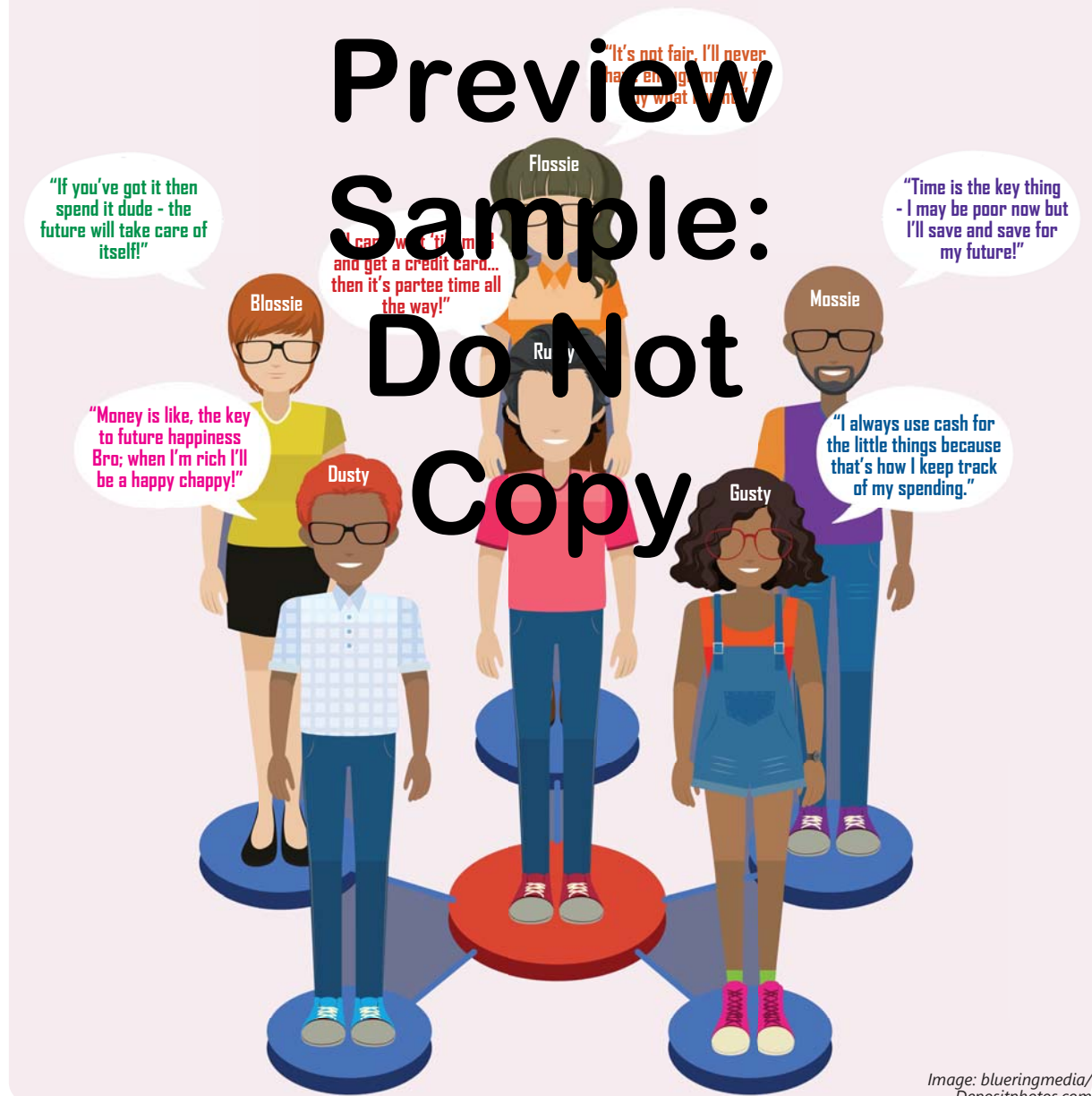
Financial management is about making sacrifices now, so as to create a better longer-term **standard of living**. Can you do that? Well we think you're up for the challenge.



## Attitudes to money

A

Do you agree with each of these statements? In your workbooks explain why or why not? Discuss these as a class.



## 4.03 Financial Documents

### Bank statement

A bank statement is a key financial document that is issued periodically, i.e. every month. A bank statement provides summary details of your **debit transactions** (money out) and **credit transactions** (money in) for your bank account. The balance column also includes a **running total** of your balance. In other words, how much money you have!

It is important that you check your bank statement regularly to ensure that you are being credited with the correct amounts, such as your pay, and other **deposits** including government payments.

It is also important that you check the debit transactions (**withdrawals**) on your account to make sure that you are not being over-billed, double-billed or even billed for transactions that you didn't make.

And of course the running **balance** total actually informs you of how much money you have in your account at any particular point in time.

However, more and more people, especially younger people are using their **mobile devices**, **apps** and **online portals** to make purchases from their bank account. This means they are losing control over their financial position by spending too much, making too many transactions and not being aware of their current bank balance. As a result they can very quickly spend all their money, end up back to back bills on credit cards and through forms of debt!

There has now emerged a new generation of mobile banking apps and user interfaces, that are offering better and more timely information for account holders. Essentially they are very kindly 'telling you' what you should already know! But if you need an app to 'tell' you how much you can spend, then really - your financial literacy is at risk!

Branch		Account Details		Statement Summary	
St Lanbans		Mr Joe D. Mirto		Opening balance	\$2173.52
<b>Account descriptor</b>		<b>Branch no</b> 013 238		Total deposits	\$1154.00
Savings booster		<b>Account no</b> 1265-72343		Total withdrawals	\$1579.76
				<b>Closing balance</b>	<b>\$1763.52</b>
				<b>Statement starts</b>	22/8/2019
				<b>Statement ends</b>	21/9/2019
				<b>Statement number</b>	43

Date	Transaction Details	Withdrawals (\$) DR	Deposits (\$) CR	Balance (\$)
22 MAR	OPENING BALANCE			2173.52
29 MAR	SALARY - TROCKS TRUCKING		1154.00	3327.52
30 MAR	ANZ ATM - SUNSCRAY	152.50		3175.02
3 APR	BPAY - GRINE COUNCIL	256.12		2918.90
10 APR	NAB ATM - DEER VILLE	500.00		2418.90
13 APR	TRANSFER - RUSTY BROOKS	275.00		2143.90
15 APR	MASTERCARD DEBIT - COLES ST LANBANS	317.14		1826.76
19 APR	MASTERCARD DEBIT - BP SUNSCRAY	64.00		1762.76
22 APR	ACCOUNT SERVICE FEE	15.00		1747.76
	<b>TOTAL AT END OF PAGE</b>	<b>\$1579.76</b>	<b>\$1154.00</b>	\$1747.76
	<b>TOTALS AT END OF PERIOD</b>	<b>\$1579.76</b>	<b>\$1154.00</b>	\$1747.76

<b>This statement includes Bank Charges</b>				\$15.00
---	--	--	--	---------

Bank statement **A**

## Part A: Bank statements

1. Use the sample bank statement on p.76 to complete the following information.
2. Investigate how this statement is similar to, or different from, your own statement.

Account holder	Branch & Account no.	Statement period
Opening balance	Fortnightly salary amount	Closing balance
Number of withdrawals & total \$	Number of deposits & total \$	Impact on his budget?
Other:	Other:	Other:

## Part B: Old school v New school

1. Which method; a full account statement, or app-based details of transactions, do you think is more useful to you for your own banking, now, and in the future? Why so?

**Preview**  
**Sample:**  
**Do Not**  
**Copy**

2. Complete the following task in your workbooks or using a spreadsheet.

Use these transactions to complete a bank statement for the time period. Include a running balance. Use the format on p.76.

Apr 1	Opening balance	85.00	Apr 10	MC EFTPOS - Lunch Blitz	14.00
	<i>Deposits</i>		Apr 10	MC EFTPOS - IGA Dandetown	27.80
Apr 3	Northpoint News - Wages	250.00	Apr 14	MC EFTPOS - Burger Treat	15.50
Apr 10	Northpoint News - Wages	250.00	Apr 16	MC EFTPOS - McJacks	9.50
Apr 14	Deposit	75.00	Apr 18	MC EFTPOS - Romonos	17.50
Apr 17	Northpoint News - Wages	450.00	Apr 19	MC EFTPOS - Lunch Blitz	10.00
Apr 24	Northpoint News - Wages	250.00	Apr 20	DD 2175268 - Netstan	20.00
	<i>Withdrawals</i>		Apr 22	MC EFTPOS - Yum Truck	22.00
Apr 1	MC EFTPOS - Coles Springwood	61.50	Apr 23	Big Gully - NAB - ATM	120.00
Apr 3	MC EFTPOS - El Munchos	14.50	Apr 26	MC EFTPOS - Burger Treat	15.50
Apr 6	DD 34546764 - iTunes	30.00	Apr 28	MC EFTPOS - Muscle Mode	45.95
Apr 8	MC EFTPOS - Lunch Blitz	10.00	Apr 29	Non-bank ATM 212-456	90.00
Apr 9	Springwood - ANZ - ATM	200.00	Apr 29	Non-bank ATM fee	3.00



## 4.05 Financial Documents

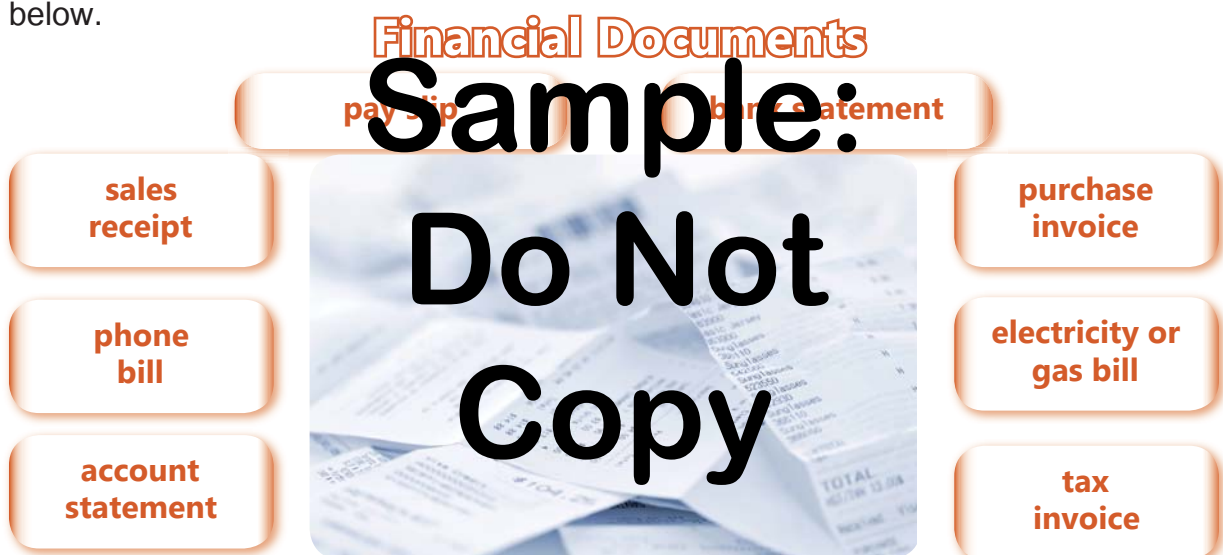
### Financial documents

Just about every financial transaction is accompanied by some type of **financial document** in either hard copy or digital form.

Financial documents for **personal transactions** include sales receipts, account statements, bills/usage summaries, tax invoices, pay slips, timesheets and many more.

Financial documents for **work-related transactions** also include all of those personal documents. The difference is that these apply to the other side of the transaction from the point-of-view of the issuer, i.e. the enterprise or the business. Businesses also deal with purchase orders, quotes, invoices, internal budgets, order records, sales charts, wage tables and many more documents that might be specific to a particular work setting. You will investigate these more in Unit 2 as part of your Numeracy-based Project Plan.

You will come into contact with many different financial documents during your personal and work-related activities. So it is important that you can interpret the numerical information used in these types of documents. Some of the most common financial documents that you need to be able to understand are listed below.



 **These documents are issued for a reason. So do you pay attention to these?**

*Image: volgariver/  
Depositphotos.com*

### B Financial documents

List examples of financial documents that you are likely to deal with as part of your personal life. Which of these do you 'read' and pay attention to?



Bills

People commonly refer to the amount they have to pay for electricity, gas, water, internet, phone, medical and other services as their 'bills'.

Bills are usually issued after a service has been provided and are often sent or emailed, e.g. electricity bill; or they are presented as soon as the service has been completed, e.g. a car repair. As an example, the dentist doesn't make you pay up front, and your mobile provider will bill you after you have accumulated call and services charges.

A bill is essentially an account usage or service summary, together with an account statement. The bill is issued to the customer outlining details such as the:

- ✓ issuer name, address, contact details, etc.
- ✓ service provided and/or the type of plan contract
- ✓ date of issue or period of time for the account
- ✓ usage summary details or list of service items provided
- ✓ itemised full usage information and details
- ✓ cost (i.e. the price) and charges related to the usage
- ✓ other charges and fees including late fees
- ✓ account balance (the amount due)
- ✓ due date
- ✓ payment method information.

Preview  
Sample:  
Do Not  
Copy



Bills C

Ask at home to find out the type of bills your family usually has to deal with. Make sure you use the word 'bills' (or other language equivalent for this word). Ask them to rank which are the most important, the highest, or even the 'worst'!


## 4.07 Financial Documents

# ENERGY OZ

Get in touch  
Enquiries: 13 11 11 1 Faults: 13 11 11 2  
Internet: www.energyoz.com.au

Robyn Citizen  
21 Main Road  
Sunsray Vic 3999

### Your electricity bill

Service address 21 Main Road Sunsray Vic 3999

ACCOUNT DETAILS	DUE DATE	AMOUNT DUE
Account Number 111 111 111  Tax invoice 21 23 56 78  Issue date: 17 Apr 20  Total amount due: See Account summary	<h2 style="margin: 0;">17 May 20</h2> <p style="margin: 0;">Direct debit: 17 May 20</p>	<h2 style="margin: 0;">\$360.06</h2>

ADJUSTMENT	USAGE STATEMENT
Direct debit discount (2%)	<div style="display: flex; justify-content: space-between;"> <div> <p>Average use per day</p> <p>Average daily usage</p> <p>Same time last year</p> <p>Indicative greenhouse gas emissions</p> <p>Same time as year</p> <p>Load shifting greenhouse</p> </div> <div> <p>\$3.91</p> <p>8.4 kWh</p> <p>12.7 kWh</p> <p>1.6 tonnes</p> <p>1.3 tonnes</p> <p>n/a</p> </div> <div> <p><b>16% increase</b></p> <p>in usage since last year</p> </div> </div>

#### HOW TO PAY

##### DIRECT DEBIT

Details specific to the biller and the account

##### CREDIT CARD

Details specific to the biller and the account

##### IN PERSON & MAIL

Details specific to the biller and the account

##### TELEPHONE & BPAY

Details specific to the biller and the account

### D Electricity bill

This sample electricity bill shows the main information that is commonly shown on the first page of a bill. However, the bill will have other pages that communicate more specific information about an account such as: recent payments, usage amounts, charges for peak and off-peak usage, supply charges, as well as some numerical information (graphs and charts) that shows comparative usage levels.

Sections might be called *Account Summary*, *Payments Received*, *Total Electricity Charges*, *Usage Breakdown*; or something similar to these titles.

1. Create a table with key headings that match the section headings and/or key information on your own bill.
2. Locate the key information from your bill and organise this under the appropriate headings. Check the meaning of anything you don't understand.
3. Develop 5-8 short sentences that explain the usage costs and patterns shown by the information on the bill. Use numbers in support.
4. Research ways to reduce electricity consumption. Make 3-5 key recommendations about how to achieve these. Estimate potential energy and money savings.

Mobile bill E

Interpreting mobile phone bills is an applied numerical skill that everyone needs. But making sense of your account is easier said than done.

If you pay by direct debit you are only likely to get emailed a summary of your monthly charges. However, if you log in to your account you can see the full information related your bill.

- 1. Get hold of a mobile phone bill, or use your own.
- 2. Everywhere on the bill that there is a number, such as *amount due*, *due date*, *call rate*, *texts to Australia*, *local calls* and so on, record these in the table. Write the words and the numbers.

Your teacher can help you to make sense of some of the terms and numerical information, but you should first try to work these out yourself. Use your own knowledge, discussion and by researching ‘unknowns’.

- 3. Share your information with another class member who uses a different service provider than you. Identify where the type of information shown on the bills from different phone providers is the same, or where it is ‘different’.

Preview  
Sample:  
Do Not  
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Extension

What is **bill shock** usually caused by ? How can you avoid mobile bill shock?

## 4.09 Budgeting

### Personal budgets

Being able to create and manage a personal budget is an essential component of your life, especially as you transition beyond school and into your adult lives!

It is essential that you manage your expenditure and minimise the use of credit; especially seemingly easy sources of credit such as credit cards, 'payday' or instant loans, digital 'lay-by', and interest-free purchase contracts. You also need to explore income sources such as wages and salaries, interest income and government benefits and assistance.

Additionally, you need to balance your expenditure with your income in order to manage your day-to-day financial obligations, to provide for longer-term spending requirements, to save for assets such as a car, and to save for your future.

### Budgeting

A budget is a financial management planning tool that lists all of your forecasted revenue and expenses over a period of time. A budget allows you to see if you expect to have more money coming in (**surplus**) or more money going out (**deficit**). A budget can help you plan your spending more responsibly and allow you to take control of your finances. Financial control is about striking a balance between your **needs** (i.e. necessities) and your **wants** (i.e. non-essential and luxuries items).

When you are budgeting it is important to be as accurate as possible by listing all of the expenditure items that you are likely to encounter. You should also budget for 'other' expenses; some of these unknowns are likely to crop up unexpectedly.

You need to prepare different budgets depending on your personal circumstances and your goals. This means that your budget will be different when you are still at school, compared to when you might be studying in post-secondary education, and also when working.

An important part of budgeting is to compare your forecasted amounts with the actual amounts to see how much variation has occurred. This will help you plan more accurately in the future.

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### Potential expenditure categories and income sources

Image: Violka08/  
iStock/Thinkstock

#### Expenses

- |                       |   |  |                                    |
|-----------------------|---|--|------------------------------------|
| ⇒ mortgage or rent    | ⇒ fines and charges   | ⇒ household products                     | ⇒ subscriptions                    |
| ⇒ home insurance      | ⇒ sporting/club fees  | ⇒ lunches and coffee                     | ⇒ holidays                         |
| ⇒ contents insurance  | ⇒ health insurance  | ⇒ take-away, deliveries & meals out      | ⇒ gifts and presents               |
| ⇒ rates               | ⇒ gym memberships   | ⇒ haircuts/grooming                      | ⇒ donations                        |
| ⇒ electricity/gas     | ⇒ pharmacy, dental, physio, optical, vet and other medicals | ⇒ clothing - personal                    | ⇒ special treats                   |
| ⇒ water               | ⇒ phone   | ⇒ clothing - work                        | ⇒ credit card repayments           |
| ⇒ repairs/maintenance | ⇒ internet  | ⇒ shoes and footwear                     | ⇒ personal loan repayments         |
| ⇒ car loan/interest   | ⇒ video/TV subscriptions                                    | ⇒ union fees                             | ⇒ others, others - lots of others! |
| ⇒ petrol              | ⇒ music purchases   | ⇒ computing                              |                                    |
| ⇒ insurance           | ⇒ cinema  | ⇒ electrical                             |                                    |
| ⇒ registration        | ⇒ entertainment   | ⇒ child-care                             |                                    |
| ⇒ service and tuning  | ⇒ clubs   | ⇒ school and education fees, books, etc. |                                    |
| ⇒ maintenance/repairs | ⇒ groceries   | ⇒ books, magazines,                      |                                    |
| ⇒ public transport    | ⇒ toiletries, beauty & health                               |  |                                    |
| ⇒ parking             |   |  |                                    |

#### Income

- ⇒ wages & salaries
- ⇒ government benefits
- ⇒ business income (profit)
- ⇒ interest income
- ⇒ investment income

Revenue

- ⇒ For personal income revenue might include wages, salaries, interest earned, dividends, gifts, government benefits and other monies coming in.
- ⇒ Revenue can refer to business income from sales, fees, commissions, service provision and any other income sources such as interest.
- ⇒ Sometimes revenue might simply be called income or incomings.

Expenses

- ⇒ For personal situations expenses might include mortgage repayments or rent, groceries, utilities, motor vehicle costs, bills, personal items, entertainment and other outlays.
- ⇒ Expenses can refer to the costs incurred by an enterprise such as wages, materials, utilities, stock, inputs, equipment and many other expenses.
- ⇒ Sometimes expenses might simply be called costs or outgoings.

Preview  
Sample:

- ⇒ A surplus exists when anticipated revenues are higher than anticipated expenses. A surplus can lead to savings.
- ⇒ A deficit exists when anticipated expenses are higher than anticipated revenue. A deficit can lead to debt.

Do Not

Surplus or deficit?

A

Calculate the anticipated budget result (surplus or deficit) for each of these.

i. Revenue = \$475 Expenses = \$526	ii. Revenue = \$87,000 Expenses = \$6,500 × 12	iii. Revenue = \$1,500 + \$2,350 Expenses = \$1,000 + \$757 + \$2,134
iv. Curly expects to earn \$150/week for 20 weeks and \$300/week for 30 weeks. His expenses are likely to average \$225/week over the year.	v. Mo runs a business that has average revenue of \$5,000 per month in autumn and winter but 20% more in spring and summer. Mo's expenses average \$950 per week.	

## 4.11 Budgeting

### B Which savings plan?

Take a close look at the list of potential expenditure categories as shown on p.82.

1. Identify expenses categories that are part of your spending patterns. Show these below. Add other expenses not on the list that are relevant for you.
2. Estimate how much you spend on each of these categories either on a weekly, monthly, or annual basis (this will depend on how often you actually pay for the item). Complete the table or each of these time periods.

(Note: There is actually an average of 4.4 weeks for each of the 12 months of a year.)



3. Why do you think it is a sensible thing for expenses be multiplied by 5 weeks, rather than by 4 weeks, so as to equate to a month?
4. Include an 'other' category. How much should you allocate to this? Why so?

Personal Budget	per	week		month		year
Expenses		\$		\$		\$
			x 5		x 12	
			x 5		x 12	
			x 5		x 12	
			x 5		x 12	
			x 5		x 12	
			x 5		x 12	
			x 5		x 12	
			x 5		x 12	
			x 5		x 12	
			x 5		x 12	
			x 5		x 12	
			x 5		x 12	
			x 5		x 12	
			x 5		x 12	
other expenses			x 5		x 12	
Total			x 5		x 12	

**Preview  
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Use this planner to forecast a monthly budget for yourself based on your current financial situation. You might have to convert some expenses from weeks into months.

Cash Budget/Financial Planner					
Name: _____					
Situation: _____ Date(s): _____					
Revenue items	Forecast \$	Actual \$	Expenditure items	Forecast \$	Actual \$
<b>Total Revenue</b>			<b>Total Expenditure</b>		
Forecasted Surplus			Forecasted Deficit		
Actual Surplus (savings)			or Actual Deficit (debt)		

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## 4.13 Saving For The Future

### Income and wealth

As you saw in Section 3, income is money that is earned from various sources. The most common form of income is from wages and salaries, but income also includes profits, interest, dividends and government benefits.

Wealth is different from income and is a measure of a person's assets or net worth. We build wealth by saving our income (i.e. spending less than we earn), or by using our income to buy assets that **appreciate** (go up or rise) in value. In Australia the main source of wealth is the family home, but there are other common sources as well.

- ⇒ The value of the family home.
- ⇒ Savings in the form of superannuation.
- ⇒ Investments (savings) in banks and other financial institutions.
- ⇒ Holdings of shares, stocks and bonds.
- ⇒ Owning businesses.
- ⇒ Holiday homes and investment properties.
- ⇒ Holdings of collectibles such as art and antiques.

Image: denphumi,  
iStock/Thinkstock



### Income or wealth

Throughout life people use income to buy consumables and services, as well as various assets. But not all of these assets will contribute to their wealth.

For example, as part of their lifestyle people will buy cars, household goods and other 'big-ticket items'. But these assets normally **depreciate** (go down or fall) in value, and as such contribute little to net wealth.

To determine net wealth you should consider the **realisable value** of these depreciable assets. The value of these assets is not the amount you paid for them, but rather the amount that you would get at auction for them if you have to sell them in a hurry. This 'realisable value' might be as little as 50% of the original purchase price for a car in good condition, down to as low as 15-25% for household assets in good condition.

### Net wealth

Net wealth is a measure of a person's (or household's) overall financial position. To calculate net wealth you need to subtract any **liabilities** (money you owe) from the value of your assets in order to determine your net wealth.

It is interesting to note that some people and households even have negative wealth. This means that they owe more than they own; and unfortunately their assets are of little or no value!

Preview  
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### Australia's wealthiest people

1. Anthony Pratt, \$12.9b, manufacturing
2. Harry Triguboff, \$12.8b, property
3. Gina Rinehart, \$12.7b, resources
4. Wing Mau Hui, \$9.1b, property
5. Frank Lowy, \$8.4b, property
6. Ivan Glasenberg, \$8.3b, investment
7. John Gandel, \$6.5b, property
8. Andrew Forrest, \$6.1b, mining
9. Vivek Shegal, \$5.9b, manufacturing
10. James Packer \$5.3b, gaming

What does \$1 billion look like?  
Try drawing it!

Source: AFR, Rich List, 2018.



### Appreciation and depreciation

Appreciation refers to when an asset increases in value. Most houses (actually land values) and collectable assets (depending on condition) appreciate over time.

e.g. Aldo bought a 1972 RT Charger for \$30,000 in 2009. The car, in the exact same used condition is worth \$60,000 in 2019. The value has doubled. It has appreciated by 100%.

Depreciation refers to when an asset decreases in value. Most usable assets depreciate with time and use.

e.g. Sandrah bought a new Holden Commodore VE for \$25,000 in 2009. The car, if in immaculate condition, but with normal wear and tear is worth \$12,500 in 2019. The value has halved. It has depreciated by 50%.

**Go online and check how realistic the values are for these cars. You might be surprised!**



### Income and wealth A

1. What is the difference between income and wealth?

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2. Eric and Erkan both started work in the same occupation, for the same income (\$40,000) at the same time. After 5 years Eric has wealth of \$75,000 but Erkan is worth \$0. How so?

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3. List 3 practical ways that you could build your wealth.

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Preview  
Sample:  
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## 4.15 Saving For The Future

### Saving

Saving refers to the financial situation whereby you spend less than you earn, and as a result you can accumulate this surplus in a savings account.

A bank (or financial institution) savings account pays you **interest** on your savings. You can consider this as a reward the bank gives you for putting your money with them. (In theory they have the opportunity lend this money out to someone else.)

Banks and financial institutions offer different types of savings (or deposit) accounts, and the names of these will vary from institution to institution.

### Everyday savings account

This is the most common form of savings account and typically pays a very low rate of interest, but it allows you to have full access to your money. Some banks and financial institutions will combine this type of savings account with a transaction account. Many customers are likely to find that the interest amount they earn is negligible; or perhaps even less than their account fees.

### Savings maximiser account

This type of account usually pays a higher rate of interest but in return is likely to place conditions or restrictions on the account holder. These conditions could include making regular monthly deposits above a certain level (e.g. \$1,000 per month) and maintaining minimum balance levels (e.g. \$5,000). If these conditions are not met then the interest rate will revert to a nominal amount.

### Term deposit

This type of savings account locks your money away for a period of time and will pay you a guaranteed amount based on a 'higher' interest rate. Many bank customers 'roll over' their term deposits every 6 months to increase their savings. Term deposits are a good way to enforce savings discipline because the account holder has limited access to their funds until the savings term is up.



Image: Goir/Depositphotos.com

Preview  
Sample:  
Do Not  
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### Simple interest

Simple interest is calculated 'simply' by multiplying the **deposit** amount by the **interest rate**.

$$\text{Interest amount} = \$ \text{ amount} \times \text{interest rate} \%$$

e.g. Myrtle is paid a simple interest rate of 3% for the year on her savings. She has \$10,000 in the bank. So:

$$\text{Interest earned} = \$10,000 \times 3\% = \$300$$

It is important to note that interest is normally paid on a **minimum daily**, monthly (or period) **balance** and not on the day interest falls due. So Myrtle is only likely to be paid interest that is calculated on the lowest amount she held in her account over those 12 months, or the lowest amount in each month.

A simple interest rate could also be used for **loans**.

e.g. Ertle borrows \$10,000 at a simple interest rate of 12%. So:

$$\text{Interest payable} = \$10,000 \times 12\% = \$1,200$$

NUM  
SUPER  
SKILLS

## Simple interest B

1. Complete these calculations based on simple interest rates.

i. \$5,000 at 1% annual interest rate.	ii. \$5,000 at 3% annual interest rate	iv. \$500,000 at 5% annual interest rate, paid monthly.	iv. \$1m at 3% annual interest rate, paid monthly.

2. Now Uncle Tomot reckons he has a system to beat the banks. He opens a savings account at 2.5% and puts \$1,000 in. He stashes the rest of his money under the mattress all year. Then on the day before the bank is due to pay interest he deposits \$99,000 into that account. He reckons he will earn \$2,500 in interest. Is he right?

Preview  
Sample:  
Do Not  
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### How much?

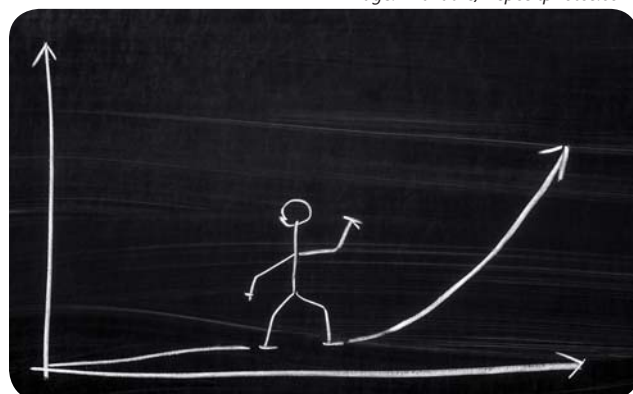
If you invest \$1,000 at 10% interest for 10 years how much money will you have at the end of 10 years?

Who said \$2,000? i.e. \$1,000 (principal) plus 10 x \$100 interest? Are you sure?

Much has been said about the magic of compound interest. What have you heard?

When you invest money (this is called the **principal**) you earn interest on that investment. If you leave both the principal and the interest in the investment, you now have a higher principal. The amount has compounded. You will now earn interest on a higher amount. And so on. And so on. And so on.

Image: Makaule/Depositphotos.com



**With compound interest the key factor is time. The sooner you start, then the greater the compounding will be - in the long term!**

## 4.17 Saving For The Future

### Compound interest

In reality, banks and financial institutions do not use simple interest for savings deposits, nor for loans. Instead, they use compound interest. **Compound interest** is interest that is paid on the initial amount deposited i.e. the **principal**; and it is also calculated on any **accumulated interest** you have earned on this principal. So effectively you are earning interest on your interest!

Compound interest is usually calculated and paid on your principal amount each month. Then in the next month your principal will have grown (your balance will be higher) due to that previous month's interest you earned. So now you will earn interest on a higher amount without having to do anything at all (except not take your money out!). And over time this can really benefit you.

You are in a unique position to start building the foundations of your future prosperity. A key to this is to make use of the 'magic' of compound interest - and the true magic of compound interest is time. The sooner you start then the bigger your savings will be.

### Compound interest

Year 1: \$1,000 + 10% interest = \$1,100      Year 6: \$1,603 + 10% interest = \$1,771  
Year 2: \$1,100 + 10% interest = \$1,210      Year 7: \$1,771 + 10% interest = \$1,948  
Year 3: \$1,210 + 10% interest = \$1,331      Year 8: \$1,948 + 10% interest = \$2,144  
Year 4: \$1,331 + 10% interest = \$1,464      Year 9: \$2,144 + 10% interest = \$2,358  
Year 5: \$1,464 + 10% interest = \$1,610      Year 10: \$2,358 + 10% interest = \$2,594

So the compounded amount of \$2,594 is much higher than the simple interest amount of \$2,000; and the more years you leave the investment, the more it will grow and grow and grow!

Did you know that if you leave this original principal of \$1,000 in for another 10 years it will compound to \$6,727? If you leave it in for another 10 years it will compound to \$17,449. Remember this is still that same \$1,000 and you haven't added any money to it! But that's assuming a 10% (very high) interest rate.

### Compound interest formula

The formula for compound interest is:  $A = P (1 + r/n)^{nt}$

This looks a bit complicated, but really it's not too hard to follow provided you know what each of the letters stand for (the variables).

*A = Amount you are calculating.*

*P = Principal amount.*

*r = Annual interest rate as a decimal  
(i.e. 10% would be 0.1).*

*t = Time in years.*

*n = number of compounding periods per unit  
of time (i.e. annually is just 1 per year,  
monthly would be 12 per year).*

*e.g. So for the example above:*

$$A = P (1 + r/n)^{nt}$$

$$A = \$1,000 (1 + 0.10/1)^{1 \times 10}$$

$$A = \$1,000 (1 + 0.10)^{10}$$

$$A = \$1,000 (1.1)^{10}$$

$$A = \$1,000 \times 2.594$$

$$A = \$2,594$$

NUM  
SUPER  
SKILLS



## Compound interest C

There are a lot of really good compound interest calculators online that you can use to quickly complete calculations. We recommended all the calculators at the ASIC website: [www.moneysmart.gov.au](http://www.moneysmart.gov.au)

1. Use ASIC's calculator for the following. Discuss your results and what they suggest for a savings plan.



i. Save \$100 a week for 2 years.  
(Research/estimate a likely interest rate.)

ii. Save \$50 a week for 5 years.  
(Research/estimate a likely interest rate.)

# Preview

# Sample:

# Do Not

# Copy

2. For the example on p.90 calculate the total amount after 10 years, but based on interest compounding monthly instead of just once a year. Comment on your results. (Do this in your workbook.)
3. Use the compound interest formula or online compound interest calculator, to comment on which of Frank or Irma has made the most sensible investment decision.

i. Frank, 18, has put \$10,000 (gift from his parents) into a savings account at 2% interest per year (assume no fees). He will take out the money when he is 30.

ii. Irma, 18, is going to put \$20,000 (gift from her parents) into a savings account at 3% interest per annum (assume no fees). She will take out the money when she is 25.

## 4.19 Saving For The Future

### Spreadsheets

One of the best ways to calculate how savings grow is to use a spreadsheet. In spreadsheets, you can enter formulae into cells to make quick and accurate calculations.

In an Excel spreadsheet you use an "=" to denote a formula or calculation.

For example:

=5\*10 will perform the calculation and yield the answer of 50

=A3 + 26 will perform the calculation of adding 26 to whatever is in the cell "A3".

Have a look at these 2 spreadsheet examples.

The first spreadsheet shows the formulae to calculate compounding interest on an annual basis. The second spreadsheet shows the result of the calculations for compound interest.

NUM  
SUPER  
SKILLS

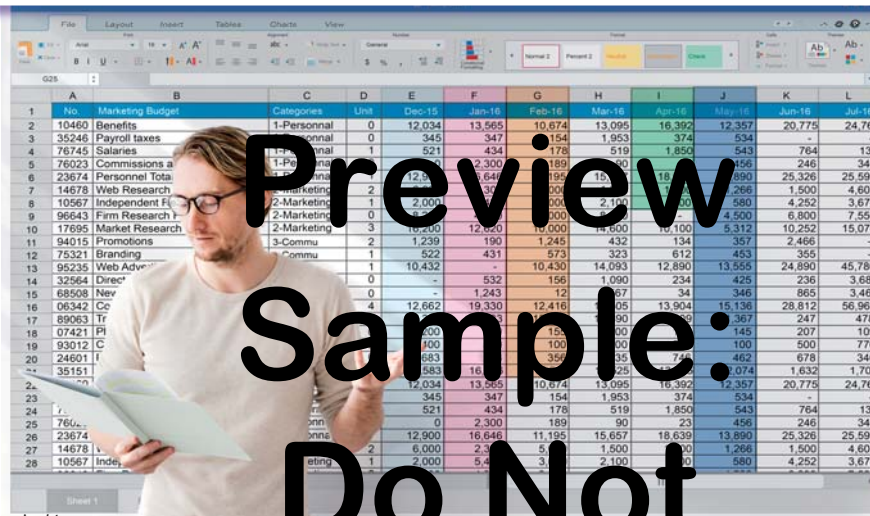


Image: Rawpixel/  
Depositphotos.com

	A	B	C	D	E	F	G	H
1	COMPOUND INTEREST CALCULATOR							
2	Year	Principal	Interest Rate	Interest	Total	Amount =	\$1,000	
3	1	=H2	=B2	=B3*C3	=B3+D3	Interest Rate =	5%	
4	=A3+1	=E3	=H3	=B4*C4	=B4+D4			
5	=A4+1	=E4	=H3	=B5*C5	=B5+D5			
6	=A5+1	=E5	=H3	=B6*C6	=B6+D6			
7	=A6+1	=E6	=H3	=B7*C7	=B7+D7			
8	=A7+1	=E7	=H3	=B8*C8	=B8+D8			
9	=A8+1	=E8	=H3	=B9*C9	=B9+D9			
10	=A9+1	=E9	=H3	=B10*C10	=B10+D10			
11	=A10+1	=E10	=H3	=B11*C11	=B11+D11			
12	=A11+1	=E11	=H3	=B12*C12	=B12+D12			
13	=A12+1	=E12	=H3	=B13*C13	=B13+D13			
14	=A13+1	=E13	=H3	=B14*C14	=B14+D14			
15	=A14+1	=E14	=H3	=B15*C15	=B15+D15			
16	=A15+1	=E15	=H3	=B16*C16	=B16+D16			
17	=A16+1	=E16	=H3	=B17*C17	=B17+D17			

	A	B	C	D	E	F	G	H
1	<b>COMPOUND INTEREST CALCULATOR</b>							
2	<b>Year</b>	<b>Principal</b>	<b>Int. Rate</b>	<b>Interest</b>	<b>Total</b>		<b>Amount =</b>	\$1,000
3	1	\$1,000	5%	\$50.00	\$1,050		<b>Interest Rate =</b>	5%
4	2	\$1,050	5%	\$52.50	\$1,103			
5	3	\$1,103	5%	\$55.13	\$1,158			
6	4	\$1,158	5%	\$57.88	\$1,216			
7	5	\$1,216	5%	\$60.78	\$1,276			
8	6	\$1,276	5%	\$63.81	\$1,340			
9	7	\$1,340	5%	\$67.00	\$1,407			
10	8	\$1,407	5%	\$70.36	\$1,477			
11	9	\$1,477	5%	\$73.87	\$1,551			
12	10	\$1,551	5%	\$77.57	\$1,629			
13	11	\$1,629	5%	\$81.44	\$1,710			
14	12	\$1,710	5%	\$85.52	\$1,796			
15	13	\$1,796	5%	\$89.70	\$1,886			
16	14	\$1,886	5%	\$94.28	\$1,980			
17	15	\$1,980	5%	\$99.00	\$2,079			

**Preview**  
**Sample:**  
**Do Not**

Interest comparison

D

## Part A: Spreadsheets

1. Set up the spreadsheet shown opposite exactly as it appears. If you are correct then you should get the results in the spreadsheet above. Save this when you are correct. Your teacher will help you with your spreadsheet.
2. Manipulate the values in cells in H2 and H3. See what happens!
3. Try adding more years and see what happens.

## Part B: Interest rate comparison

1. Find out the current interest rate on 3 deposit accounts.
2. Use the spreadsheet to input these interest rates so as to calculate potential savings differences.
3. Show your findings based on the 3 different interest rates in a table. Do this for 2 years, 5 years, 10 years, 20 years and for 30 years.

## Part C: It's all about time

1. What is the relationship between time and compound interest?
2. Knowing this, what should you do?



## 4.21 Credit

### Credit

In life we can't always afford what we want to buy right away. So we use credit to buy things. Credit is easy money. Yeah right! Read on! There are six main types of personal credit finance available in Australia.

1. **Mortgages for housing loans**
2. **Personal loans**
3. **Credit cards**
4. **Interest-free purchases**
5. **Payday (short-term) loans**
6. **Digital 'lay-by'**



Image: Siong Fong Chua, iStock/Thinkstock

### 1. Mortgages

- ⇒ People can take out a long-term credit contract called a mortgage or housing loan to buy a house (and land).
- ⇒ The term mortgage refers to the right of the lender to take possession of the property in the case of default. (Some people say that the 'bank' still 'owns' their home until the entire loan is paid off.)
- ⇒ Home loan mortgages are normally taken out over 25-30 years. Mortgages are a pretty good use of credit because the value of the house and land will usually go up in the long-term.
- ⇒ So borrowers are actually gaining utility (by living in the house) while building an investment (the value of the house and land increasing).

### 2. Personal loans

- ⇒ People often use shorter-term credit contracts such as personal loans.
- ⇒ Personal loans are often used to pay for cars, household items, holidays, weddings and big ticket items. The loan is repaid with regular repayments, including interest, over a period of perhaps 3-5 years.
- ⇒ However, it can be a mistake to use personal loans to buy luxuries that are consumed immediately such as holidays; and for electricals, that date quickly. e.g. A holiday can = 2 weeks of enjoyment but paid for over 5 years!
- ⇒ It is better to save up for a holiday! (I won't mention about borrowing to buy engagement rings!)

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Sample:  
Do Not  
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### A Mortgages and loans



After class discussion and online research answer the following.



1. Why is a mortgage a good type of credit?

2. How much is the average mortgage in Australia, and in your state?

3. By how much has this grown in the last 10 years?

4. Use a mortgage calculator to calculate monthly repayments on an average mortgage, and how much interest (at today's rate) would be paid over 25 years.

5. List mortgage traps that borrowers should avoid.

6. For which type of purchases would you recommend a personal loan? Why?

7. For which type of purchases would you not recommend a personal loan? Why?

8. Use a personal loan calculator to calculate fortnightly repayments on a 5 year, \$10,000 loan for a car. How much in interest (at today's rate) would be paid over the 5 years?

9. Discuss the following case study as a class.

*Larry has steady employment and gets approval for a \$5,000 loan for a used car through a finance company. He chose this loan because he didn't have to get comprehensive insurance, but he does pay higher fees. Unfortunately on the way home from the car yard, he lost control of the car in the wet, fishtailed, slammed into a power pole on the passenger side and wrote his car off. What happens next?*



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## 4.23 Credit

### 3. Credit cards

- ⇒ People use the flexible credit offered by credit cards to buy groceries, personal items, consumer items, entertainment and gifts. Credit cards can also be used to pay for emergencies such as car repairs and medical bills.
- ⇒ But this form of credit can come at a high price. Credit cards are handy as long as you pay off your debt before the interest-free period expires. Otherwise you could be up for a BIG interest bill!
- ⇒ Look ahead. If you can't afford to pay for an item within one month then you really must reconsider using a credit card to buy. Interest accrues quickly.

**Beware. If you are using credit cards to pay bills then you are already sliding into financial trouble. Seek help immediately.**

### 4. Interest-free purchases

- ⇒ Interest-free purchase periods are often offered by retailers to purchasers of household goods, electricals and other big ticket items. Some of these offer up to 5-years 'interest-free'.
- ⇒ The purchaser usually enters into a finance agreement with a third-party lender and/or receives a 'store credit card'.
- ⇒ If the purchaser pays back the 'loan' within the interest-free period then no interest is charged. However, there is likely to be substantial fees.
- ⇒ However, if the 'loan' is not paid off within the specified time then the purchaser is usually up for very high interest charges.

**Beware: The recommended minimum monthly repayment amount is not likely to pay off the purchase price within the specified time.**

### 5. 'Payday' or instant loans

- ⇒ This short-term form of credit is basically a cash advance.
- ⇒ There are government regulations that cap the fees and charges related to these types of loans, but they are still very high.
- ⇒ Ads for these online and on TV make it seem fun and easy. They don't talk about paying the loan back!

**Beware: If you are considering this type of credit then the best advice is: DON'T. You are already experiencing financial difficulties.**

**Financial help is available free. Cash advances are not!**

### 6. Digital 'lay-by'

- ⇒ This is one of the fastest growing sources of 'credit' for consumers in Australia.
- ⇒ Key providers include *Afterpay*, *Zip Pay* and others.
- ⇒ Technically this is not a form of credit; it is an agreement to pay off an item over a number of instalments. i.e. 'buy-now pay-later'.
- ⇒ But you get to use the service, or take the item home straight away. But if you miss your repayments you pay fees!

**This source of 'credit' is causing severe financial trouble for people aged 18-35 and for people on low incomes.**

Image: glegorly/iStock/Thinkstock



Work through the case studies below using the online calculators available at ASIC's: [www.moneysmart.gov.au](http://www.moneysmart.gov.au)



1. Jumbuk turns 18 and gets a credit card with a \$1,500 limit (and 18% interest rate). He goes out that day and buys a new iPhone and accessories for \$1000. He has a job and plans to pay this off over time.

On his first statement he receives a notice of his balance, \$1,000 and a request to make a minimum payment of \$25 which he pays within the time period specified.

Jumbuk is quite financially disciplined and he doesn't use his card again. On his next statement he receives a notice:

Opening balance	\$975
Add purchases	\$0
Add interest charges	\$18.4
Closing balance	\$983.42
Minimum payment due	\$25.00

i. What will happen if Jumbuk continues to only pay the minimum monthly payment due? Use the credit card calculator.

ii. What happens if he increases his minimum monthly payment to \$50?

iii. What about \$50?

iv. What about \$100?

v. What would you recommend?

2. Leela 18, drives 45 minutes to and from her job as a pharmacy assistant. Her car blows a head gasket and she is quoted \$1,000 to repair the engine.

Leela approaches a 'Payday lender' and borrows \$1,000 over 12 months.

The establishment fee for the loan is \$200 (this is set at 20% of the loan amount).

She will pay monthly 'interest' fees (they are set at 4% of the total loan amount).

i. What is the total of Leela's loan amount?

ii. How much will her fortnightly repayments be?

iii. Calculate the total 'interest' and fee amounts that Leela will repay over life of the loan.

iv. Calculate the % in 'interest' and fees on the loan. (Total interest and fees/total loan amount) x 100%.

v. Find out what happens if Leela defaults on her loan.

vi. Do some research and find alternative sources of finance for Leela.

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## 4.25 Credit

### C Comparing credit

For this applied task you are required to compare the cost of credit across a range of different borrowing options. It's very likely that this task will also form part of your assessment for this Learning Outcome (LO2). Your teacher might instruct you to complete this investigation in pairs.



#### Part A: Credit Cards

Research the interest payable, fees and other conditions related to 3 different credit cards from 3 different financial institutions. Choose a card from one of the 'Big 4' banks, a credit card from another financial institution, and a credit card from a financial provider that says it is aimed at younger people.

Set your results up in a table like the one below. Use this table to collect and draft your information. You should also use a spreadsheet to make comparisons. It is a good idea to use the loan calculators on the ASIC website to help you.

Card feature	Card 1	Card 2	Card 3
Provided by...			
Name of 'card'			
Annual fee			
Purchase interest rate			
Interest-free period			
Cash advance interest rate			
Other fees			
Spending limits			
Other conditions and information			
Scenario	Put \$1,000 on your new credit card. Pay back \$50 a month	Put \$1,000 on your new credit card. Pay back \$50 a month	Put \$1,000 on your new credit card. Pay back \$50 a month

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### Part B: Personal Loans

Research the interest payable, fees and other conditions related to 3 different personal loan options from 3 different financial institutions. Choose a personal loan from one of the 'Big 4' banks, a personal loan from another financial institution, and a personal loan from a financial provider that says it is aimed at younger people.

Set your results up in a table like the one below. Use this table to collect and draft your information. You should also use a spreadsheet to make comparisons. It is a good idea to use the loan calculators on the ASIC website to help you.

Loan feature	Loan 1	Loan 2	Loan 3
<i>Provided by...</i>			
<i>Name of 'loan'</i>			
<i>Loan period</i>			
<i>Interest rate: &amp; fixed or variable?</i>			
<i>Set-up fee</i>			
<i>Ongoing fees</i>			
<i>Other fees</i>			
<i>Security needed?</i>			
<i>Other conditions and information</i>			
<i>Scenario: Monthly loan repayments?</i> <i>Total interest?</i> <i>Total amount repaid?</i>	<i>Borrow \$10,000 over 5 years. Monthly repayments.</i>	<i>Borrow \$10,000 over 5 years. Monthly repayments.</i>	<i>Borrow \$10,000 over 5 years. Monthly repayments.</i>

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## 4.27 Assessment Task

### AT4 Budgeting 101

You are required to prepare an accurate budget to help you save for a car.

Your teacher will guide you through the stages/tasks you have to complete, and the timeframe for your budget (most likely a 2-3 year plan).



Use a budget template (see p.85, or source/create your own, e.g. a spreadsheet).



Your teacher might instruct you to present your information to the class in the form of an oral or multimedia report.

#### Stage 1: Budgeting for your car

- ☐ Find or draw an image of your likely first car. Estimate a realistic cost of this car. Find an advertisement for one that is available for sale to use as a benchmark. Include this ad as part of your report.
- ☐ Prepare a budget for yourself that shows your anticipated average monthly expenses and income for the next 2-3 years.
- ☐ After completing your budget prepare a report that discusses the likelihood of you being able to buy the car that you wanted. What changes might you need to make?

#### Stage 2: Trying harder

- ☐ Prepare a second set of budgets based on you cutting down your spending in various areas by 20%, and boosting your income earning by 20%.
- ☐ Prepare a report that discusses how and where you made savings, how you earned more income, the impact of these changes in your lifestyle, and on your ability to buy your car.
- ☐ Are you prepared to make those sacrifices. Why/why not?


#### Stage 3: Saving up

- ☐ Research the deposit rates on 3 different savings accounts.
- ☐ How much could you save a week, based on you cutting your spending by 20% and boosting your income by 20%?
- ☐ Calculate how much your savings account would grow if you saved for 1 year, for 2, and for 3 years.
- ☐ Repeat this, based on you earning an extra \$100 per week, and saving 80% of that amount.

#### Stage 4: Borrowing the difference

- ☐ Research potential sources of finance (loans) that you could borrow money from. How much would you need to borrow? Do calculations to compare the different costs associated with these sources of finance on the loan.
- ☐ Which loan would you choose? Justify your preferred source of finance by using numerical evidence to explain why.

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<b>Name(s):</b>				
<b>Dates:</b>				
<b>Tasks - AT4: Budgeting 101</b>	<b>Re-quired</b>	<b>Due by</b>	<b>Done</b>	<b>Teacher initials</b>
<b>Stage 1: Budgeting</b>				
1. Research a suitable car and collect information.	<input checked="" type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
2. Prepare your budget.	<input checked="" type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
3. Prepare a report explaining your budget.	<input checked="" type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<b>Stage 2: Trying harder</b>				
1. Prepare adjusted budget.	<input checked="" type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
2. Prepare a report on this adjusted budget.	<input checked="" type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
3. Outline issues surrounding sacrifices.	<input checked="" type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<b>Stage 3: Saving up</b>				
1. Research deposit rates on 3 different savings accounts.	<input checked="" type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
2. Calculate savings based on 20% changes.	<input checked="" type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
3. Calculate savings growth over time periods	<input checked="" type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
4. Calculate savings growth based on extra earnings	<input checked="" type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<b>Stage 4: Borrowing the difference</b>				
1. Calculate different costs of possible finance for your car.	<input checked="" type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
2. Compare different potential costs of finance.	<input checked="" type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
3. Choose a source of finance; explain why using evidence.	<input checked="" type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<b>Reporting</b>				
⇒ Prepare and submit your final report.	<input checked="" type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
⇒ Present your final report to the class (if required). 	<input type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

Additional information:

Signed: \_\_\_\_\_

Date: \_\_\_\_\_

## 4.29 Self-Reflection

### Self-Reflection Pro-Forma

Which numeracy skills did I develop during this unit?

→ \_\_\_\_\_

→ \_\_\_\_\_

→ \_\_\_\_\_

How have the skills of numeracy helped improve my personal life?

→ \_\_\_\_\_

→ \_\_\_\_\_

How have the skills of numeracy helped my development of work-related skills?

→ \_\_\_\_\_

→ \_\_\_\_\_

How would I rate my performance using a circle in developing my numeracy skills this unit?

0 not shown	1 low	2 reasonable	3 good	4 very good	5 excellent
----------------	----------	-----------------	-----------	----------------	----------------

What were my strongest areas of performance and what should I work on improving?

My strongest topics/skills were:	But I need to improve my skills in:

Signed: \_\_\_\_\_ Date: \_\_\_\_\_

Teacher initials: \_\_\_\_\_ Date: \_\_\_\_\_

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# Time

5

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Activities 5: Time	p.	Due date/Done?	Comment
5.01A Different times	104	<input type="text"/>	<input type="text"/>
5.02B What's the time?	105	<input type="text"/>	<input type="text"/>
5.03C What's the time? 2	106	<input type="text"/>	<input type="text"/>
5.04D You and time	107	<input type="text"/>	<input type="text"/>
5.06A Calculating time	109	<input type="text"/>	<input type="text"/>
5.08A How long?	111	<input type="text"/>	<input type="text"/>
5.10A Elapsed time	113	<input type="text"/>	<input type="text"/>
5.11C Time worked	114	<input type="text"/>	<input type="text"/>
5.12D Timesheet	115	<input type="text"/>	<input type="text"/>
5.13A My timetable	116	<input type="text"/>	<input type="text"/>
5.14B Timetables in action	117	<input type="text"/>	<input type="text"/>
AT5 Taking Your Time	118	<input type="text"/>	<input type="text"/>

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Comments:

## 5.01 Time

### Time

Time is the only resource which we all have the same amount of. We each have 24 hours a day, 7 days a week, 52.18 weeks a year and about 82 years a lifetime.

But do you use your time efficiently or are you wasting this valuable resource? So how do you value your time, how much is an hour worth to you?

At work we get paid a wage per hour for our time (and effort and skill); or an annual salary for our time per year (and effort and skill).

So at work we don't really just get paid for our 'time'.

Giving up our time is just a small part of working. If all we needed to do was give up our time to get paid then we could get anyone to do any job. I could get your grannie to be your hairstylist, or your little brother to be your teacher.

In reality we get paid for our effort (labour) and our skill level (competency at doing the task). This reality is from your employer's point-of-view. They employ you to perform a task. The most common types of payments are shown on p. 17.

From your own point-of-view you want to get rewarded for the time you give up and any effort you will need to contribute to do that task. So how much would we need to pay you to get you off the couch and give up part of your labour? And what could you do?

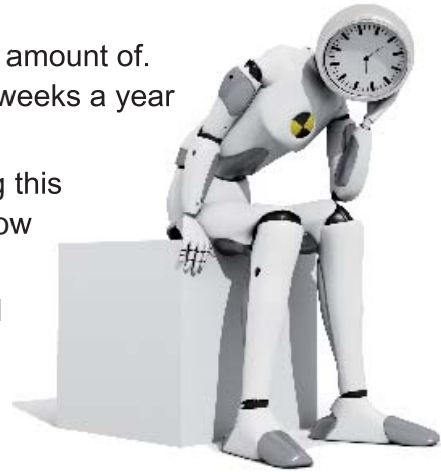


Image: Jorge enrique Villalobo espinosa/  
Hemera/Thinkstock

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### 24-hour clock

Time is a construct which in Western society is measured in seconds, minutes, hours, days, months, years, etc.. Time can be commonly expressed in analogue terms using hands and numbers on a clockface, or in digital terms using numbers. There are many other scientific measures of time as well. Time is also the 4th dimension!

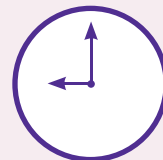
Many industries use a 24-hour clock to communicate and record time for activities associated with shift times, rosters, transport, logistics, manufacturing schedules, automated tasks, communication and many other work-related activities.

### A Different times

Larry, Curley and Mo each prefer different time methods. Larry uses analogue, Curley uses digital and Mo uses 24-hour time. This can cause some difficulty when communicating.

1. In your workbooks, show the following times using the three methods. Draw a clockface, a 12-hour digital readout and 24-hour time.

⇒ 3:30am, 17:27, a quarter to eleven in the morning, midnight, the time you got up this morning, 2 hours after today's sunset and the current time in London.



9:00 pm

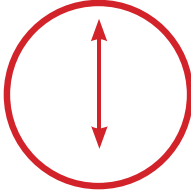
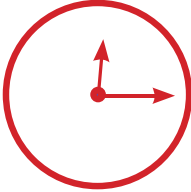
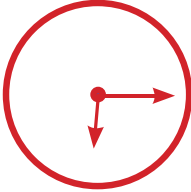
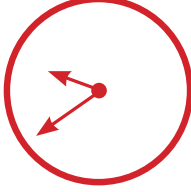
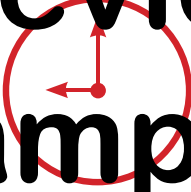
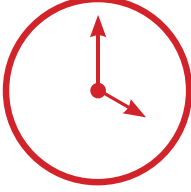
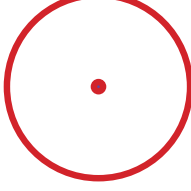

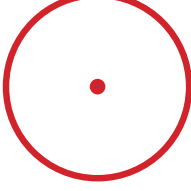
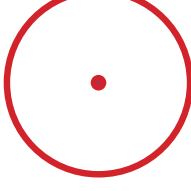
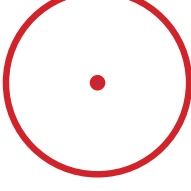
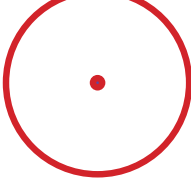
21:00

## What's the time?

B

1. Interpret these analogue clockfaces to estimate the time. (You might want to show key numbers on the clockface to help you.)
2. Show the correct time on the blank clockfaces.

*Tip: Remember that the hour hand does move continuously between numbers (but slightly) as the minute hand goes round an hour.*

		
<input type="text"/>	<input type="text"/>	<input type="text"/>
		
<input type="text"/>	<input type="text"/>	<input type="text"/>
		
<input type="text" value="7:30"/>	<input type="text" value="10:15"/>	<input type="text" value="Half past nine"/>
		
<input type="text" value="A quarter to four"/>	<input type="text" value="Noon"/>	<input type="text" value="The current time"/>

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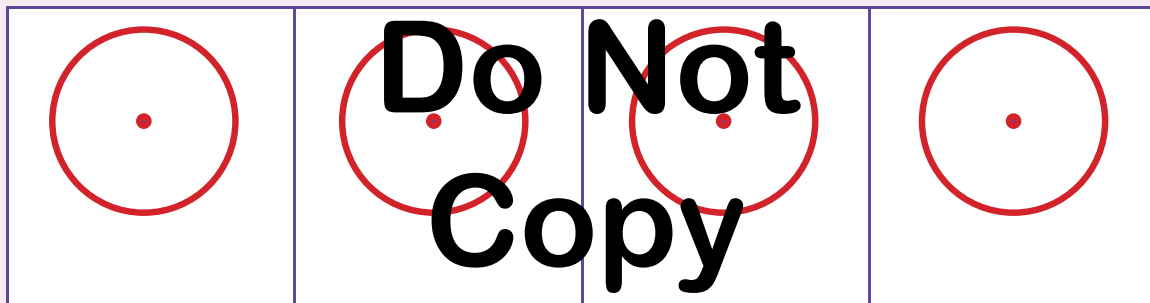
## 5.03 Time

### C What's the time? 2

- a. Use the signifiers of am and pm to interpret these 24-hour digital displays as 12-hour time.

15:30	13:45	21:30	23:15
06:00	04:55	09:30	21:45
18:00	00:00	12:00	24:00

- b. Choose 4 of these 24-hour examples, and show the correct time on a 12-hour analogue clockface. Make sure to also include am or pm.



- c. What time do you usually get up and go to bed? Show these times on a 12-hour clockface, as digital time and as 24-hour time.

	<div></div> m	<div>:</div>
	<div></div> m	<div>:</div>

## You and time D

1. Which do you think is the best method to use for telling the time in personal, social and in work-related situations? Discuss as a class.

Personal situations	Social situations	Work-related situations

2. Describe examples of when you expect others to be on time, or situations when you need things to be running on time and to schedule.

Situations	Personal	Social	Work-related
When I expect others to be on time.			
When I need things to be running on time and to schedule.			

3. Describe examples of when others expect you to be on time, or situations where by others rely on you to ensure that things are running on time or on schedule.

Situations	Personal	Social	Work-related
When others expect me to be on time.			
When others need things to be running on time and to schedule.			

4. How would you rate your time management skills?
5. What time management strategies do you currently use; and what time management strategies could you implement to improve the management of your own time?

## 5.05 Calculating Time

### Converting time

At times we have to convert hours into minutes, minute into hours or different conversions using other units of time. Of course our major units for recording time are hours, minutes and seconds. But the breakdown for counting time is different from our usual decimal counting method. With hours, minutes (and seconds) we need to remember that there are 60 seconds in a minute and 60 minutes in an hour. So:

- ⇒ 1 full hour is 60 minutes
- ⇒ 1 half of an hour is 30 minutes
- ⇒ 1 quarter of an hour is 15 minutes
- ⇒ 3 quarters of an hour is 45 minutes
- ⇒ 1 full minute = 60 seconds
- ⇒ 1 half of a minute is 30 seconds (and so on).



# Preview

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### Calculating time

#### i. Hours to minutes

To convert from hours to minutes we simply **multiply** the number of hours by 60. For example:

- ⇒ 3 hours =  $3 \times 60 \text{ minutes} = 180 \text{ minutes}$
- ⇒ 20 hours =  $20 \times 60 \text{ minutes} = 1,200 \text{ minutes}$
- ⇒ 2 and a half hours = ? (So let's do the calculation)  
 $= 2 \times 60 \text{ minutes plus another half of an hour}$   
 $= 120 \text{ minutes} + 30 \text{ minutes}$   
 $= 150 \text{ minutes}$

#### ii. Minutes to hours

To convert from minutes to hours we perform a **division** calculation.

We divide the total minutes by 60 (which equals 1 full hour).

- ⇒  $240 \text{ minutes} = 240 / 60 = 4 \text{ hours}$
- ⇒  $540 \text{ minutes} = 540 / 60 = 9 \text{ hours}$
- ⇒  $900 \text{ minutes} = 900 / 60 = 15 \text{ hours}$

#### Minutes to hours (cont.)

With many time conversions we are likely to get a **remainder**, because few tasks take 'exact' hours to complete.

- ⇒  $150 \text{ minutes} = 150 / 60$   
 $= 2 \text{ hours } 30 \text{ minutes (or } 2 \frac{1}{2} \text{ hrs)}$

### Adding time

To add time we add the hours first and then we add the minutes. e.g.

- ⇒  $1 \text{ hr } 30 \text{ mins} + 1 \text{ hr } 15 \text{ mins} = 2 \text{ hrs } 45 \text{ mins}$

If the total minutes part of the answer is greater than 60, then this is an another whole hour. So we have to take 60 away from this 'minutes' total and add it back as 1 hour to the 'hours' part of the calculation.

- ⇒  $1 \text{ hr } 30 \text{ mins} + 1 \text{ hr } 45 \text{ mins}$   
 $= 2 \text{ hrs and } 75 \text{ mins}$   
 $= 2 \text{ hrs and } (75 - 60 \text{ mins})$   
 $= (2 + 1 \text{ hrs}) \text{ and } 15 \text{ mins}$   
 $= 3 \text{ hours and } 15 \text{ minutes}$

NUM  
SUPER  
SKILLS



1. Calculate the time for the following situations.

1 hour in minutes	2 hours in minutes	1 hour 15 minutes in minutes	4 and a half hours in minutes
4 hours in minutes	20 hours in minutes	2 1/4 hours in minutes	1 day in minutes
120 minutes in hours	180 minutes in hours	330 minutes in hours	495 minutes in hours
600 minute in hours	960 minutes in hours	990 minutes in hours	15 minutes in hours

2. Calculate the total time in hours and minutes for the following situations.

1 hour + 2 hours	1 hour 30 min + 2 hours 15 min	3 hours + 30 min + 45 min
2 hrs 45 min + 3 hrs 30 min	30 min + 3 hrs 15 min + 1 hr 15 min	45 min + 75 min + 120 min

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## 5.07 Time - Duration

### Elapsed time (duration)

Elapsed time, which is also called **duration**, indicates how much time has passed between one time and another.

*For example, the elapsed time in 1 hour = 1 hour (or 60 minutes!). That's pretty straightforward! So therefore the elapsed time between 3pm and 4:00pm is 1 hour. Or the elapsed time between 6:45am and 7:45am is 60 minutes. There you go!*

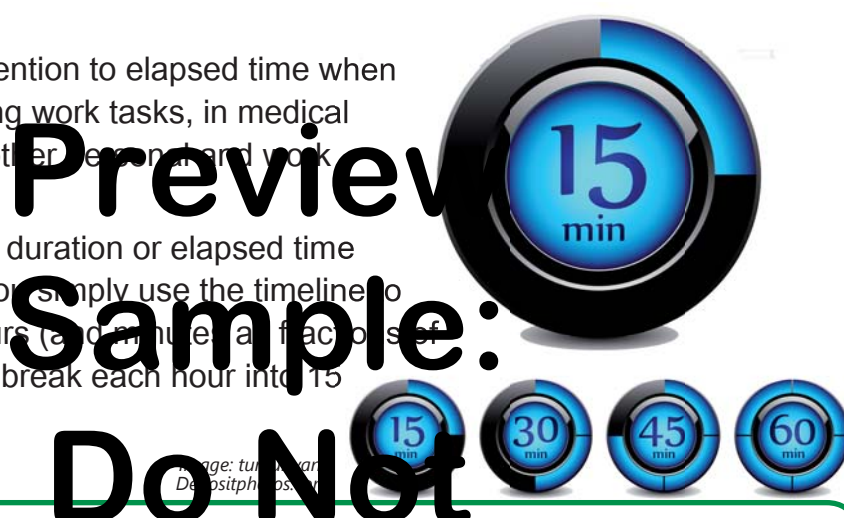
Elapsed time or duration is used to calculate how 'long' something takes. This might include travel times, work times, task times or even leisure times.

Sporting activities rely heavily on elapsed time such as with AFL, soccer, netball and rugby. The game time dictates how long the play goes for. Other sporting activities use duration (or how long) to record achievement such as the 100m sprint, the 1,500m freestyle, the marathon and the 200km cycling road time trial.

Fastest wins!

We also need to pay attention to elapsed time when cooking, when performing work tasks, in medical situations and in many other personal and work activities.

One method to work out duration or elapsed time is by using a timeline. You simply use the timeline to count the number of hours (and minutes, a fraction of hours). You should also break each hour into 15 minute intervals.



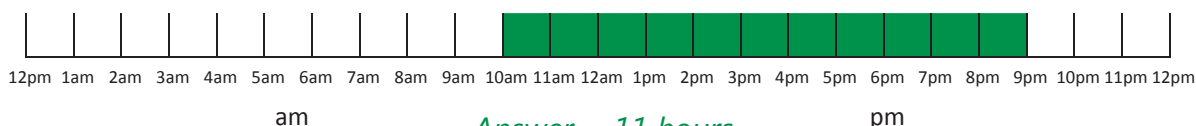
### Duration: Using a time line

How much time from 7am to 11am?



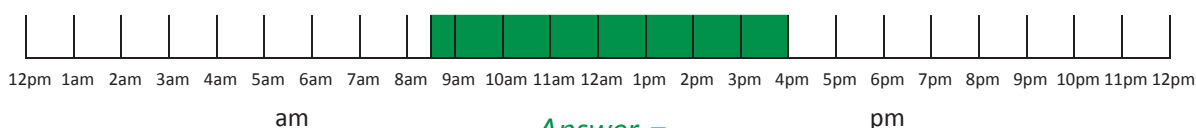
Answer = 4 hours

How much time from 10am to 9pm?



Answer = 11 hours

So, how much time from 8:30am to 4pm?



Answer =

## How long? A

1. Calculate how much elapsed time is represented by the clocks.

Write a timespan that would match this elapsed time (e.g. 30 minutes = 1:00pm to 1:30pm).

Suggest a task that you estimate would take this amount of time.

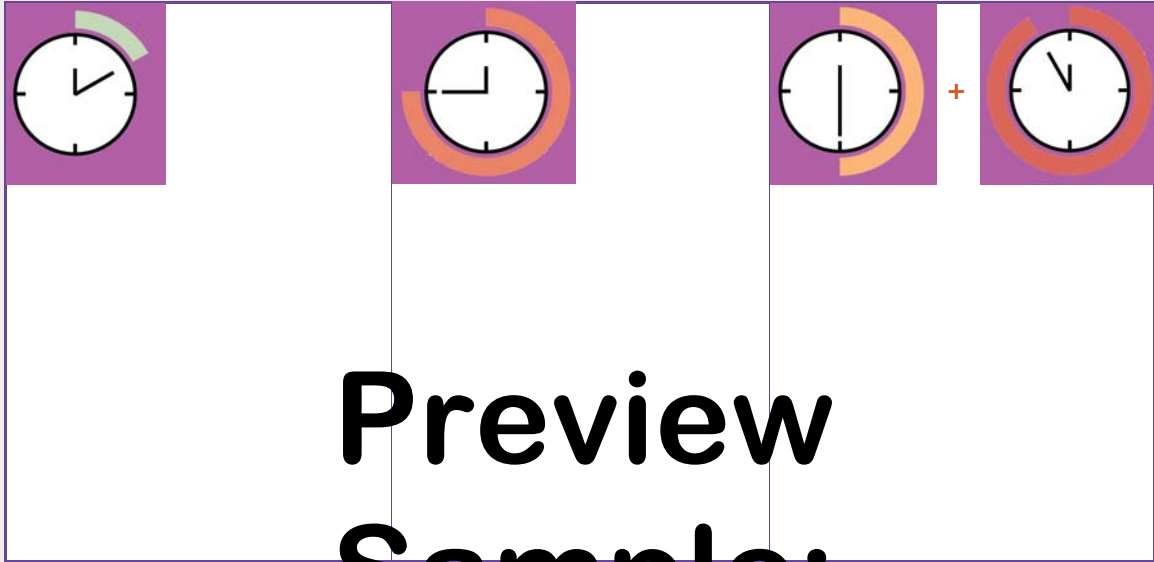
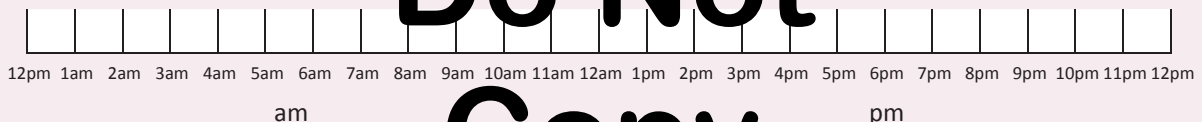


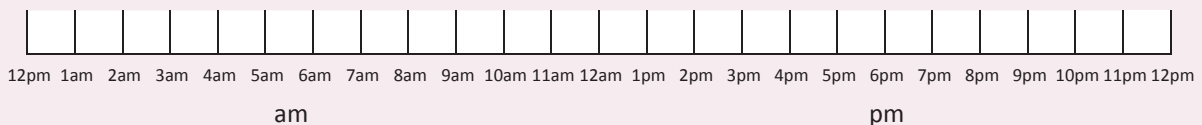
Image: tumunyan/  
masha\_tace.com

2. Use number lines to calculate the total duration for the following.

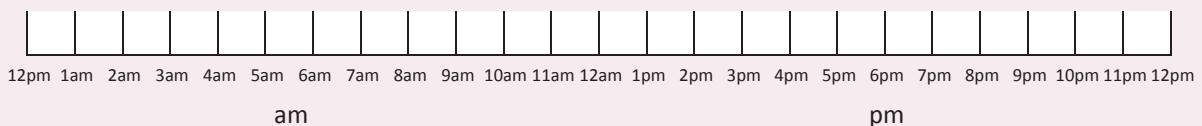
i. 6am to 11am



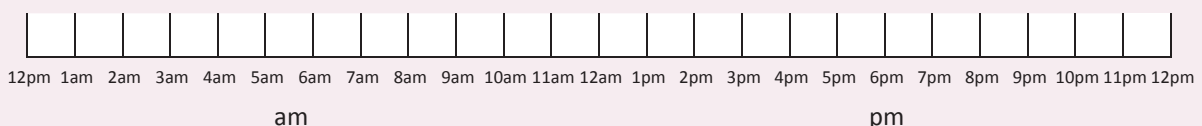
ii. 9:30am to 2pm



iii. 11:30am to 10pm



iv. 9am to 4:45pm



## 5.09 Time - Duration

### Elapsed time (duration)

To calculate total **duration** in hours and minutes we need to see how much time has passed (or elapsed) between one period of time and another.

Some calculations are easy. e.g.

3pm to 4pm = 1 hour (or 60 minutes).

7:45pm to 8:30pm = 45 mins (15 mins to the end of the hour, plus another 30 mins).

11:30pm to 2:30am = 3 hours (or 180 mins).

But some calculations are a bit harder. To calculate elapsed time we use 3 steps.

i. e.g. 5:15am to 7:50am (**later time minutes > than earlier time minutes**)

1. First you subtract the hours (later minus earlier).

= 7 - 5 (hours) = 2 hours

2. Then subtract the minutes (later minus earlier)

= 50 - 15 (mins) = 35 minutes

3. In this case (because the later minutes are higher (>) than the earlier minutes) you combine the answers as an addition.

= 2 hours plus 35 minutes

**Note: If the earlier time starts as a '12'**  
**e.g. 12:30am treat the 12 as a '0'.**

ii. e.g. 7:45pm to 8:30pm (**later time minutes < than earlier time minutes**)

1. First you subtract the hours (later minus earlier).

= 8 - 7 (hours) = 1 hour

2. Then subtract the minutes (later minus earlier).

= 30 - 45 (mins) = -15 minutes

3. In this case (because the later minutes are smaller (<) than the earlier minutes) you combine the answers as a subtraction.

= 1 hour minus 15 minutes

= 45 minutes

**Note: If the earlier time starts as a '12'**  
**e.g. 12:30am treat the 12 as a '0'.**

iii. e.g. 8:30am to 4:30pm (**later time crosses over am or pm**)

For times that cross over into am or pm you do 3 steps.

1. Subtract earlier time from the next 12.

= 12:00am - 8:30am

= (12 - 8) hours    00 - 30 (minutes)

= 4 hours                      - 30 minutes

= 3 hours 30 mins

2. Add the time that has elapsed after the 12 (am or pm).

(This means that you are treating the 12 as '0'.)

= 4 hours 30 minutes

3. Add these 2 times together.

= 3 hours 30 mins plus 4 hours 30 mins

= 7 hours 60 mins

= 8 hours

**Note: If the earlier time starts as a '12'**  
**e.g. 12:30am treat the 12 as a '0'.**

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Elapsed time **B**

1. Calculate the elapsed time for the following situations.

7:30am to 11:30am	8:30am to 11:45am	2:30pm to 7:45pm
5:45am to 7:15pm	9:45am to 11:15pm	1:30am to 8:15pm

2. Calculate the total daily opening hours, and the weekly opening hours, for these shops based on this information.
3. Discuss what type of retail shops might have these hours. What do your answers show about retail working hours?

**Opening hours**  
**Mon-Fri:** 6:30am to 9:30pm  
**Sat:** 6:30am to 9:00pm  
**Sun:** 7:30am to 8:30pm

**Trading hours**  
**Weekdays:** 10 - 6pm  
**Saturday:** 10 - 5pm  
**Closed Sunday**

Calculations:

Calculations:

## 5.11 Time - Duration

### C Time worked

Consider the following timesheet details for the employees listed below. They all work for the same employer in the same skilled occupation as a panel operator.

1. Rudi says that he works a longer day than Jo or Vinh and because of this he should get paid more. Calculate and then comment on whether Rudi is correct.

<b>Rudi:</b>
On 06:45
Off 16:15

<b>Jo:</b>
On 16:00
Off 01:15

<b>Vinh:</b>
On 01:00
Off 09:40

2. Jo and Vinh do not agree with Rudi and want you to consider their scheduled unpaid breaks as part of your calculations. Use this extra information to calculate and then comment on whether Rudi is still correct.

<b>Rudi:</b>
Lunch = 1 hour
2 x 15 min breaks

<b>Jo:</b>
Lunch = 45 min
2 x 15 min breaks

<b>Vinh:</b>
Lunch = 20 min.
2 x 10 min breaks

3. Vinh actually is paid 30% more per hour than Jo, who is paid 15% more per hour than Rudi. Why might this be the case? Is it fair?

4. If Rudi receives \$20 per hour, how much would he earn in a normal 5 day week; and how much would he approximately earn per year? What about Jo and Vinh?



5. Why might Jo and Vinh be happier to take shorter breaks? What about you?

## Timesheet D

Timesheets exist in various forms and are used to record employee working hours, break times, rates of pay, as well as other information relevant to the particular work setting and employee. Timesheets often use a 24-hour clock.

- Complete this sample timesheet with the correct calculations for an adult retail employee working a standard, 38 hour week, Monday to Friday.
  - ⇒ Sign-on is 8:15 am.
  - ⇒ Unpaid lunch break is from 1:00-1:45.
  - ⇒ The employee is paid \$20.79 hour (as per the *General Retail Industry Award 2010*, as at Nov. 2018).

	Date	Start	Finish	Break	Hours Worked	Rate	Total
Sunday							
Monday							
Tuesday							
Wednesday							
Thursday							
Friday							
Saturday							
Totals							

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- What other information do you think is missing from this timesheet?

- Find an example of a timesheet for an occupation or industry you are interested in. Use it to help complete question 2.





## 5.13 Timetables

### Timetables

A timetable is a plan or schedule that sets out various times and durations for a particular activity. The most common timetables that you use include your subject timetable, public transport timetables, your VET timetable, work timetables (rosters) and various appointment timetables such as the doctor, hairdresser or barber, government services such as Centrelink, and any other activity that uses set times and time durations.

Image: anze.bizjan/Depositphotos.com

One of the most important things to understand about timetables, is that any single timetable must fit in with all the other timetables that are part of the same activity, network or system. This means that timetables must be designed to meet very rigid time schedules.

For example, your school timetable has to balance the needs of students, teachers, classrooms, facilities (such as computer rooms) and many other variables to construct a suitable timetable.

The aim is to make compromises so that the needs of most users are met. For your study program this might involve ensuring that all of the VCAL Intermediate subjects are scheduled at suitable times during the week, to allow one free day to be available for VET courses or for Workplace Learning.

And then on your VET or work day you may have to deal with your TAFE timetable, your employer's work roster, transport timetables, your personal or family commitments (such as looking after younger siblings or doing domestic chores) and perhaps even your own personal or work roster. So it can get quite complex!



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### A My timetable



1. So how 'good' is your school timetable? In your workbooks (or using software) reconstruct your timetable based on your preferred times and days for classes. You must keep the same classes you are doing now, and the same lesson or period duration - but other than that - redraft your timetable to suit you.

Times	Monday	Tuesday	Wednesday	Thursday	Friday
e.g. Period 1 7:30-8:20am	Numeracy	PDS	Literacy	Work-Related Skills	VET

2. See if you can find another classmate with the same timetable as yours or one that is close. How many matches did you get? Were there any classmates with totally different timetables from you? Why so? As a class discuss how hard it would be to please everyone; and why compromises need to be made.

## Timetables in action B

One of the key types of timetables you might use regularly is public transport timetables. Some people have access to well-developed public transport systems. But those of you in the outer metro, regional or rural areas might find public transport to be quite scarce.

Go online to research information to complete the following tasks.

Find information for 1 trip of your own choosing.



a. What time do you need to leave home to get to school? What public transport options are available and what are the associated times and travel durations?

b. What time would you need to catch a train to get to the CBD by 9am? What time would you need to leave home?

# Preview

c. You need to get to Geelong for a friend's birthday at Sunday 12:30pm. Is this trip possible or practical for you by public transport? If so, what will be your travel times and trip duration?

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d. You are leaving for a holiday at the Gold Coast tomorrow. The plane takes off at 09:30am. What time do you need to get to the airport? If you used public transport to get to the airport what mode(s) would you use, what time(s) would they leave and how long would the trip(s) take? When would you need to leave home?

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e.

## 5.15 Assessment Task

### AT5 Taking Your Time

#### Overview

For this task you are required to develop a detailed **personal timetable to manage your life more effectively**. You will focus on activities such as school, work, VET, travelling, sport, recreation, sleeping, eating, socialising, time online, videos/TV, household duties and so on. You choose the types of activities that best suit your personal, social and work commitments, and your lifestyle.

#### Stage 1: Estimate how you will be 'using' your time next week.



1. Use a spreadsheet or a table to create a **7-day timetable**, with rows for each of the 24 hours in a day.
2. Estimate what you are **likely to be doing during each of the times** (hours) next week. (e.g. Monday, at school 8:30-15:30.) Estimate the **duration** of the activities. For shorter activities, or activities that extend into another hour, you should estimate using 30 minute or even 15 minute time intervals.
3. Complete your spreadsheet by **entering** your activities' estimated times and durations for next week.
4. Calculate **estimated daily** and **weekly totals** for the categories of **activities** you have chosen.
5. Create a **pie chart** or **bar graph** to display this information visually.

#### Stage 2: Actual activities and times



1. Record the **activities you actually did** for the week, and the **times** and **durations** for these activities, using another spreadsheet or table.
2. Calculate **actual daily** and **weekly totals** for the categories of activities you have chosen.
3. Create a **pie chart** or **bar graph** to display this information visually.

#### Report

1. Compare the **similarities** between your **estimates** of how you thought you would use your time, and how you **actually used your time**. Use short numerical statements to describe these **similarities**.
2. Compare the **differences** between your **estimates** of how you thought you would use your time and how you **actually used your time**. Use short numerical statements to describe these **differences**.
3. Outline key **reasons** why your **estimates** and **actuals** were **similar**.
4. Outline key **reasons** why your **estimates** and **actuals** were **different**.
5. Look at when you **used your time well**. Discuss how this helped you in your life.
6. Look at when you **'wasted' your time**. Discuss issues that this could cause.
7. Identify key **actions** and strategies that you could do, to **use your time 'better'**.

# Place

# 6

## Contents

6.01 Maps and Directions .....	120	6.17 Maps and Apps .....	136
6.05 Using Maps.....	124	6.19 Assessment Task.....	138
6.11 Retail Maps.....	130	6.21 Self-Reflection.....	140
6.13 Distance and Time .....	132		

## Activities 6: Place

	p.	Due date/Done?	Comment
6.01A <b>Compass directions</b>	120	<input type="checkbox"/>	
6.03B <b>Check out da 'hood</b>	122	<input type="checkbox"/>	
6.03C <b>School map grid</b>	122-123	<input type="checkbox"/>	
6.05A <b>Get me here!</b>	124-125	<input type="checkbox"/>	
6.07B <b>Training time</b>	126-127	<input type="checkbox"/>	
6.10C <b>Word up</b>	128	<input type="checkbox"/>	
6.11A <b>Hard to find</b>	130	<input type="checkbox"/>	
6.12B <b>Retail layout</b>	131	<input type="checkbox"/>	
6.14A <b>Distance and time</b>	133	<input type="checkbox"/>	
6.16B <b>Travel costs</b>	135	<input type="checkbox"/>	
6.17A <b>Maps vs apps</b>	136	<input type="checkbox"/>	
6.18A <b>Old school vs new school</b>	137	<input type="checkbox"/>	
<b>AT6 On Holiday</b>	138-139	<input type="checkbox"/>	
6.21 <b>Self-Reflection</b>	140	<input type="checkbox"/>	

Comments:

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## 6.01 Maps and Directions

### Which way do I go?

Ever been lost? Of course you have. Well a good map would've come in handy.

Who gets lost more, men or women? There's an old sexist saying, "*Women can't read maps and men don't ask questions.*" This means that we are often as lost as each other, regardless of gender.

The growing use of apps, satellite navigation systems and GPS demonstrates that people have trouble reading maps. They would rather be told where to go by a smooth, but insistent voice.

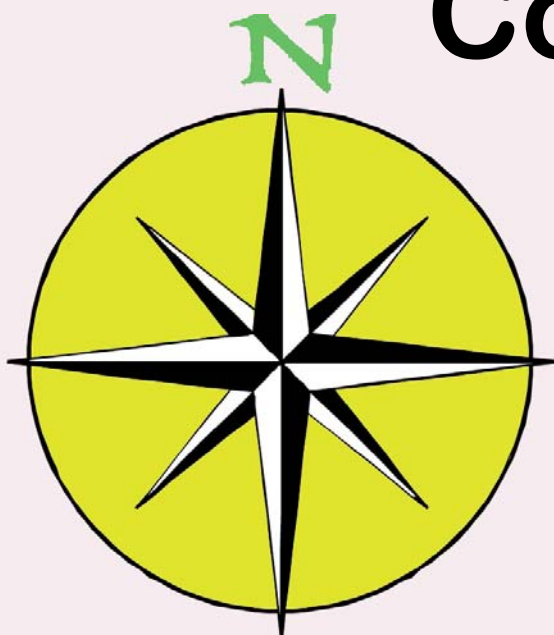


"Take High Street for another kilometre Marcel. Turn right at 200 metres Marcel. You missed your turn Marcel. Where are you going Marcel? You're not going to Hungry Jacks again are you Marcel? You know that you are trying to lose weight Marcel. Why have you taken your hand off the steering wheel Marcel? Why did you throw me out the window Marcel?" "I am now on the corner of Bull Rat Road. Do a U-turn."

### A Compass directions

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1. Label the compass pointers with the appropriate directions.



2. The face of a compass is made up of 360°. (It is a circle after all.) If north is 0°, label all the compass points with their correct degrees.



3. Get hold of a compass. Place this page flat on the desk in front of you. Use the compass to draw an arrow showing north on this page.

### Mapping features

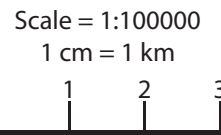
There are some key features of cartography (map-making) that make maps more user-friendly. A few of these are outlined below.

#### Directions

- ⇒ North, south, east and west or N, NE, NW, E, SE, S, SW, W. Also NNE, NSE, SSW and so on.
- ⇒ Some people use 'left' or 'right', 'up' or 'down', 'over there', 'here' or even, 'around the corner'!
- ⇒ Directions are used to steer people in the right direction (of course!).
- ⇒ If a person holds a page upright they are not necessarily travelling north. An arrow that indicates north should be included on maps.
- ⇒ Some people orient maps in the direction that they are travelling to make it easier to interpret.
- ⇒ Digital mapping uses co-ordinates that are triangulated from satellites, such as  $144^{\circ}58'51.99''$  E  $-37^{\circ}49'7.19''$  S

#### Scale

- ⇒ Most maps are usually drawn to scale. This means that an allotted distance on the map corresponds with a distance in real life. However, not all maps are to scale.
- ⇒ A scale measures a ratio such as  $1\text{cm} = 1\text{km}$ . Scale might be written as 1:100 (e.g.  $1\text{cm} = 1\text{m}$ ).
- ⇒ Scale allows us to make a visual estimate of travel distance and travel time, and to get our bearings.
- ⇒ If the map is for a short distance then the scale will be quite generous, e.g.  $1\text{cm}:1\text{m}$ . If the map is for a large distance the scale will be quite economical, e.g.



#### Pathways (route)

- ⇒ Pathways indicate the ways to get from 'point A' to 'point B'.
- ⇒ A person might mark the pathways (route) that the user of the map should follow.
- ⇒ Pathways on GPS, street directories and maps might include roads, streets, highways, freeways and other methods of travel.
- ⇒ Pathways might also include public transport routes, pedestrian traffic areas, waterways, bulk transport terminals and exchanges (e.g. airports & train stations), and so on.

#### Features

- ⇒ Most maps will include common or key features or landmarks.
- ⇒ These features might include places of interest, government buildings and services, emergency facilities, green areas, schools, signs, landmarks and other distinguishing and useful features.
- ⇒ Features might be located in the correct spot on the map but may not be drawn to scale.
- ⇒ Many map features are shown using symbols or a key. You need to be able to interpret these.

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## 6.03 Maps and Directions

### B Check out da 'hood

Get hold of a street directory or print a map of your local area. Make a copy for educational purposes. On the map locate and highlight the following features.

- Your home.
- The homes of 2 other members of the class or other local people that you know.

---

---

- The major arterial roads.
- Public transport routes.
- 4 landmarks or places of interest.

---

---

- In your workbooks use the scale to calculate the following.
  - Distance from your home to each of these 2 people both 'as the crow flies' and by road.
  - Length and breadth of the map's coverage.
  - The time it would take you to walk both the length and breadth of the area covered by the map.



# Preview

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### C School map grid



When drawing maps it is best to use a grid. The grid should correspond to a scale.

- Use the grid opposite to draw a map of your school.
- If your school is too big then draw a map of one level of your school. Your teacher might instruct class members to each map a different section of the school. You might best do this task working in pairs. You need to have suitable measuring tools.
- Work out your scale and orient your page before you start.
- Make copies of the grid opposite before you start; or design your own grid.
- Do rough sketches and plans first. Perhaps use multimedia for your final map.
- On the map include the key features below:
  - ⇒ rooms, exits, fire extinguishers, stairs, toilets, windows, heating ducts or vents or air-conditioning vents (plus others of your own).



**Name(s):** \_\_\_\_\_

**Map of:** \_\_\_\_\_ **Date:** \_\_\_\_\_ **Scale: 10mm:** \_\_\_\_\_

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## 6.05 Using Maps

### Drawings maps

When someone asks you to draw a map for them you are taking responsibility for them arriving at their destination safely and quickly. You have to design the map with the following practical features in mind.

- ⇒ The traveller needs to be able to read the map quickly and easily.
- ⇒ All key roads, turns and landmarks need to be clearly marked and easily identified.
- ⇒ You might need two maps, a long-distance map showing the suggested major route, and then a short-distance map with exact directions that show how to get to a specific destination.
- ⇒ Directions need to be clear e.g. N, S, E, W, etc., or turning left or right.
- ⇒ Long-distance maps should either be close to scale and show this scale; or they should have estimated distances and travel times.
- ⇒ Short-distance maps should be to scale and should show the scale.
- ⇒ A contact phone number can be included on the map to help the traveller.



# Preview

### A Get me here!

I'm not very good at following directions. Direct me on how to get to your school. Where am I? I am at Flinders Street station. (If you are not in Victoria, then I am at your main CBD railway station.)

1. I need to know how to get there on public transport. Draw me a map.
  - a. What modes of public transport should I take? Do I need to take any interconnecting services?
  - b. Where do I catch these? How often do they leave?
  - c. What tickets will I need to buy, where can I buy them from and how much will they cost me?
  - d. How long will my journey take?
  - e. When I get near your school am I going to have to walk much at all?
  - f. Don't forget to include directions, street names and major landmarks.
2. Maybe I will drive my car to get to your school. Draw me a road map(s).
  - a. What roads should I take? In which direction am I heading while on these roads?
  - b. What major landmarks should I look out for?
  - c. Are there any tricks and turns I might miss? Help me out.
  - d. How long should my journey take?
  - e. Calculate the approximate petrol cost for the journey.
  - f. What about catching a taxi or Uber? Do you think that this is a good idea? Why/why not?



Name(s): \_\_\_\_\_

Map of: \_\_\_\_\_ Date: \_\_\_\_\_ Scale: 10mm: \_\_\_\_\_

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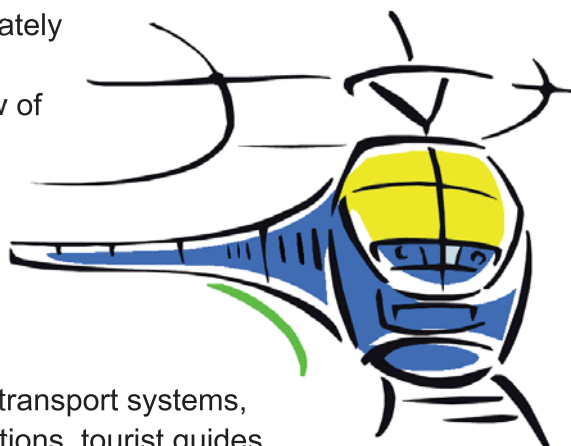
## 6.07 Using maps

### Using Maps

Maps do not need to be to scale or even accurately drawn in order to be useful. Some maps are abstracts and provide a diagrammatic overview of a feature or facility.



The idea of these types of maps is to give a general guide to the user. They usually represent the information in an easy-to-read diagrammatic form. This makes them very user-friendly.

These types of maps are often used for public transport systems, shopping centre maps, theme parks and attractions, tourist guides, building maps, information centres and other related situations.



### B Training time

Shown on p.128 is a map of the Melbourne metropolitan train network. The map is not to scale. But in most cases the length of the lines do reflect the number of stations.

- ⇒ Listed on the map are the different train lines with the final station of each line.
- ⇒ Also shown are some V-Line services indicated by  and diesel services shown by .

Working in pairs you are required to choose a section of the system either:

- ☐ North: Upfield, South Morang and Hurstbridge
- ☐ South: Sandringham, Frankston, Cranbourne and Tattenham
- ☐ East: Lilydale, Belgrave, Alamein and Glen Waverley
- ☐ West: Craigieburn, Sunbury, Melton, Werribee and Williamstown.

1. For each train line in your section complete the following.

- a. The names of each station.
- b. The distances of each station from the CBD.
- c. The cost of a ticket to the station from the CBD.
- d. Indicate these on the map. (Enlarge the map to A3, or use multimedia.)

Draft/workings/other information

2. For each train line in your section complete the following.

- Find out the travel times to each station from the CBD.
- Find out the travel times from each station to the CBD.
- Find out the peak and off-peak travel frequencies.



Draft/workings/other information

# Preview

3. Calculate the following travel times and distances.

- It's 07:30 hours on a weekday. If you set out from Pakenham station when will you arrive at Watergardens?

# Sample:

# Do Not

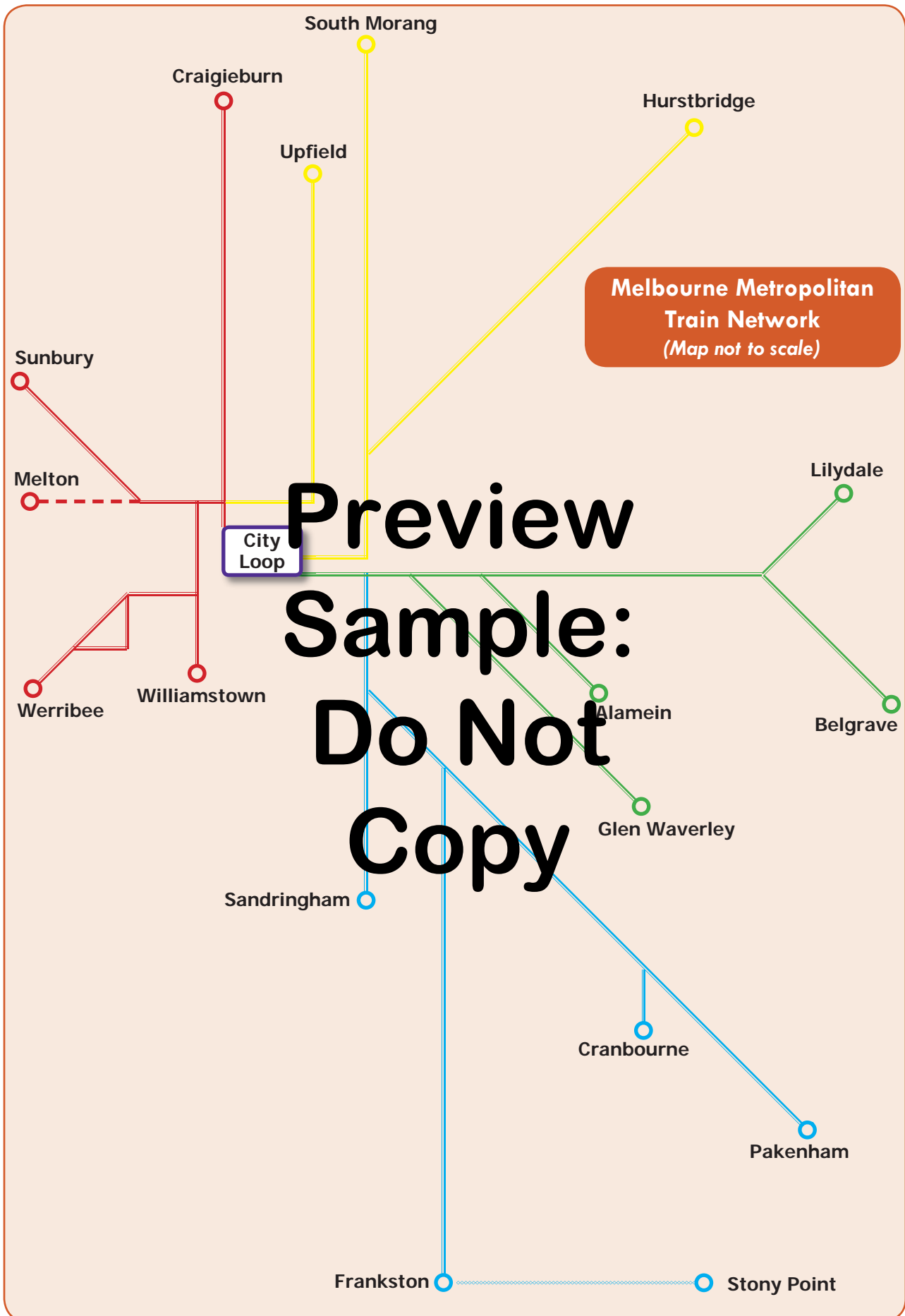
# Copy

- It's 14:35 on a weekday. If you set out from Hurstbridge when will you arrive at Werribee?

- It's 17:55 on a weekday. If you are at Frankston, when will you get to Craigieburn?

- It's 18:55 on Sunday. You need to go from Nunawading to pick up a friend in Oak Park and then back to the city to go out. Do you need to make this whole trip?

## 6.09 Using Maps





Sometimes we have to give people verbal instructions and directions which can result in a range of communication difficulties. Discuss these case studies and then provide verbal directions for each person. Why not role model these scenarios?

*Dimi needs directions to walk from your nearest railway station to your home. He texts you saying his phone is about to die, but he reckons he has 15 seconds of time left. Plan and then communicate your 15 second message to Dimi.*

# Preview

*Paola is vision impaired and uses a guide dog. She is to visit your school and needs directions from the town centre. She needs clear and explicit directions in one phone message, including time estimates.*

# Sample: Do Not Copy

*Cousin Tor is visiting from overseas. His English is very limited. The cab has dropped him in the next suburb (or town). He doesn't have enough money for another cab but could afford public transport (if it exists). Direct him to meet you at an identifiable local landmark.*

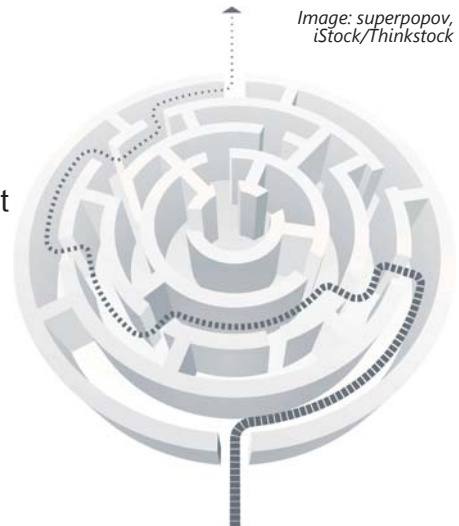


## 6.11 Retail Maps

### Retail layout

The mission of the retail industry is to get you to buy stuff, and lots of it. Retail design aims to ensure that consumers spend as much money as possible with a particular retailer (actually them!). So given this, different retail establishments are set up to suit the 'needs' of their target market. Retail shopping has been designed as an emotionally satisfying modern cultural and recreational experience.

This retail ambience extends to young funky stores that are set out like a club, playing loud music, creating a whole shopping experience. No self-respecting older person could stand to be in the store, which is just as well, because no self-respecting younger person would want to be seen dead in a store with old people in it anyway!



**Navigating retail layouts can seem like being in a maze at times!**

### Supermarkets

Retail and supermarket layouts are designed to try and get consumers to pass as many items as possible on their way to those few staple items that they came in to buy such as milk or bread.

Product manufacturers and wholesalers pay inordinate amounts to get the best shelf sites so as to attract the eye and \$ of consumers. Some items are also co-located to encourage complementary purchases, e.g. corn chips and salsa.

In modern times we earn more income but have less time. So we go to a supermarket that has been designed to make us queue up and waste our time to pay for 'cheaper' items. We even self-scan now, or in other words, do ourselves what used to be the job of the supermarket. Does this save time? What do you think?

So what is it to us that is really most precious? As at May 2018 the average hourly full-time wage was about \$41.71 (ABS, 6302.0 May 2018). So technically an hour of shopping costs \$41.71. Are supermarkets designed to save people \$41.71 an hour? Or are they designed to get people to spend more? Talk it over as a class.

### A Hard to find

Have you ever been to IKEA? Why do you need a map at this retailer? Outline other retail experiences that you think would be improved by a map.

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You are required to visit your local supermarket to research and map the store layout. You might be best undertaking this task in pairs or working as a group. Your teacher will instruct you as to your requirements and the tasks to complete.

Your teacher will also instruct you whether different groups will be mapping different stores, (which is the best way of doing this task).

You will need to gain relevant permissions including an unsupervised excursion form (if applicable) and of course, permission from the retailer.

### 1. Draft supermarket layout.

- Use a grid to map out the retail store from your memory, prior to visiting it.
- Make sure that you include all aisles, registers and relevant sections. Try to get the dimensions and layout as accurate as possible.

### 2. Accurate supermarket map.

- Visit the supermarket, take notes and make draft sketches so that you can complete your map later.
- Complete your final map. Make sure to include all aisles, registers and relevant sections. Try to get the dimensions and layout as accurate as possible.
- You should make and use a scale.

### 3. Analysis of supermarket Map

- Prepare a report to the class that discusses the effectiveness of the supermarket's layout, customer flows, retail links used by the supermarket in its layout, OH&S hazards, and any other issues that you noticed. Use PowerPoint or KeyNote or some other way of showing your supermarket map.
- Design a more suitable layout for a supermarket or for a retail store of your choosing.

*Notes and information*

Preview  
Sample:  
Do Not  
Copy

## 6.13 Distance and Time

### Travel rates

When we are travelling we usually need to estimate an expected travel time and an average travel speed.

If you are using public transport then a timetable will let you know of your approximate (but not exact) arrival time. This calculation gets more complex if you're combining smaller trips as part of your overall journey. But still - the timetable is your best friend!

But if you are getting there under your own steam, such as by car, bike or walking, then you might need to know the distance you are travelling, as well as a likely average travel speed.

The best way to plan your journey time is to start with the time when you need to arrive, and then work backwards. This method will give you a time when you need to start out on your journey. And the rest is up to you to organise. Of course your success depends on the complex activities and interactions of the entire public and private transport system! Nowadays many people just trust their SatNav to do this thinking for them!

A **travel rate** is expressed as the **distance** achieved in a certain amount of **time**, e.g. 10km per hour (10kmh). This is pretty 'slow' - unless you are jogging, or driving in city peak hour traffic.

If you know the **distance** and can confidently predict an **average speed** you can also estimate the **time** needed, e.g.  $10\text{kmh}/10\text{km} = 1\text{ hour}$ . Pretty simple really!

# Preview Sample:

A travel speed represents the ratio between one quantity (distance) and a second quantity (time). This relationship can be expressed as **rate**, such as kilometres per hour (km/h or kmh) or metres per second (m/s or mps).

e.g. An international passenger jet travels at about 700-900 km per hour. That's pretty fast over a sustained distance. Usain Bolt can sprint at just under 10 m/s for a short distance - up to about 200m. For a human, that's really bolting along! And in 2011 Kurt Fearnley wheeled the Boston Marathon in just under 79 minutes at an average speed of about 32kmh. That's really moving!

- ⇒ Strolling: 2-3kmh
- ⇒ Walking: 4kmh
- ⇒ Brisk walking: 6kmh
- ⇒ Easy jog: 6-8kmh
- ⇒ Skating: 7-10kmh
- ⇒ Fast jog: 9-11kmh
- ⇒ Running: 11+kmh
- ⇒ Cycling easy: 10kmh
- ⇒ Cycling moderate: 15-25kmh
- ⇒ Cycling hard: 25+kmh
- ⇒ Driving peak hour inner: 15-25kmh
- ⇒ Driving metro: 25-40kmh
- ⇒ Driving outer metro: 30-50kmh
- ⇒ Driving highway/freeway: 60-90kmh
- ⇒ Train 25-45kmh: regional much faster
- ⇒ Tram 15-35kmh: faster offpeak
- ⇒ Bus 20-40kmh: regional much faster

Many commuters cycle to work which can be much faster than peak hour driving!



### Slowing you down

When it comes to travel times it is important to estimate by taking into account the range of factors that can impact on travel times. Vehicles (and people) do not travel at 'top' speeds for an extended distance. For example, a motor vehicle on city roads will never average 60kmh (or 50kmh or even 40kmh).

So when getting from one place to another, people find that they usually travel at an average speed. This average speed can be impacted upon by a range of variables. You have to take these variables into account when estimating travel times - especially if you are travelling for an important event such as a job interview, to get to work or even to arrive at your wedding! Consider:

- ☹ method of transport
- ☹ day of the week
- ☹ time of the day
- ☹ traffic conditions
- ☹ familiarity with the route
- ☹ unforeseen circumstances such as roadworks or an accident



Preview  
Sample:  
Do Not  
Copy

### Distance and time A

1. Calculate the following travel times. What travel types/modes might be involved?

Distance: 60km at 60kmh.	Distance: 90km at 60kmh.	Distance: 50km at 100kmh.
Distance: 36km at 6kmh.	Distance: 8km at 24kmh.	Distance: 12km at 3kmh.

2. Estimate how long it would take you to travel these distances using these different travel modes. What would be the average speed of each?

	Walk/wheel	Jog/wheel	Cycle	Car
1km				
3km				
5km				
10km				
20km				
50km				
100km				

## 6.15 Distance and Time

### Costs of travel

Some people will travel great distances to secure a bargain of a few dollars, but are they really saving money? Sometimes we really need to work out whether it is worth the extra costs associated with travel.

### Direct (explicit) travel costs

The first cost issue with travel is the direct costs of the travel itself. When we use public transport we can easily see these costs. These are the costs of the ticket or fares we pay to use the system.

The second cost issue with travel is the lost time. People put a different value on their time. If the travel is associated with a leisure activity then they might be happy to 'give up' their time. But if the travel time takes away from their personal life, or adds to their work time, they might need to 'cost' their time at their average hourly income.

### Vehicle costs

When we use our car for travel it is not so easy to work out the direct costs of travel. But we should consider direct petrol costs and wear and tear. According to the RACV in 2018, a recent model Holden Commodore cost \$18.40 per kilometre to run. These running costs include petrol and tyre consumables, repairs, servicing and insurance. Different cars have different running costs depending on their size, fuel consumption and service requirements.

Apart from running costs, cars also incur 'standing costs'. These include costs such as registration and insurance, depreciation of the vehicle, interest costs on the car loan, and so on.

According to the RACV in 2018, that recent model Holden Commodore had standing costs of \$183.48 per week. Cars also have different standing costs depending on their purchase price and trade value.

The total vehicle costs for that Holden Commodore equalled \$237.81 per week, based on an average drive of 15,000 kms per year.

Check out [www.racv.com.au](http://www.racv.com.au)  
Search for [Driving Your Dollars survey](#) and  
look up the information for different cars.

### Public transport

Not everybody likes public transport, but in Australia it is a pretty effective option to get around most metropolitan areas. Regional services have varying degrees of usefulness. Using public transport saves vehicle costs; and in some cases, can save time. However, the use of public transport can both add to, and relieve stress. How so?



**"Petrol shock" can afflict many first car owners. Then there's rego shock, repairs shock and so on!**

Image: Lisa F. Young,  
iStock/Thinkstock

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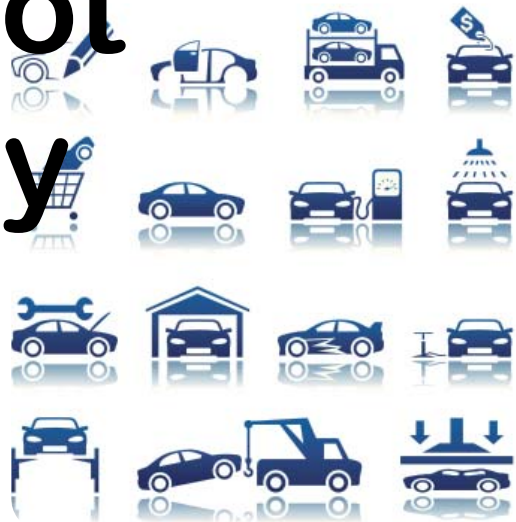


Image: Alexander Vasilyev,  
iStock, Thinkstock



1. Estimate and then research the costs associated with the following trips.
2. What other information might you need?



<i>i. A return weekday trip by public transport to the CBD.</i>  estimate: _____  actual: _____	<i>ii. Petrol costs to drive from your home to central Geelong.</i>  estimate: _____  actual: _____	<i>iii. A taxi ride from a night out in the city (or regional centre) to your home.</i>  estimate: _____  actual: _____
<i>iii. An Uber ride from a night out in the city (or regional centre) to your home.</i>  estimate: _____  actual: _____	<i>iv. Bus fare from Melbourne to Sydney.</i>  estimate: _____  actual: _____	<i>v. Return flight from your state to Perth.</i>  estimate: _____  actual: _____
<i>vi. Return flight to Los Angeles in December.</i>  estimate: _____  actual: _____	<i>viii. Your choice</i>  estimate: _____  actual: _____	<i>ix. Your choice</i>  estimate: _____  actual: _____

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6.17 Maps and Apps

Maps v apps

One of the most interesting outcomes of modern technology is watching people walking around streets while using their devices to find out where they are going. Perhaps they should just look up?

However, there is no doubt that mapping apps, GPS and other technological locators can provide enormous benefit for travellers. And they are very useful when one is lost! On the downside screens can be too small, GPS can suggest routes that ignore local knowledge (which can increase travel time) and users may dumb down and become technologically dependant.

Old-style paper maps and street directories can also be extremely useful in the right circumstances. Users can see a larger area, instantly recognise features, and orient the map in the direction they are travelling. However, they can be too large, can date quickly and are a distraction when driving.



Image: Sergey Nivens, iStock/Thinkstock

A Maps vs apps



List the advantages and disadvantages associated with using ‘printed maps’ such as a street directory as opposed to electronic maps such as GPS or a phone app.

Advantages		Disadvantages	
Printed maps	GPS & apps	Printed maps	GPS & apps



Old school vs new school **B**

Split into 4 groups for this challenge.

*Jorgen, is an exchange student who has just arrived from Denmark. As yet, he has no access to mobile technology. He wants instructions on how to get from your school to the CBD (or major regional town centre) using public transport. He is then going to hire a car for the weekend. He wants instructions on where to hire a car. Jorgen is then planning to drive to visit a zoo (or animal sanctuary), a beach (or lake or river), a BBQ/recreation area in a national park and an indigenous activity or cultural centre. He would also like to know where to stay overnight as part of his adventure.*

You are going to use different methods to plan and communicate the most appropriate travel directions, instructions and advice for Jorgen. Each group will choose one method only. The four mapping methods are:

- ⇒ a motor vehicle GPS system
- ⇒ an app on a mobile phone
- ⇒ a maps function on a desktop or laptop
- ⇒ a street directory or pre-prepared paper map

**Complete the following tasks**

1. Research and prepare travel instructions, costs and travel times for Jorgen.
2. Produce and prepare any relevant hard copy maps and instructions.
3. Does Jorgen need to use any mobile mapping technology to find his way around? Explain.
4. List any advantages associated with your particular mapping method.
5. List any disadvantages associated with your particular mapping method.
6. Prepare a group report to the class to communicate your advice and instructions to Jorgen.
7. As a class discuss the strengths and weaknesses of each method.

Notes and information

## 6.19 Assessment Task

### AT6 On Holiday

Good news. You are going off on a 2-week holiday. For this task you are required to plan your travel itinerary, find out costs, times and other information; and collect and gather relevant destination data.

⇒ You should use online resources to help you with your research.

⇒ You should set up a table with a draft itinerary like the one below.



#### Away you go!

You are required to plan a 2-week local holiday in your state visiting at least 3 destinations, and then prepare a report to the class based on your holiday plans.

- Decide on your destinations.
- Plan your travel route, travel modes, travel times.
- Draw or print a map showing your travel destinations.
- Research and calculate the costs of your travel.
- Find out room rates for where you are staying, and calculate the total cost of your accommodation for the holiday.
- Identify any attractions and activities that you will be enjoying, and list any costs associated with those.
- Calculate your total budget (don't forget to include money for food, spending money and other expenses).
- Prepare and (if required) present a summary report.

Add other information, notes, key dates, etc..

Do Not  
Copy

Name: \_\_\_\_\_ Draft itinerary to: \_\_\_\_\_

Dates: \_\_\_\_\_ Travelling with: \_\_\_\_\_

Day & date	Destination from/to	Travel mode & Cost	Travel times	Accommodation & cost	Activities & cost	Other information
e.g Monday 26/11/19-	Melbourne - Colac	Drive/ Petrol \$35	2.5 hours Depart 11:45 - Arrive 14:15	La 'Otel De Cucaracha \$90 night	Dinner \$25	Need to pre-book the hotel.
Day 1						
Day 2						
Day 3 etc.						

Name(s):

Key dates:

Tasks - AT6: On Holiday	Re- quired	Due by	Done	Teacher initials
<b>1: Planning your holiday</b>				
a. Research suitable destinations.	<input checked="" type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
b. Plan and outline travel route and associated information.	<input checked="" type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
c. Prepare your travel maps and times.	<input checked="" type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<b>2: Budgeting for your holiday</b>				
d. Research, estimate and calculate travel costs.	<input checked="" type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
e. Research and calculate accommodation costs.	<input checked="" type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
f. Research, estimate and calculate food costs.	<input checked="" type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
g. Prepare your holiday budget.	<input checked="" type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<b>Stage 3: Reporting</b>				
⇒ Prepare report to the class.	<input checked="" type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
⇒ Present your report if required.	<input checked="" type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

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Additional information:

Signed: \_\_\_\_\_

Date: \_\_\_\_\_

## 6.21 Self-Reflection

### Self-Reflection Pro-Forma

Which numeracy skills did I develop during this unit?

→ \_\_\_\_\_

→ \_\_\_\_\_

→ \_\_\_\_\_

How have the skills of numeracy helped improve my personal life?

→ \_\_\_\_\_

→ \_\_\_\_\_

How have the skills of numeracy helped my development of work-related skills?

→ \_\_\_\_\_

→ \_\_\_\_\_

How would I rate my performance using a circle in developing my numeracy skills this unit?

0 not shown	1 low	2 reasonable	3 good	4 very good	5 excellent
----------------	----------	-----------------	-----------	----------------	----------------

What were my strongest areas of performance and what should I work on improving?

My strongest topics/skills were:	But I need to improve my skills in:

Signed: \_\_\_\_\_ Date: \_\_\_\_\_

Teacher initials: \_\_\_\_\_ Date: \_\_\_\_\_

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# Design and Representation 7

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7.05 3D Objects .....	146	7.19 Assessment Task.....	160
7.09 Representing Objects.....	150		

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7.01A Basic shapes	142	<input type="text"/>	<input type="text"/>
7.02B 3D shapes	143	<input type="text"/>	<input type="text"/>
7.03C Describing shapes	144	<input type="text"/>	<input type="text"/>
7.04D Recognising shapes	145	<input type="text"/>	<input type="text"/>
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7.16D Classroom floorplan	157	<input type="text"/>	<input type="text"/>
7.18C Organic infographic	159	<input type="text"/>	<input type="text"/>
AT7 Make Me Over	160-162	<input type="text"/>	<input type="text"/>

Comments:

## 7.01 Shapes and Design

### Design

As part of everyday living you interact with design all of the time. The consumer products you use are designed for your needs. Industrial products have been designed for a particular use.

Sometimes design is technical; at other times it is more artistic. People might develop and design systems, processes and procedures to help us do our jobs more efficiently. People might also design graphics, multimedia productions and works of art to improve our leisure and hobby experiences.

Good design has often been said to be a blend of form and function, that is; how good something looks versus how good it works. So how good are you at recognising the shapes that surround you in everyday life?

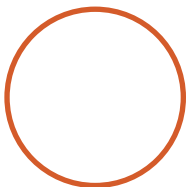









Image:  
Nik\_Merkulov;  
iStock/Thinkstock

**'Modern' design is constantly evolving. What's next?**

### A Basic shapes

1. Name each of the basic shapes shown in the table below.
2. List 3 objects that you come into contact with as part of your everyday life that have been designed using this basic shape.
3. List a naturally occurring situation in nature which resembles this shape.

**Preview  
Sample:  
Do Not  
Copy**

### 3-Dimensions

You live in a 3-dimensional (3D) world. The spatial dimensions which interact to create a sense of depth are:

- ⇒ **length**
- ⇒ **width**
- ⇒ **height.**

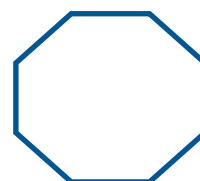
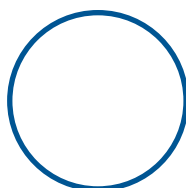
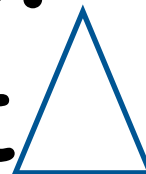
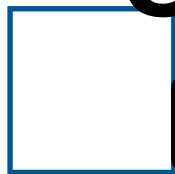
On paper you can usually only work in 1 or 2 dimensions. 1D involves lines. 2D involves the flat shapes on these pages. However, talented graphic designers can make 2D shapes seem like 3D objects by creating a sense of depth. You see the world in 3D. This is because you have two eyes which create **binocular** vision. If you cover one eye you will lose the ability to sense depth accurately. This can be a hazard when performing tasks such as driving.



### 3D shapes B

1. Change the shapes below into their corresponding 3D objects. Name them. (You might need to sketch some carefully in your workbooks to get these right.)
2. For each shape list 3 objects that you come into contact with as part of your everyday life that have this 3D shape.

**Preview**  
**Sample:**  
**Do Not**  
**Copy**





## 7.03 Shapes and Design

### The shape of our environment

Have a look at the direct world around you now. What types of shapes exist?

Look at your hands, your body, your legs and arms and feet, your clothes, your school materials, the chairs and tables in the room, the fixtures and fittings and all the equipment. Look down at the floor to see the patterns and up at the ceiling to see everything going on there. Look at the other people, their faces, their eyes.

You live in a world of objects and shapes. Objects with depth are 3-dimensional. Flat shapes appear 2-dimensional. Lines are 1-dimensional. Think about this...sometimes shallow people are described as being 2-dimensional. How about that! What does shallow mean? Without depth of course!



### C Describing shapes

## Preview

1. List 6 things in this room and describe their shapes.

**Sample:  
Do Not  
Copy**

2. Draw 4 body parts and/or items of clothing and describe their relevant shape.  
e.g. *My eyes are quite round and are spherical in depth.*

## Recognising shapes D

1. Name or describe the shapes represented in the drawings below.
2. List things from your everyday world that are similar to these objects.

Image:  
Adapted from  
Axsimen/  
Depositphotos.com



3. Choose an item or an object from your everyday life that consists of 2 or more of these shapes. Draw it, or take a photo.
4. Take accurate measurements of the object's dimensions. Add these to the drawing or image.
5. List the major shapes that are part of this object.

## 7.05 3D Objects

### 3D objects

A key part of visual numeracy is the ability to estimate and manipulate objects in three dimensions. One way to work with solid objects is to use **object nets**.

As an example, consider the 3D properties of a cube. A cube is a solid 3-dimensional item and this shape is used for items such as dice, a block of sugar, a stool, a gift box and even sandstone bricks.

But if you were covering a plain cardboard cube with gift wrapping paper how should you lay out and cut your paper for maximum efficiency? To help you picture this (i.e. to use visual numeracy) you can use an object net.



Image: scanrail/  
iStock/Thinkstock

Preview  
Sample:  
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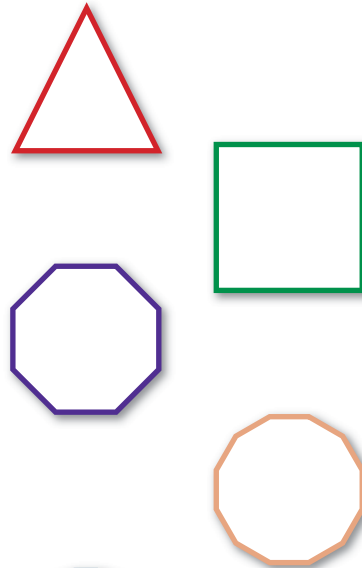
#### A Cube net

1. Measure the cube net shown above and draw it on stiff card or heavy paper.
2. Carefully cut, fold, assemble and fix the cube.
3. How did you go? Does your cube look neat?
4. Create a cube net for a cube 3 times the size as the one above.
5. Cover the cube with decorated paper. Use your net to measure the paper. Glue the paper to the cube. Now that you're a crafts person you might try to sell this on Etsy! Otherwise make a gift of your cube to your favourite teacher!
6. Outline the type of work tasks that object nets might be used for.

### Other shapes

Some shapes have all of their sides of equal length and all of their angles of equal length. These are called **regular polygons**. Some of these include:

- ⇒ **Trigon** (needs to be an equilateral triangle)
  - It has 3 sides which as a solid object can be formed into a tetrahedron with 4 faces
- ⇒ **Square** (tetragon) - It has 4 sides which as a solid object can be formed into a cube (hexahedron) with 6 faces
- ⇒ **Octogon** - It has 8 sides which as a solid object can be formed into an octahedron with 8 faces
- ⇒ **Dodecogon** - It has 12 sides (look in your pocket, you might have one!) which as a solid object can be formed into a dodecahedron with 12 faces
- ⇒ **Icosagon** - It has 20 sides which as a solid object can be formed into an icosahedron with 20 faces.

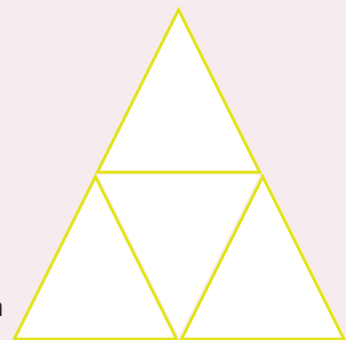


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### Solid objects

B

1. Shown opposite is the net for one of these shapes. Which shape is it?
2. Use stiff card to draw up this net and then assemble 3 of these shapes.
3. As a class combine the shapes you have made into one big object. Comment on how well (or not) these shapes fit together. Discuss whether any of these shapes are used in commerce or industry? Why/why not?
4. Go online and find out about octahedrons, dodecahedrons and icosahedrons. Make a dodecahedron.
5. Create or source an image for each of these. Find out if, and how, each shape is used for products; or if they exist in nature.



octahedron	dodecahedron	icosahedron

## 7.07 3D Objects

### Irregular shapes

In reality most shapes are irregular and are not uniform. They don't fit together as neatly with each other as do cubes or tetrahedrons. So in order to function successfully in the world, you need to be able to visualise how these shapes might fit together. For example:

- ⇒ a furniture removalist will have to pack a household full of odd-shaped furniture and other household items, very carefully, into a rectangular van,
- ⇒ a cabinet-maker might combine different shaped cabinets, cupboards and drawers into a practical kitchen fit-out, and
- ⇒ a visual merchandiser might need to display different shaped and varied size stock items in an attractive and cost-effective manner.

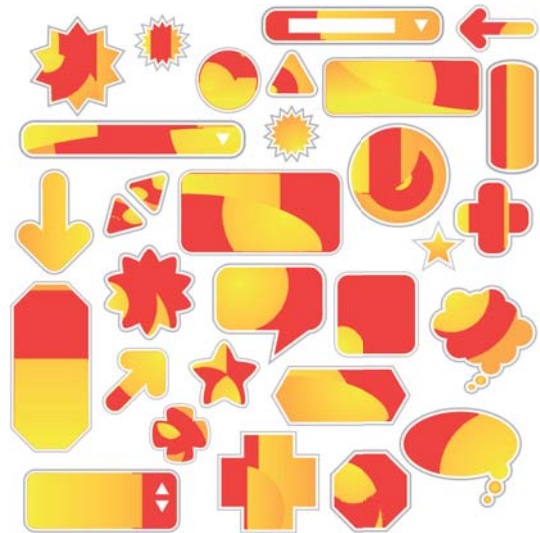


Image: Adapted from John Takai/Hemera/Thinkstock

You need to be able to use visual spatial numeracy skills to work effectively with these irregular shapes.

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**Sample:**  
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**Copy**

### C Shape of tools

1. Choose 6 of these tools, draw and correctly name each.
2. Describe the overall shape of these 6 tools, and also the shapes that constitute the main parts or components of each tool. (Consider terms such as sphere, cylinder and so on.)



Image: sv-time/iStock/Thinkstock


Pack up your troubles **D**

1. Why do removalists try to pack as many things as they can in boxes?

---

---

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---

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2. Why is it important for removalists to fit as much as they can into their truck?  
Does this also apply to you if you are hiring a van for the day?

---

**Preview**

**Sample:**

3. What sorts of household items might be packed together to save space? Explain.

---

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---

---

---

4. Retail stores tend to dislike items that come in round or odd-shaped packaging.  
Why so?

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---

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---

---

## 7.09 Representing Objects

### Representing size

When drawing and designing you might often have to represent shapes and objects as different sizes from what they actually are. You will usually have to show large-sized shapes and objects as smaller design elements or images. At other times you might have to do this representation the other way around, and make smaller shapes and objects bigger. Two important numerical techniques that you can use for this involve **scale** and **ratio**.

### Scale and ratio

A scale is used to represent the relative distance or size of a map, diagram, shape or object compared to itself in real life.

Scales use quantity ratios, e.g. 1:4, 1:20, 1:10,000 or even 2:1!

A map scale of 1:10 (in cm) means that every 1cm on the map represents 10cm in real life. Or, the map is 1/10th the size of real life.

An action figure might be in 1:6 scale. This means that every 1cm of the action figure represents 6cm in real life. So the action figure is 1/6th the size of the character it is representing.

A small object such as fly might be drawn at 4:1. This means that the drawing is increasing the real life size of the fly by a factor of 4.

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*e.g. Tul draws a 3cm square at a ratio of 1:1*

*Measure this square to see how well he has done.*

*Now Tul draws the 3cm square at a ratio of 2:1. He has doubled the size of the square.*

*Measure this square to see how well he has done.*

*Finally Tul draws the original 3cm square at a ratio of 1:2. Now he has halved the size of the square.*

*How well did he do with this drawing?*

Consider: 

*One thing you will notice about these scaled drawings is that the square that has doubled in size (2:1) actually looks a lot bigger than simply being doubled. Do you agree?*





*And the square that is half the original size (1:2), looks much smaller than simply being halved. And it looks much, much smaller than the 2:1 square.*

*(The 2:1 square is actually 4 times the size of the smaller 1:2 square but it looks much larger than that!)*

*The reason for this 'difference' relates to measurements of area.*



1. First, estimate the dimensions (size) of these icons as shown on the page.
2. Second, measure these icons. How did you go with your estimates?
3. In your workbooks convert these icons by:
  - ⇒ doubling their size
  - ⇒ halving their size.
4. Turn these icons into drawings of 3D objects by adding depth.
5. Check your answers by measuring the new dimensions of your enlarged, reduced and 3D icons. How did you go?
6. Estimate the scale of the drawings of each icon compared to the object that each represents in real life.

	<h1 style="text-align: center;">Preview Sample: Do Not Copy</h1> <p style="text-align: center; font-size: small;">Image: adanv1/iStock/Thinkstock Image: adanv1/iStock/Thinkstock</p>	
 <p style="text-align: center; font-size: x-small;">Image: greenwatermelon/iStock/Thinkstock</p>		 <p style="text-align: center; font-size: x-small;">Image: Tanton/Depositphotos.com</p>

7.11 Representing Objects

Representing objects

Designers and illustrators represent real life objects and living creatures as **2D** drawings either by **hand**, by using **computer software**, or through a combination of methods.

One way to represent objects, especially in drawn plans, is by using an **elevation** view. So this means drawing the object from the point-of-view that looks down from above on the object. This way the object can be easily drawn using simple geometric shapes. The creator of the plan can also use **scale** to ensure that the areas of the plan, and the objects in the areas, are shown at the 'right' **size relative** to each other.

In other situations the creator of a plan will render the drawing in a **3D** style, usually using **CAD software**. This makes the finished illustration resemble a **model**. This means that the designer or illustrator no longer has to stick to a simplified elevation view.

Some plan creators even make **models**, **dioramas** and **maquettes** based on the plans. This is especially so with architects, set designers, product developers and others working with large-scale objects and settings.



Image: AndrewLozovyi/Depositphotos.com

B Floorplan

- 1. List the rooms/areas shown on the floor plan.
- 2. Identify the objects represented in each room/area. Does the scale of these objects appear to be accurate? Explain.
- 3. Add any other objects that you would put in these rooms.
- 4. Add objects into bedrooms 2&3.

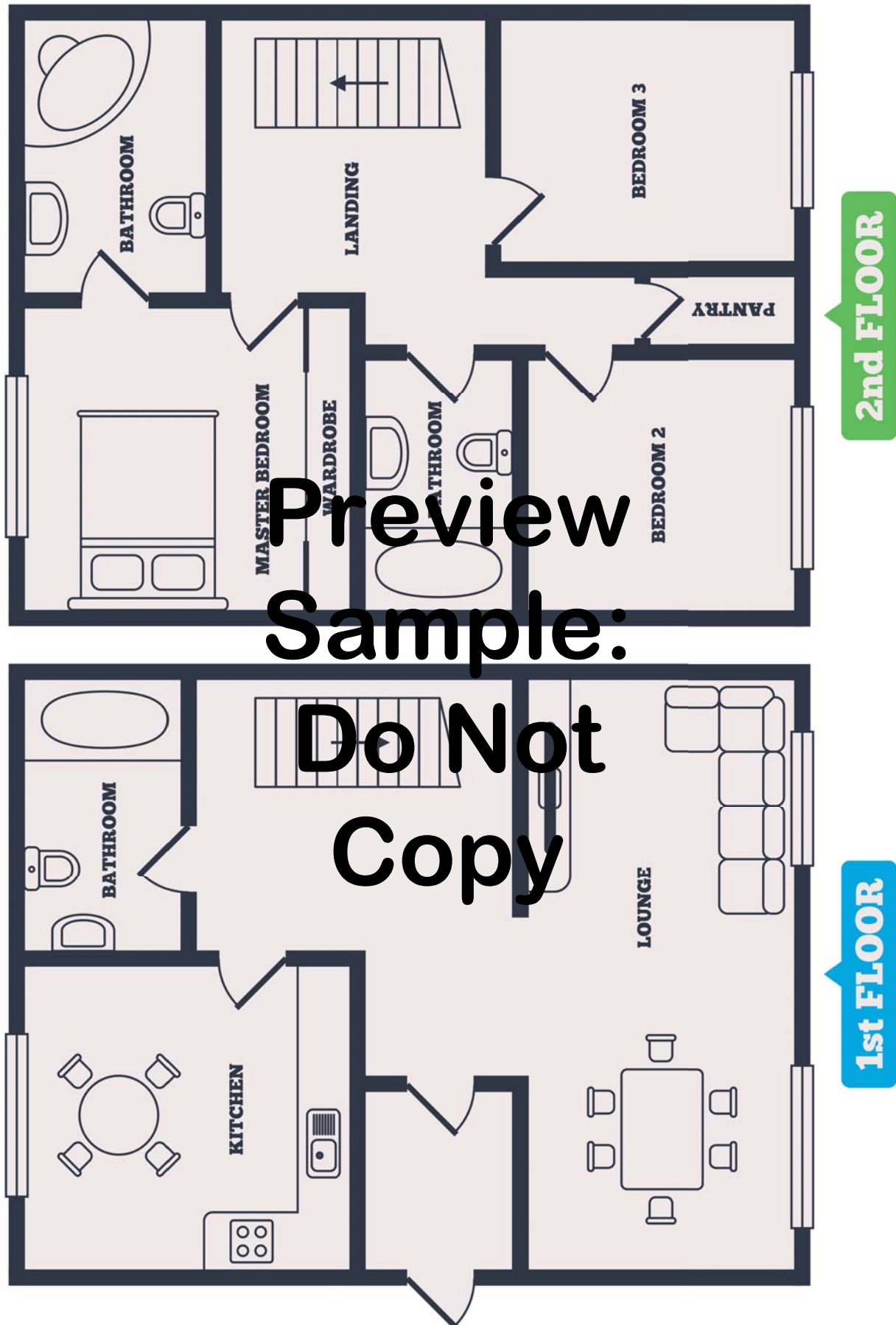



Image: Blankstock/Depositphotos.com

## 7.13 Plans and Diagrams

### Plans

An important numerical skill is the ability to read, interpret and design plans. This skill often requires people to think in a visual-spatial way.

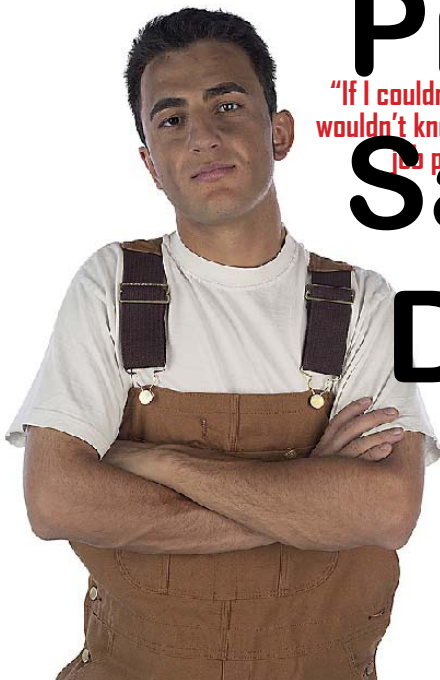
Plans are used in many different occupations and industries and may go under many different names. Common examples include:

- ⇒ plan
- ⇒ map
- ⇒ diagram
- ⇒ floor-plan
- ⇒ blueprint
- ⇒ schematic
- ⇒ diagram
- ⇒ circuit diagram
- ⇒ technical drawing
- ⇒ sketch.

### Occupations - plans & diagrams

Here are some key occupations that rely on diagrams and visual plans.

- ⇒ architects
- ⇒ electricians
- ⇒ electro-technology workers
- ⇒ construction workers
- ⇒ car mechanics
- ⇒ computer programmers
- ⇒ engineers (all types)
- ⇒ designers (all types)
- ⇒ business equipment technicians
- ⇒ logistics co-ordinators
- ⇒ drivers
- ⇒ geologists
- ⇒ plumbers
- ⇒ surveyors
- ⇒ bricklayers
- ⇒ miners
- ⇒ draftspersons
- ⇒ builders
- and many more.



### A Working plans

Choose types of plans from the list above, and explain how these might be used by people working in specific occupations.

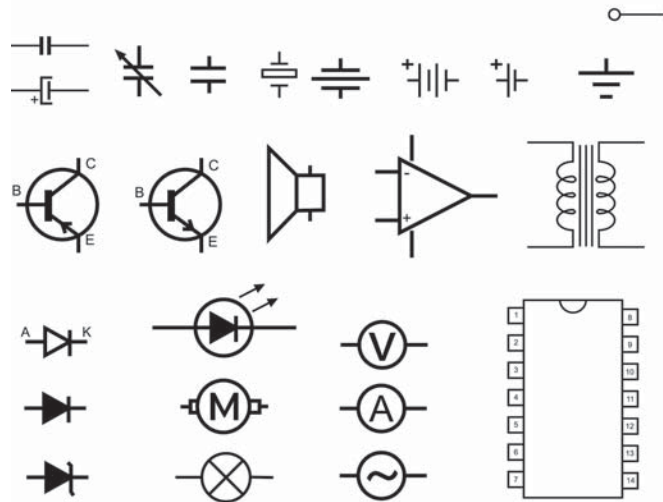
i.	ii.
iii.	iv.

### Plan symbols

Plans and diagrams use a common set of symbols to represent 3-dimensional items.

Technical symbols on plans and diagrams are usually standardised so that anyone reading the plan can quickly recognise what a shape is meant to be representing.

Using these symbols improves accuracy, efficiency and also safety.



**Do you know what these symbols are used for?**  
**Some of you will recognise these immediately and be able to say what they are and even perhaps know what they represent on a plan, schematic or diagram.**  
**Most of you won't - that's no problem - that's why we engage skilled workers who know their stuff!**

# Preview

Image: iStockphoto78/  
Depositphotos.com

Plan symbols

B

Draw symbols to represent the following fixtures and fittings that might be a part of a house plan. Name the symbols that you use in each drawing.

*Tip: Go online and check a real estate agent's website for house floorplans.*



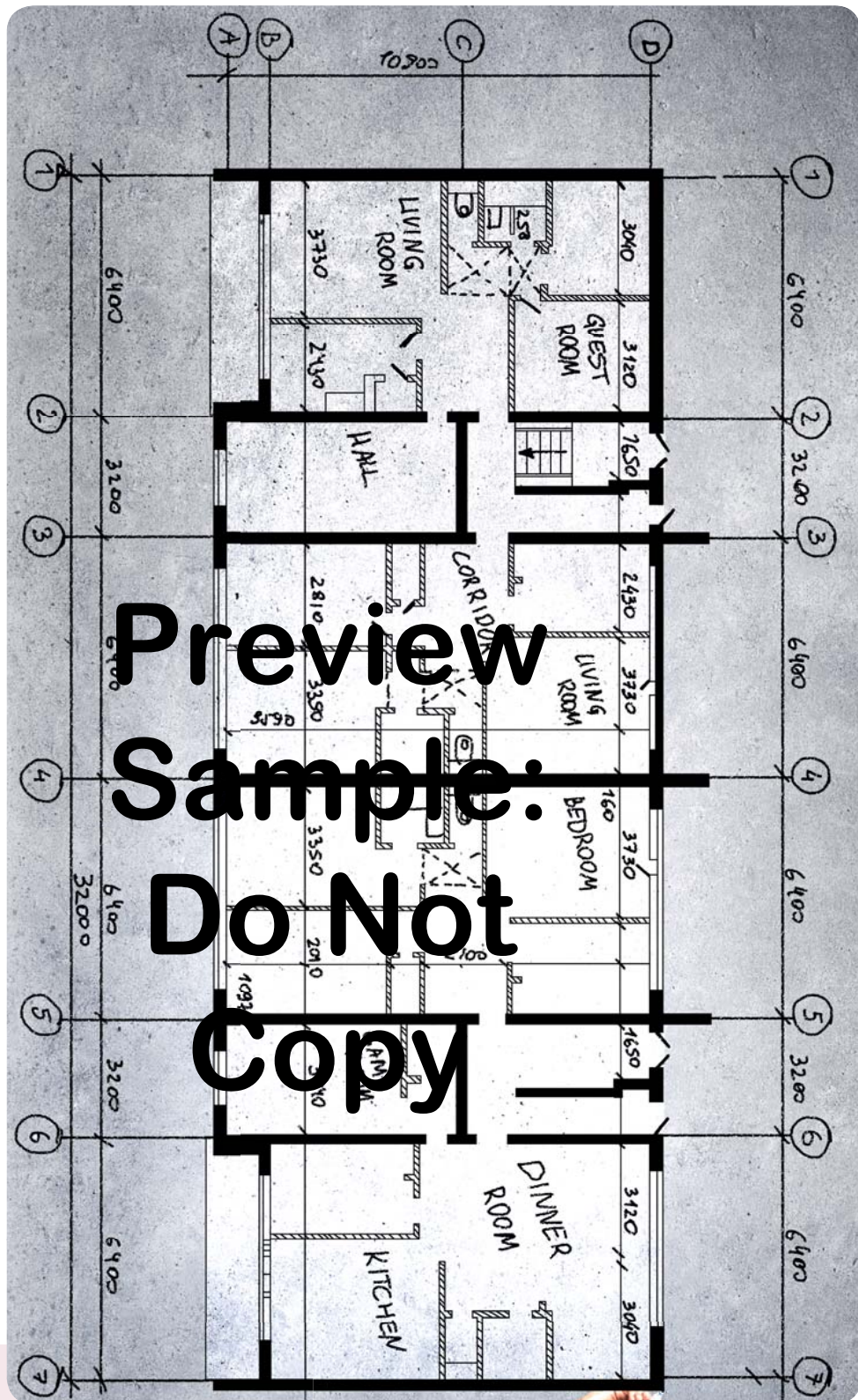
door	light fitting
toilet	electrical outlet
stairway	wall
window	tree
table	sink
fireplace	couch

# Do Not Copy



## 7.15 Plans and Diagrams

Image: Khakimullin/  
Depositphotos.com



### C Plans

Jhak asked the builder, Jheel to send him the plans. Jheel texted this grainy image.

1. Identify and list the numerical measuring information shown on the plan, including the size of the rooms. Is this a big, medium or small house? How do you know?
2. What are some problems that can occur when taking quick snaps of complex or important documents?

## Classroom floorplan D

1. Draw a floorplan of this classroom. Start by doing a sketch below.
2. Include all permanent fixtures and fittings and also all furniture items.
3. Make sure that you include relevant dimensions as well.
4. Include all electrical, air-conditioning and plumbing fixtures (if relevant).
5. After your teacher has checked your draft, prepare a larger final floorplan on A3, poster paper or using a multimedia design program.

Name: \_\_\_\_\_ Floorplan of Classroom: \_\_\_\_\_

*Orient this page to match your room.*

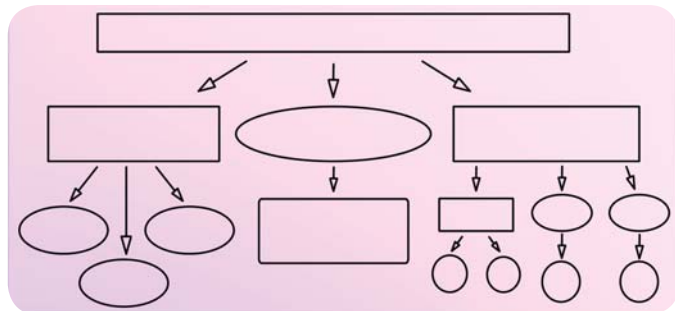
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## 7.17 Plans and Diagrams

### Diagrams

A diagram is a visual representation that usually combines numerical, written and visual elements. In a diagram, it's the **visual information** that is usually the key **communication tool**. Diagrams often set information out in a structured way so as to show the **relationships** between people, decisions, actions, resources, flows of information and other key elements.



**Charts, diagrams and mind-maps can be an effective way to summarise and communicate complex ideas, thoughts and information that could take a long time to explain in words.**

*Image: Pixelery.com/Depositphotos.com*

Some people will prefer to use a diagram either to **communicate information**, **record ideas** or **give instructions**. For example, a tradie will often make a sketch diagram to layout what a potential client is asking for, such as with a kitchen renovation. A couple about to be married might make a diagram of the seating plan for their reception (single colleagues down the back table of course). And a sports coach might make a diagram of the field positions for players for a set play.

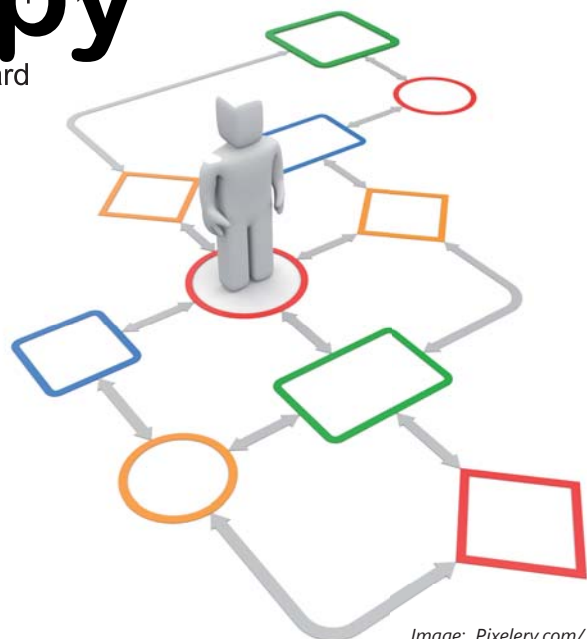
So do you create diagrams, can you 'read' and interpret them, and do you naturally prefer to think in this **visual-spatial** way?

There are many different types of diagrams. Some common uses and examples include these, as well as many more, including a range of industry-specific technical diagrams.

- ⇒ Organise ideas and information, e.g. mind maps, organisational charts.
- ⇒ Give instructions, e.g. how-to guides, assembly instructions.
- ⇒ Inform customers, e.g. online menu, stadium seating plans, self-serve instructions.
- ⇒ Outline a process, e.g. flowchart, instructions, order processing, production plan.
- ⇒ Aid navigation, e.g. route markers, maps, travel routes, site maps.
- ⇒ Communicate summary information, e.g. graphs, charts and infographics.
- ⇒ Communicate safety information, e.g. hazard warnings, safety instructions, emergency exits.

**Flowchart diagrams can be very useful for mapping out a process that involves choices between decisions and what actions might then need to be taken.**

**In fact many people think in a flowchart type of way when planning and doing tasks, especially when they are developing new skills, such as driving.**



*Image: Pixelery.com/Depositphotos.com*

## Organic infographic E

Shown below is a computer-drawn infographic that illustrates the factors of production and steps involved in organic farming. You can see that text is used sparingly. The diagram has used perspective to present objects in more of a 3D style. It also includes directional flow arrows; and it doesn't worry about scale.

1. In your workbooks, identify the key information shown in this organic farming infographic.
2. Evaluate the effectiveness of this infographic. Consider how long it took you to interpret the information. Also consider how effectively the infographic shows different elements in relation to one another. Have you learned about the 'organic farming' process from the infographic?
3. Develop an infographic about something you are quite expert in. This might be a personal situation (e.g. how to build fitness) or a work-related situation.

Image: macrovector/Depositphotos.com



## 7.19 Assessment Task

### AT7 Make Me Over

Your eccentric Uncle Boab has promised you \$2,000 for your birthday. However, he will only give you the money if you spend it doing a makeover of your bedroom. He has said that he will pay for items such as:

1. painting and decoration
2. bed and bedding
3. furniture and study equipment
4. audio-visual systems and equipment/devices
5. (others as negotiated with your teacher). \_\_\_\_\_



*Note: Fixtures refers to fixed aspects of the room such as doors, windows, vents, etc..*

#### Stage 1: Planning and Design

- ☐ Draw a draft using common shapes to sketch your room as it is now, noting key dimensions. Use the page opposite as a start.
- ☐ On your sketch identify any static features such as doors, windows, etc..
- ☐ On your sketch lay out the fittings and furniture that are currently part of your room.
- ☐ Discuss your sketch and ideas with your teacher.

#### Stage 2: Creating a 2D Simulation

- ☐ Outline the changes you are going to make as part of your room makeover.
- ☐ List all the items that you are going to use and/or buy to makeover your room. Name these correctly. Note their dimensions.
- ☐ Prepare a basic budget that outlines your expenditure on the items you have chosen. (Tip: Refer to p.85 for a guide.)
- ☐ Draw a precise layout of your 'new' room noting all static fixtures and their relevant dimensions. Include a scale.
- ☐ Use stiff card or cardboard to make a 2D representation of all the fittings in your 'new' room.
- ☐ Use an adhesive to affix these objects in the 'room'.
- ☐ Discuss your 2D layout with your teacher.

#### Stage 3: Building a 3D Model

- ☐ Use cardboard, timber, plaster or some other medium to make models of the fittings and furniture you have selected as part of your room makeover.
- ☐ Use these models to create a 3D diorama of your room after the makeover.
- ☐ Give an oral presentation describing your 'new' room to the class. (Your teacher will inform you whether this is a compulsory task for this activity.)




**My Room: Before**

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Sketch # \_\_\_\_\_

*(Tip: Orient this page to match your room. Make copies as needed for your drafts.)*

**Preview  
Sample:  
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## 7.21 Assessment Task

<b>Name:</b>				
<b>Key dates:</b>				
<b>Tasks - AT7: Make Me Over</b>	<b>Re- quired</b>	<b>Due by</b>	<b>Done</b>	<b>Teacher initials</b>
<b>Stage 1: Planning and Design</b>				
i. Draw a draft sketch of your room with dimensions.	<input checked="" type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
ii. Include any static fixtures on your sketch.	<input checked="" type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
iii. Include fittings and furniture on your sketch.	<input checked="" type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
iv. Discuss the sketch with your teacher.	<input checked="" type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
v. Finalise your sketch.	<input checked="" type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
	<input type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<b>Stage 2: Creating a 2D Simulation</b>				
i. Summarise changes you are planning to do as part of the makeover.	<input checked="" type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
ii. Prepare a basic budget showing your expenditure.	<input checked="" type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
iii. Draw a precise layout of your new room. Include fittings, fixtures, dimensions and a scale.	<input checked="" type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
iv. Make a 2D representation 'showing' your room after the makeover.	<input checked="" type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
v. Discuss your 2D layout with your teacher.	<input checked="" type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
	<input type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<b>Stage 3: Building a 3D Model</b>				
Make a 3D diorama of your room makeover.	<input checked="" type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
	<input type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<b>Prepare and present a report.</b>				
⇒ Prepare your report.	<input type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
⇒ Present your report if required. 	<input type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Additional information:				
Signed: _____			Date: _____	

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# Measuring Up

8

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Activities 8: Measuring Up	p.	Due date/Done?	Comment
8.01A Measurement units	164	<input type="text"/>	<input type="text"/>
8.02B Estimating	165	<input type="text"/>	<input type="text"/>
8.03A Distance	166	<input type="text"/>	<input type="text"/>
8.04B Perimeter - Rectangle	167	<input type="text"/>	<input type="text"/>
8.05C Perimeter - Triangle	168	<input type="text"/>	<input type="text"/>
8.06D Circumference - Circle	169	<input type="text"/>	<input type="text"/>
8.07E Edge of reality	170	<input type="text"/>	<input type="text"/>
8.08F Pizza time	171	<input type="text"/>	<input type="text"/>
8.10G Combined shapes	171	<input type="text"/>	<input type="text"/>
8.11A Golden cloth	174	<input type="text"/>	<input type="text"/>
8.12B Pizza revisited	175	<input type="text"/>	<input type="text"/>
8.14A Volume - Solids	177	<input type="text"/>	<input type="text"/>
8.15B Cola volume	178	<input type="text"/>	<input type="text"/>
8.15C Treat or threat?	178	<input type="text"/>	<input type="text"/>
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8.18A Angles	181	<input type="text"/>	<input type="text"/>
8.19A Area in action	182	<input type="text"/>	<input type="text"/>
8.20B Candy counter	183	<input type="text"/>	<input type="text"/>
AT8 Measuring Quality of Life	184-185	<input type="text"/>	<input type="text"/>
8.21 Self-Reflection	186	<input type="text"/>	<input type="text"/>

Comments:

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## 8.01 Measuring

### Measuring

You measure lots of things. Time, cost, distance, weight, depth, area, volume, speed and so on. Measurements use particular units that are standard. This makes it easier to do calculations. It also makes it easier for people to communicate more effectively by sharing a common language.

Some workers need to measure very accurately and may use precision tools and instruments. These include engineers, draftspersons and pharmacists. Why so? Other workers can afford to be a little less accurate because they work in occupations that do not need to be exact, such as chefs, concreters or clothing designers.

As a person becomes more skilled and experienced they are more able to easily estimate measurements. For example:

- ⇒ experienced tradespeople can look at a job and give a pretty accurate estimate of the materials and time needed for completion, or
- ⇒ an experienced hairdresser can assess a client's hair and estimate how much length needs to be removed, or
- ⇒ an experienced teacher can estimate how long it should take for a class to complete an activity.

### Measuring tools and devices

In order to measure accurately you need to use appropriate tools and devices. Although estimates can be useful when planning a task, people need to be more accurate when it comes to actually organising and doing these tasks.

Precision measuring tools are **calibrated** for accuracy so that a user doesn't just have to rely on estimates. There are thousands of specific measuring devices that can be used for different tasks within different jobs. Which ones are you familiar with?



### A Measurement units

List some common units of measurements for each of the following. What types of measuring instruments might you commonly use to measure these units?

length	mass
volume	temperature
time	price/cost
speed	other



## Estimating

When making estimates for measurements you should make use of rounding.

e.g. You need 4 timber lengths of 1.3m for skirting. What total length do you need to buy? You will need about 6 metres ie.  $4 \times 1.5\text{m}$  just to be safe. You round up because you can cut extra timber off.

e.g. You want people at your party to have about a 375ml can of drink each. But you are buying bottles because they are cheaper. 20 people are coming. How does four 2 litre bottles sound? 375ml round up to 400ml. Times by 20 = 8,000ml or 8 litres.

e.g. Kitty needs to save \$1,000 for a holiday at the end of the year. Kitty usually gets about 10 hours per week in shifts and takes home \$10 per hour. Kitty has estimated she spends about \$55 a week. So she rounds her spending down to \$50 and says it will take her 20 weeks to save up. What do you think?

You find out that Kitty actually averages 9.5 hours a week but she upped that to 10 because it's a nice round number! What would you have recommended she do?

### Estimates and rounding

#### Round up: Playing it safe!

Always allow a bit extra just to be safe especially when working with materials.

#### Round up: Overestimate costs

If you are spending money then round up. Things often cost more than you expect. If you run out of money then a project or goal could fail.

#### Round up: Don't fool yourself

Don't underestimate things that are hard, or that require discipline, or which involve a long time frame or might be subject to other variables and/or unknowns. Instead round them up!

#### Round down: Don't get cocky

Don't overestimate 'good' things such as income. Always round down money you are expecting to earn or hoping to get - just in case!

And what about the haircut rule?



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## Estimating B

Estimate each of the following. You choose the measurements and the units. Make measurements to see how accurate you were.

The 'size' of this room.	The length of your hair.
The perimeter of the school grounds.	The area of your bathroom at home.
The volume of a shipping container.	The cost of the timber for a doghouse

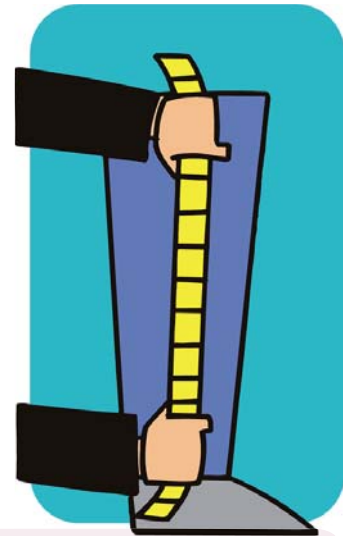
## 8.03 Measuring Length

### Distance

In essence, distance tells us 'how far'. We might measure the distance between one or more places, a distance travelled, distances around the edge of an object (which we usually call perimeter, or circumference for a circle) or other distances.

Distances are usually measured in mm, cm, m and km.

- ⇒ 1 kilometre = 1,000 metres.
- ⇒ 1 metre = 100 centimetres.
- ⇒ 1 centimetre = 10 millimetres.



### A Distance

Estimate and then calculate each of the following.



1. How many millimetres are in 2.4 metres?

2. How many metres are in 17.3 kilometres?

3. How many centimetres are in 1 metre plus 65 mm?

4. What is the distance from your home to your school?

5. Over what distance is the Melbourne Cup run?

6. What is the distance from your eyes to the bottom of your feet?

7. What is the distance in km and metres for the Olympic Games Men's Marathon?

8. What is the flight distance from Melbourne's Tullamarine Airport to Los Angeles?

9. At footy training Albi does 4 warm-up laps of the 400m oval, 20 x 100m sprints, 20 x 200m sprints, a 2km time trial; and then general training for another half hour at an average pace of 8km/hour. What distance has Albi covered?

10. If you walk 2km each way to school daily, what distance would you cover in a normal school year? Where would that total distance get you to in Australia (from your school)?

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## Perimeter: Rectangles

The **perimeter** is the distance around an object. To calculate perimeter we simply add up the length of all sides of an object. For example the perimeter of the rectangle below is:

$$\Rightarrow \text{perimeter} = \text{length} + \text{width} + \text{length} + \text{width} \text{ or } (2l + 2w)$$

**Perimeter: Rectangle**

**perimeter = l + w + l + w**



$\Rightarrow$  perimeter of rectangle = 5cm + 8cm + 5cm + 8cm

$\Rightarrow$  perimeter = 26cm or 260mm (note: nearly all trades use mm as measurements rather than cm)

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So as you can see, the total length of the edges of the rectangle above is 26cm. If you were making an object, let's say a box picture frame, with these same external dimensions, the total length of timber you would need would be 26cm (or 260mm). But in reality, you probably should buy a little bit more. Why so?

Image: alanpoulson/  
Depositphotos.com

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**Perimeter - Rectangle**

**B**

Estimate and then calculate the following.

i. What total length of fence would be needed for a yard that measures 26m x 18m.

ii. If each fence pailing measures 100mm with 25mm overlap on each side, what would be the minimum number of palings needed for this job?

iii. What other materials are needed to build a pailing fence? Go online and see if you can find a handy guide to building timber fences. Work out the materials cost for this job in your workbooks



## 8.05 Measuring Length

### Perimeter: Triangles

We measure the perimeter of a triangle in the same way as for a rectangle. We simply add up the length of all sides.

For example the perimeter of the triangle below is:

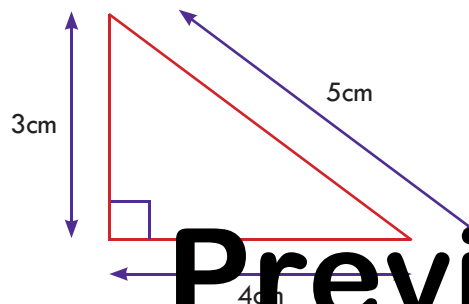
$$\Rightarrow \text{perimeter} = \text{length } a + \text{length } b + \text{length } c$$



Image: kavramm / Depositphotos.com

### Perimeter: Triangle

$$\text{perimeter} = \text{length side 'a'} + \text{length 'b'} + \text{length 'c'}$$



$$\Rightarrow \text{perimeter} = 3\text{cm} + 4\text{cm} + 5\text{cm}$$

$$\Rightarrow \text{perimeter} = 12\text{cm or } 120\text{mm or } 0.12\text{m}$$

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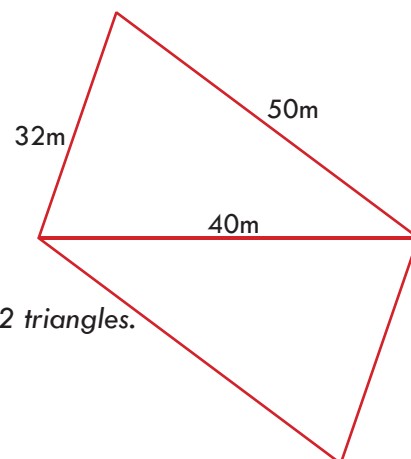
### C Perimeter - Triangle

Estimate and then calculate the following.

i. What is the perimeter of a right-angled triangle with sides of 9cm, 12cm and 15cm?

ii. What is the perimeter of a triangle with sides of 22cm, 12cm and 17cm?

iii. Calculate the perimeter of each of the identical triangles shown below



iv. Calculate the total perimeter of the shape made by the 2 triangles.

## Perimeter: Circles

The perimeter of a circle has its own name - **circumference**. You might remember learning about that at some other time in your schooling. The circumference measures the total distance around a closed curve (i.e. a circle!).

We know that the distance around a circle (the circumference) will always equal the distance across a circle (the **diameter**) multiplied by a constant amount. This is true no matter how big or small the circle is. How much is that constant amount?

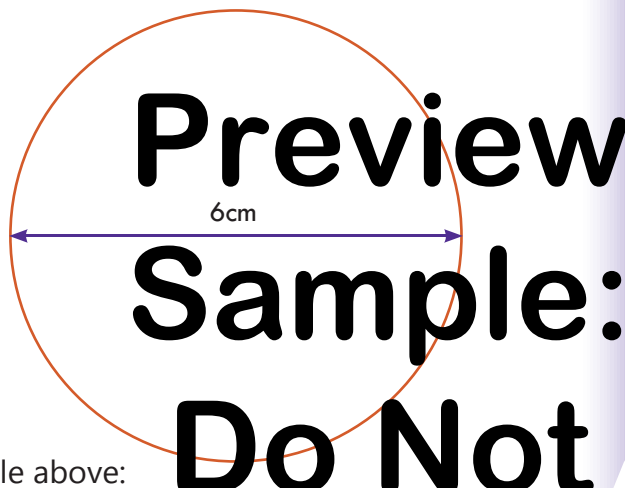


Image: Zveiger/Depositphotos.com

### Circumference: Circle

$$\text{circumference} = \text{diameter} \times 3.142 \text{ (which is pi or } \pi)$$

$$\text{or } c = d\pi$$



So for the circle above:

$$\Rightarrow \text{circumference} = 6\text{cm} \times 3.142$$

$$\Rightarrow \text{circumference} = 18.85\text{cm or } 188.5\text{mm}$$

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## Circumference - Circle D

Estimate and then calculate the following.

- You are helping the Jones family with the instal of their new above-ground pool. The diameter of the pool is 5m. What is the pool's circumference?
- Their neighbours are also considering getting a pool with a diameter of 8m. What is the circumference of this pool?
- By how much bigger is the neighbour's pool compared to the Jones's?

## 8.07 Measuring Length

### Perimeters in the workplace

By being able to calculate perimeters we can carry out a number of important workplace tasks. This is especially relevant in trades. Some examples are as follows.

- ⇒ A fencing contractor will need to calculate the perimeter of the land that they have been contracted to fence. They need to calculate material needed, time to do the job and also be able to give a quote. They rely on their ability to calculate perimeters.
- ⇒ A roof plumber will need to calculate lengths of guttering needed for a house that might have regular, as well as odd shapes.
- ⇒ A builder might need to calculate the length of skirting board and quads needed for different shaped rooms.
- ⇒ A dressmaker might need to calculate the length of piping needed for the edges of a dress.
- ⇒ A greenkeeper might have to work out how long it might take to do the edging on a lawn.
- ⇒ A chef might need to know how much piping to put around the edge of a large wedding cake.



# Preview

### E Edge of reality

Joe is a concreter who specialises in laying guttering. He has been asked to provide a quick quote on laying the gutters on the edges of a lawn measuring 4m by 4m square.

1. Draw a diagram in your workbook of Joe's job (and also for Q3).
2. What is the approximate length of guttering Joe needs to lay?

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3. As part of the job Joe has to order exact length timber frames on both the inside and outside of guttering to hold the gutters until they set. What is the total length of framing Joe needs to cut, assuming the guttering he is laying is 200mm wide?

4. If Joe usually charges \$95 per linear metre (including materials and labour but excluding GST), how much should he quote?

Pizza time F

At Mo's Pizza Emporium, the following size ranges apply for their round pizzas.

Small: 24cm    Medium: 30cm    Large: 36cm    Family: 42cm

Calculate the circumference of each of these pizzas.

Small	Medium
Large	Family

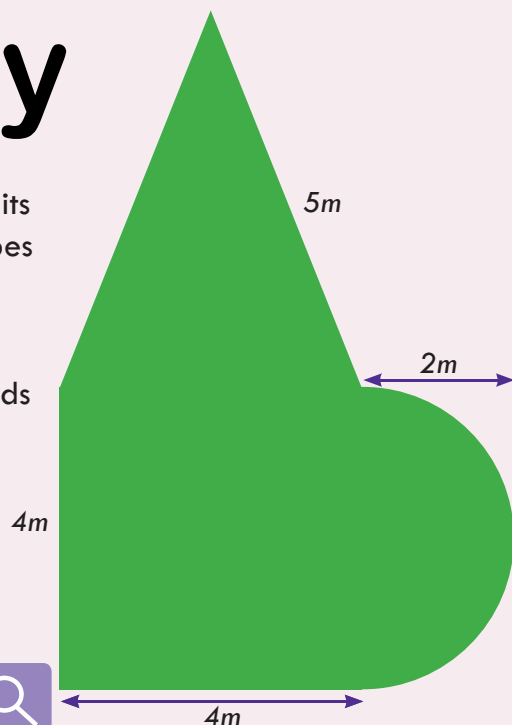
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Combined shapes G

When you have to find the perimeter of odd shapes and sizes you should try to break the object into its basic geometric shapes (rectangles, triangles and circles). From this you can calculate the perimeter of each shape and then add them together. But watch out for double counting!

Flo is going to lay a funky shaped lawn (refer to diagram). She wants to install a good quality drip system right on the edge of the lawn.

- In your workbooks, break the lawn down into its basic shapes and label these component shapes with the correct lengths.
- Estimate how much hosing Flo might need.
- Calculate how many metres of hosing she needs to go around the perimeter of her lawn.
- Estimate how much it might cost for Flo to buy the hosing.
- How much hosing should she buy? (Think carefully.)
- Do some research online to find out how much the hosing might cost.





## 8.09 Measuring Area

### Measuring area: Rectangles


Area is a 'how much' sort of calculation. i.e. How much area does that lawn cover? The most basic area calculation is the calculation for the area of a rectangle.

$$\Rightarrow \text{Area of rectangle (A)} = \text{length} \times \text{width}$$

Think of area like a grid of squares. Then count the number of squares (provided they are of the appropriate size). This total should equal the area.

**Area: Rectangle**

**Area of rectangle (A) = length (l) x width (w)**



**Preview**

**Sample:**

$\Rightarrow$  Area of rectangle =  $8\text{cm} \times 5\text{cm}$

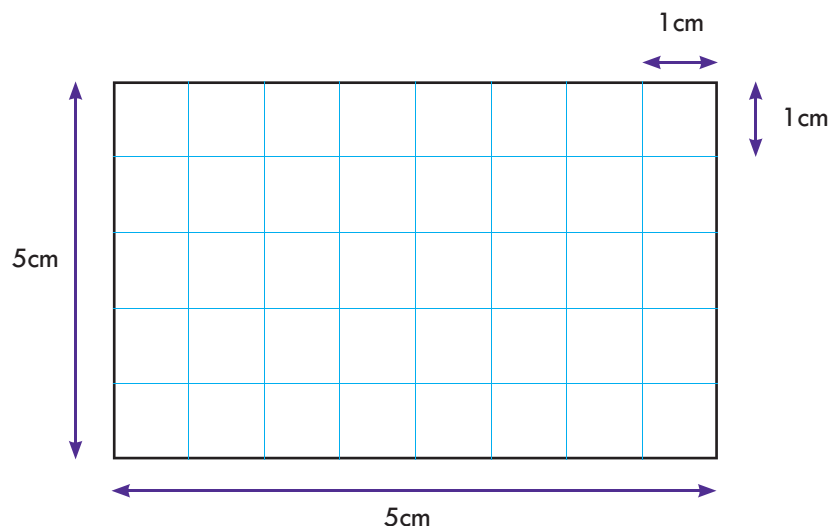
$\Rightarrow A = 40\text{cm}^2$  (or  $4,000\text{mm}^2$ )

Note: Here the unit, cm, is squared (?). That's because cm is multiplied two times in the calculation (i.e.  $\text{cm} \times \text{cm}$ ). And of course you are working in 2 dimensions with area, hence  $\text{cm}^2$ !

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Alternatively, we can draw a grid on the object and add up the squares to calculate the area. In the example, each square =  $1\text{ cm}^2$ . If you add all of these squares up the total area will equal  $40\text{ cm}^2$ .



### Measuring area: Triangles

Measuring the area of a triangle is a bit harder but we still use the same basic principles.

For a right-angled triangle, or an equilateral triangle, it is easy to measure the height. So we can easily apply the formula which is:

$$\Rightarrow \text{Area of triangle} = 1/2 \text{ base} \times \text{height}$$

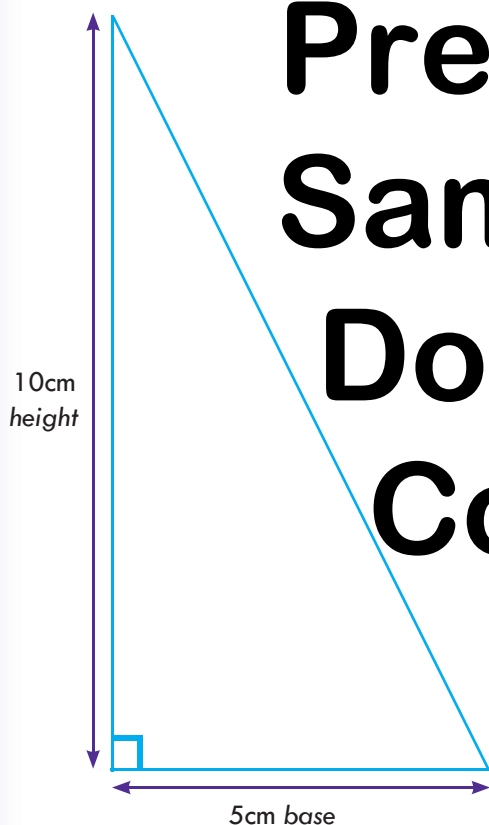


A glazier will have to measure and cut the right size glass to install windows in this loft conversion.

Image: peshkova/Depositphotos.com

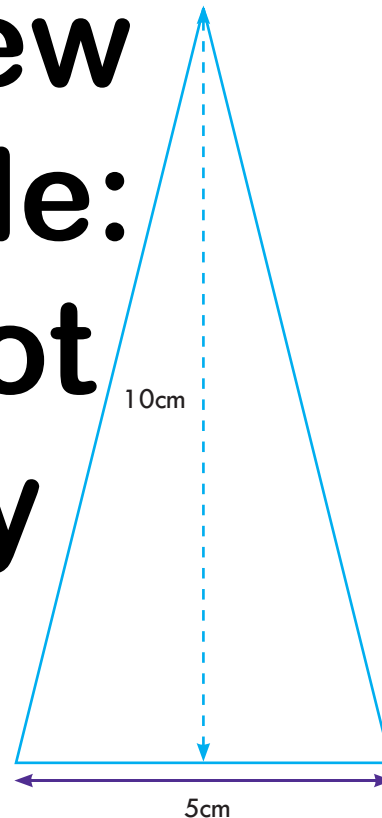
### Area: Triangle

Area of triangle (A) =  $1/2 \times \text{base} \times \text{height}$  (or  $A = 1/2bh$ )



$$\begin{aligned} \Rightarrow A &= 1/2bh \\ \Rightarrow A &= 1/2 \times 5\text{cm} \times 10\text{cm} \\ \Rightarrow A &= 1/2 \times 50\text{cm}^2 \\ \Rightarrow A &= 25 \text{ cm}^2 \text{ (or } 250\text{mm}^2\text{)} \end{aligned}$$

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$$\begin{aligned} \Rightarrow A &= 1/2bh \\ \Rightarrow A &= 1/2 \times 5\text{cm} \times 10\text{cm} \\ \Rightarrow A &= 1/2 \times 50\text{cm}^2 \\ \Rightarrow A &= 25 \text{ cm}^2 \text{ (or } 250\text{mm}^2\text{)} \end{aligned}$$

Now, this formula makes sense because when you think about it, each of the triangles above are basically half a rectangle. So the formula for calculating the area of a triangle is the same as that for calculating a rectangle, but halved!

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## 8.11 Measuring Area

### Measuring area: Circles

It's harder to calculate the area of circles because they don't have straight lines. However, the good old Pi ( $\pi$ ) formula helps us out once again.

We calculate the area of a circle using the formula:

$$\Rightarrow \text{Area of circle (A)} = \pi r^2$$

R = the **radius** of the circle, which you get by drawing a straight line across the circle (diameter) and halving it (i.e. the distance from the centre of a circle to its edge.)

As with a rectangle we can draw grids on the objects to calculate the area. However, it is easier and more accurate to use these formulas rather than to draw grids. Knowing formulas such as these can also enable you to make quick calculations in everyday life.



Area of circle (A) =  
 $\pi \times \text{radius}^2$

Area: Circle

Preview  
Sample:

10cm

Area of circle =  $\pi r^2$

$$\Rightarrow A = 3.142 \times (5\text{cm})^2$$

$$\Rightarrow A = 3.142 \times 25\text{cm}^2$$

$$\Rightarrow A = 78.6\text{cm}^2 \text{ (or } 786\text{mm}^2)$$

Note: Here the unit, cm, is squared ( $^2$ ). That's because cm is multiplied two times in the calculation (i.e. cm x cm). And of course you are working in 2 dimensions with area, hence  $\text{cm}^2$ !

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### A Golden cloth

Simponie wants to sew a gilt-edged tablecloth for Mother's day. The family's dining table measures 1.7m by 2.4m.

1. Calculate in square cm the area that you recommend the tablecloth should be.

2. What length of gold edging will Simponie need to buy for the tablecloth?

## Pizza revisited B

Remember Mo's pizza sizes? Small: 24cm, medium: 30cm, large: 36cm, family: 42cm.

1. Calculate the area ( $\text{cm}^2$ ) of each pizza. (You might use a spreadsheet.)
2. Calculate the percentage change in the area of the pizzas as you upsize.
3. Calculate the relative cost of each pizza. (Hint: Your answer should be in cent/ $\text{cm}^2$ .)
4. Explain which sized pizza gives the best value for money. Why would that be so?
5. A comparison based on area may not really be the only, nor the most effective way to calculate the value of different pizzas. Identify and explain any other factors that should be taken into account when comparing the value of pizzas.
6. As a class split into different groups and do a price, size (and other factor) comparison on the pizzas available in your area. (A taste test would be a good idea too!)



Small 1. Area	Medium Area	Large Area	Family Area
	2. % Change	% Change	% Change
	3. Relative cost	Relative cost	Relative cost
4. Best value for money?			
5. Other factors?			

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## 8.13 Measuring Volume

### Volume

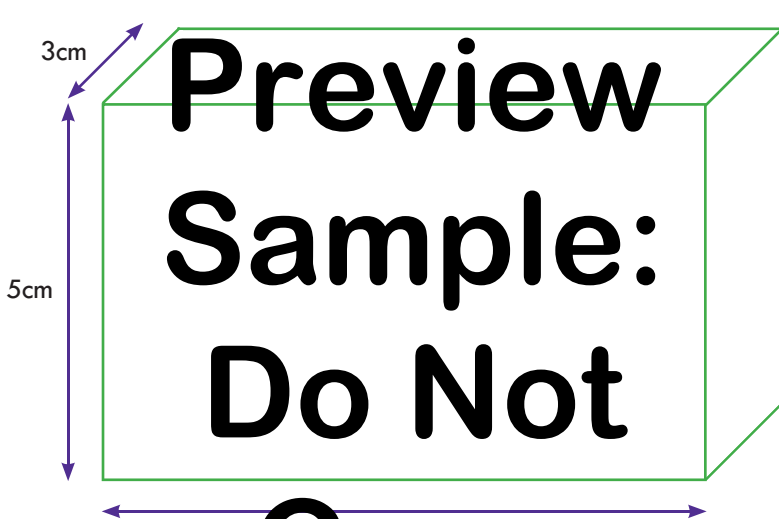
The volume of an object refers to how much space it occupies. When you learned about area you were only working in 2 dimensions, length x width. Volume is different from area in that it relates to 3 dimensions; length, width and height (or depth). It might be helpful to think of an object's volume as its **capacity**, or how much it holds. But in theory volume is measured by how much space an object displaces.

To calculate the volume of a solid rectangle shaped object (a prism) we have to consider the object's properties in all three dimensions; its length, its width and its height (or depth).

To calculate the volume of a rectangular prism we can use the formula:

$$\Rightarrow \text{Volume of a rectangular prism (V)} = \text{length} \times \text{width} \times \text{height}$$

**Volume: Rectangular prism**  
**Volume of rectangular prism =  $l \times w \times h$**



$\Rightarrow \text{Volume} = 3\text{cm} \times 8\text{cm} \times 5\text{cm}$   
 $\Rightarrow V = 120\text{cm}^3$  (or  $120,000 \text{ mm}^3$  or  $0.00012\text{m}^3$ )

Note: Here the unit, cm, is cubed (<sup>3</sup>). That's because cm is multiplied three times in the calculation (i.e. cm x cm x cm). And of course you are working in 3 dimensions with volume, hence cm<sup>3</sup>!

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Image: ilyakalinin/Depositphotos.com



## Volume - Solids A

1. What is the volume of each of these packing boxes? By what percentage is the volume of each box greater than the volume of the smallest?

- ⇒ Box 1: 10cm x 8cm x 12cm
- ⇒ Box 2: 12cm x 10cm x 16cm
- ⇒ Box 3: 15cm x 20cm x 18cm
- ⇒ Box 4: 25cm x 22cm x 20cm



Image: zager/Depositphotos.com

# Preview

2. Estimate and then calculate the total volume of the boxes stacked on this pallet. Each box measures 60 x 40 x 50cm

Image: Elgusser/iStock/Thinkstock

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3. List situations where volume measure are important as part of your own personal or working life.

## 8.15 Measuring Volume

### Volume - Fluids

Volume measures abound in our everyday lives for cooking, medicine and of course, for fluid containers. What was the volume of the last bottle of soft drink you consumed? What volume of sauce is in a bottle? This type of volume is called capacity. Or in other words, how much something can hold. e.g. How much liquid in a bottle?

Most fluids are measured in millilitres or ml. 1,000ml equal 1 litre. A millilitre is the same volume as a cubic centimetre (cc). So therefore a cube that has sides of 1cm will have a volume of 1 millilitre.

### B Cola volume

Find out the prices of 4 different sized Coca-Cola containers both in a milk bar and in a supermarket. Complete the following table and discuss the results as a class.

Date: _____ Milk Bar: _____ Supermarket: _____				
Size	Milk Bar price	Milk Bar price/litre	Supermarket price	Supermarket price/litre

### Cooking

Cooking uses metric measurements for volume but also uses volume measures based on cooking utensils. These measures might vary in different countries, but in Australia we accept these values opposite to be accurate.

### Fluids

- ⇒ 1 teaspoon = 5ml
- ⇒ 1 tablespoon = 20ml
- ⇒ 1 cup = 250ml
- ⇒ 1 fluid ounce = 28.41ml
- ⇒ 1 pint = 568.26 ml
- ⇒ 1 gallon = 4.564 litres

### Solids

The weights of solids vary so we should not really use 'utensil' measures.

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### C Treat or threat?

Complete the following tasks in your workbooks

1. If a recipe calls for 4 teaspoons of milk how many ml is this?
2. If a fruit dessert recipe calls for a sauce to be made from 100g of cooking chocolate, 6 tablespoons of cream and 2 tablespoons of icing sugar per person, and you are serving 10 people, what total quantity of cream, in ml, do you need?
3. What weight of both icing sugar (1 tble = 8 gms) and of chocolate do you need?
4. Find out how much these ingredients might cost.
5. What do you think about this recipe? Discuss this as a class!





Complete these tasks related to capacity. Some you will have to research.

Note: There are 1,000 millilitres in a litre and 1 million litres in a megalitre.



i. How many mls of fluid would be in 5 tablespoons?	ii. How many mls of fluid would be in 5 teaspoons?
iii. How many mls of fluid are in three x 3 litres bottles.	iv. How many litres are in 2 megalitres?
v. How much 'bad' fluid do you consume a week? What might be a 'bad' fluid?	vi. How much 'good' fluid do you consume in a week? What might be a 'good' fluid?
vii. How many litres of water are needed to fill up an average backyard swimming pool?	viii. How many litres of water are needed to fill up an Olympic sized swimming pool?
ix. How much does bottled water cost per litre?	x. How much does tap water from home cost per litre?
xi. What is the capacity of a fuel tank for a motorbike?	xii. What is the capacity of a fuel tank for a ship?
xiii. When is a 'cup' measure used for fluid volumes?	xiv. When is 'cc' used for fluid volumes? Find examples.
xv. List situations from your own life when it is suitable to estimate fluid volumes.	xvi. List situations when you must measure fluid volumes exactly.

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## 8.17 Measuring Angles

### Angles

An angle measures the 'distance' between 2 **rays**. When drawn these rays might be represented by lines. In the real world the 'rays' might actually represent the edges of physical objects or components of an object. For example, a carpenter/ joiner building the roof for a pergola might have to affix 2 lengths of timber (the 'rays') with the edges at an angle of  $90^\circ$ .

An angle is measured in degrees. One full turn of an angle equals  $360^\circ$ . Therefore a  $\frac{1}{4}$  turn represents  $90^\circ$ , which is called a **quadrant**. Therefore, four quadrants make up an entire 'turn'. Just like you if face north and turn  $90^\circ$  to face west, turn another  $90^\circ$  to face south, turn  $90^\circ$  again to be facing east and then  $90^\circ$  once more and you're back to facing north. That's  $360^\circ$  in total. And you're back to the same direction you were in the beginning.

One of the most common ways of measuring degrees is to use a **protractor**. You probably are used to seeing them in sets of drawing and writing implements as part of your booklist. You've also probably used a protractor many times in the past.

The major directional points on a compass each represent  $90^\circ$ .

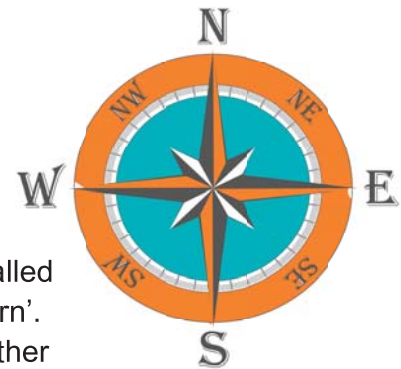


Image: kontur-vid/  
iStock/Thinkstock



Image: Serhiy Stakhnyk/  
iStock/Thinkstock

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Using angles is a natural part of our lives. It's just that we don't really think about them that much. Discuss these personal examples.

- ⇒ We use angles to assess how our clothing sits on our body.
- ⇒ When dancing, angles can be used to articulate line and to drive movement.
- ⇒ We try to get the best angles when watching screens.
- ⇒ Angles are very important when parking a car, such as parallel parking,  $45^\circ$  parking (which is called angled parking!) and when making tricky turns.
- ⇒ Self-obsessed people try out angles when taking selfie after selfie in the mirror!

And now some work examples.

- ⇒ Carpenter/ joiners assemble timber framing using varied angles.

- ⇒ Tilers have to cut tiles for geometric patterns.

- ⇒ Designers rotate design elements based on angles.

- ⇒ Clothing makers use angles to determine garment shape and hang.

- ⇒ Nurses and carers have to support patients at different angles, using beds, trolleys or chairs.

- ⇒ Truck drivers use angles to make turns and to reverse park their vehicles and loads.

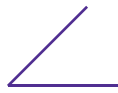
- ⇒ Hairdressers style and cut geometric hair shapes and patterns.

- ⇒ Construction workers use angles for many tasks, including the safe placement of a ladder.

- ⇒ Sportspeople rely on the use of angles, such as footballers and soccer players kicking for goal, cricketers when bowling, and batting and many more diverse applications in sports.

## Types of angles

Acute: An acute angle is less than  $90^\circ$ .



Looking down:  
Opening a door.

Straight: A straight angle is exactly  $180^\circ$ .



Looking side-on:  
Laying down flat.

Right: A right angle is exactly  $90^\circ$ .



Looking front-on:  
Wall meeting a floor.

Reflex: A reflex angle is greater than  $180^\circ$ .



Looking side-on:  
Doing a hyper-extension on a bench.

Obtuse: An obtuse angle is more than  $90^\circ$  but less than  $180^\circ$ .



Looking side-on:  
A reclining chair.

Full: A full angle is  $360^\circ$ .



Looking down:  
Performing a pirouette!

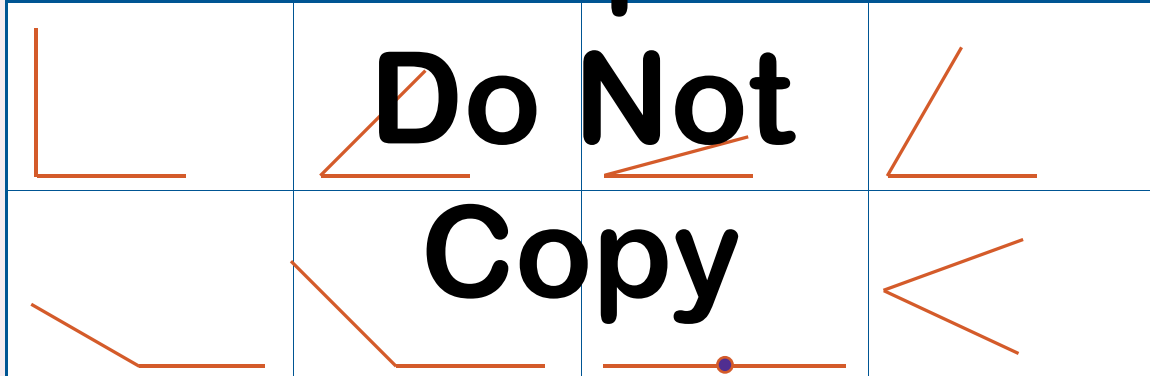
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# Preview Sample:

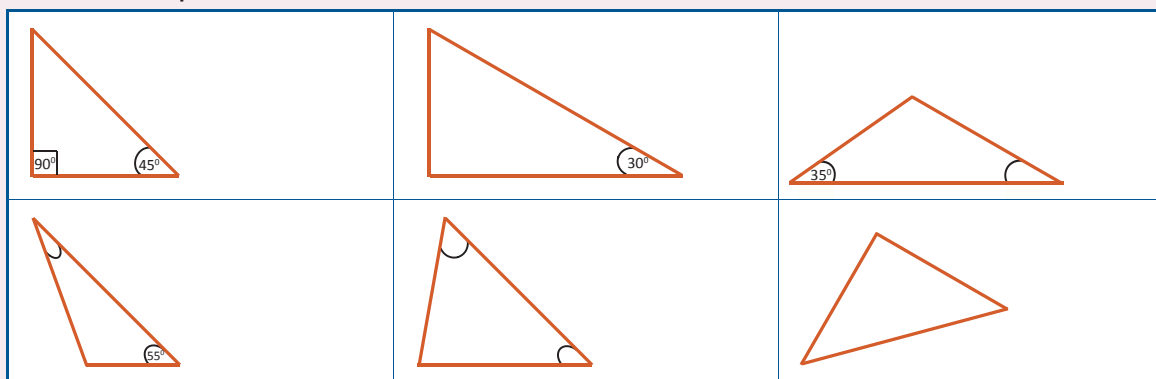
Angles A

A triangle shape has three straight lines that are joined. The three angles inside a triangle will always add up to  $180^\circ$ . This can help you calculate the value of a missing angle.

1. Estimate and the measure these angles



2. Estimate and then calculate the missing number(s) to show the angle. Use a protractor to measure each angle. Where might you experience objects with these shapes in life or at work?



## 8.19 Measurements in Action

### A Area in action

#### Part A: Mow the lawn

Petros has negotiated to mow his grandpa's lawn for \$20. The lawn is rectangular, measuring approximately 6m by 14m. His grandfather insists that Petros must use his hand-mower which has a cutting width of about 34cm.

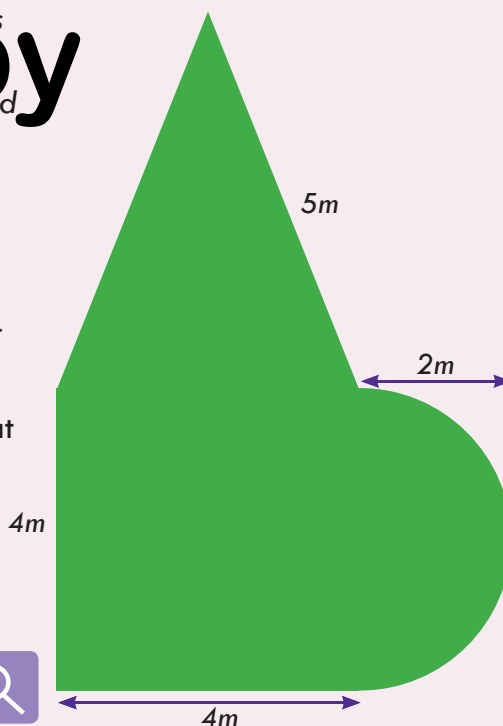
1. Estimate and then calculate the overall area of lawn that needs to be mown.
2. Estimate how many passes of 6m need to be made to mow this area of lawn? Estimate how many metres Petros will walk to mow this area? (Include turns of 10%.)
3. Calculate the number of passes and the distance that will need to be walked. How did you go with your estimates?
4. Express this total area in terms of hectares.
5. Estimate how long you think the job will take. Is it worth \$20? Discuss as a class.
6. Research, calculate and compare how long you think it would take to mow the MCG with a hand mower, a motor mower and a riding mower! Calculate the perimeter and the area in metres<sup>2</sup>, and in hectares.

#### Part B: Area: Combining shapes

If you are calculating the area for odd shaped objects you should try to break them down into their basic geometric shapes (just as you learned for perimeters). But there won't be any double-counting this time because each shape covers its own area. But you need to be aware that you might be working with half-circles or other parts of shapes.

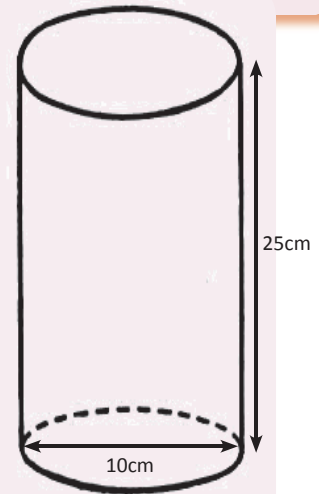
Remember Flo and her funky shaped lawn? Flo has gone green and wants to lay a synthetic lawn. She needs to find out the area of 'lawn' she would need to buy, the area of each component shape, and at least 2 different price estimates.

1. Estimate what you think the total area of the lawn might be.
2. Calculate the area of each of the component shapes. (Note: triangle  $h = 4.6\text{m}$ )
3. Calculate the total area of synthetic lawn that Flo would need to purchase.
4. Research prices online from 2 different 'local' suppliers. Prepare cost estimates.
5. Are there any other issues Flo would need to consider when laying the synthetic lawn for this shape? Explain.



Candy counter **B**

This cylinder has the dimensions as shown. Alternatively your teacher will bring in a cylindrical jar and will draw a diagram with its dimensions for you to copy.

**Stage 1**

- Find out the formula to calculate the volume of a cylinder. Calculate the volume of this jar.
- Choose a confectionary item that has a regular shape such as M&Ms, Jaffas or some other item. Perhaps you need to investigate a lolly shop!
- Estimate how many of these confectionary items will fit into the jar.
- Calculate the volume of each single confectionary item.
- Calculate how many of these confectionary items you think will fit into this jar.

**Stage 2**

- Fill the jar with these confectionary items. (Tip: Wear hygienic gloves when handling food. Someone with a Certificate in Food Handling might need to do this step.) **!!!ALSO BEWARE OF FOOD ALLERGENS SUCH AS NUTS!!!**
- Count how many items fit into the jar without crushing (or eating) any!
- As a class compare your estimates with the actual results.
- Suggest other ways to estimate the number of confectionary items that might fit in a jar. (Tip: Think of a how you could do a bottling in a screw factory!)

**Stage 3**

- Run a guessing competition in your school.
- Use a different confectionary item or a different sized jar from your previous example. (Tip: This might help minimise potential cheating.)
- Count the contents (2 people), seal the jar and store the answer with someone neutral. The candy counter might be someone neutral and should not be involved in customer contact.
- Draw up a guessing sheet and system for taking and recording guesses.
- Make sure that you follow appropriate OH&S procedures. (e.g. Wear hygienic gloves when handling food. Someone who has a Certificate in Food Handling might need to do this step.) **!!!ALSO BEWARE OF FOOD ALLERGENS SUCH AS NUTS!!!**
- After the competition count the contents again (2 people) and average the results (if needed).
- Award the prize. Do not eat the prize!
- Calculate how much money you have raised.
- How about using the proceeds to sponsor a child, with your teachers making up any shortfall! Discuss the possibilities.



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## 8.21 Assessment Task

### AT8 Measuring Quality of Life

#### Overview

You are required to undertake an applied investigation using a range of estimates, measurements and techniques to report on **quality outcomes** related to personal/ social life situations, and to work life situations.

You will apply your knowledge of estimation, measurements and measurement techniques to 4 types of **quality outcomes**: **Utility, Comfort, Speed** and **Safety**.

You will investigate these **quality outcomes** related **Utility, Comfort, Speed** and **Safety** in personal/social situations and in work situations.

#### Quality Outcomes

**Utility:** Estimate and measure to assess the usefulness of objects, products and processes in relation to their stated or intended purpose for use. e.g. Measure the size of phone numbers on a standard mobile interface and whether this size is suitable for diverse users.

**Comfort:** Estimate and measure to assess the comfort of objects, products and processes to cater for the wellbeing of people. e.g. Household rooms, furniture, clothing, airline travel, event seating, interior car space, work spaces, ambient temperatures - even personal distance for emotional wellbeing.

**Speed:** Estimate and measure to assess the speed of objects, products and processes. e.g. Household travel speeds, vehicle travel speeds, travel times, cooking times, sporting achievements, work task durations, customer service rates, work travel, delivery times and so on.

**Safety:** Investigate measurements that guide, monitor, report and warn about safe temperatures, recommended screen sizes and times, safe work conditions, safe travel speeds, safe driving distances, safe weights and loads, safety zones and so on.

#### Requirements and Report

1. Choose 2 examples to investigate for each of **Utility, Comfort, Speed** and **Safety**. Some of these examples might be inter-related. Your examples of **quality outcomes** must relate to both personal/social situations and work situations.
2. Make **estimates** of relevant measurements such as size, weight, distance, speed, temperature, time and so on, as appropriate for your 8 examples.
3. Measure, or research, **accurate measurements** for each of your 8 examples.
4. For **each of your 8** measurement examples:
  - ⇒ describe what your **measurements** suggest about **Utility, Comfort, Speed, and Safety**
  - ⇒ discuss **positives and negatives** associated with each of your measurement examples
  - ⇒ make practical **recommendations** on how the **quality of outcomes** could be improved.

You should consider including images and/or diagrams in your final report to help explain some of your findings.

Name(s):

Dates:

## Tasks - AT8: Measuring Quality of Life

Re-  
quired

Due by

Done

Teacher  
initials

### Utility

- Estimates and calculations in personal/social situations.
- Estimates and calculations in work situations.
- Describe what your measurements suggest about **utility**.
- Discuss positives and negatives.
- Make recommendations to improve **utility** outcomes.

### Comfort

- Estimates and calculations in personal/social situations.
- Estimates and calculations in work situations.
- Describe what your measurements suggest about **comfort**.
- Discuss positives and negatives.
- Make recommendations to improve **comfort** outcomes.

### Speed

- Estimates and calculations in personal/social situations.
- Estimates and calculations in work situations.
- Describe what your measurements suggest about **speed**.
- Discuss positives and negatives.
- Make recommendations to improve **speed** outcomes.

### Safety

- Estimates and calculations in personal/social situations.
- Estimates and calculations in work situations.
- Describe what your measurements suggest about **safety**.
- Discuss positives and negatives.
- Make recommendations to improve **safety** outcomes.

### Reporting

- ⇒ Prepare and submit your final report.
- ⇒ Present your final report to the class (if required).



Additional information:

Signed: \_\_\_\_\_

Date: \_\_\_\_\_



## 8.23 Self-Reflection

### Self-Reflection Pro-Forma

Which numeracy skills did I develop during this unit?

→ \_\_\_\_\_

→ \_\_\_\_\_

→ \_\_\_\_\_

How have the skills of numeracy helped improve my personal life?

→ \_\_\_\_\_

→ \_\_\_\_\_

How have the skills of numeracy helped my development of work-related skills?

→ \_\_\_\_\_

→ \_\_\_\_\_

How would I rate my performance using a circle in developing my numeracy skills this unit?

0 not shown	1 low	2 reasonable	3 good	4 very good	5 excellent
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What were my strongest areas of performance and what should I work on improving?

My strongest topics/skills were:	But I need to improve my skills in:

Signed: \_\_\_\_\_ Date: \_\_\_\_\_

Teacher initials: \_\_\_\_\_ Date: \_\_\_\_\_

Preview  
Sample:  
Do Not  
Copy