obook assess

FOUNDATION MATHEMATICS

VCE UNITS 1&2

THIRD EDITION

SAMPLE

BRYCE GATON
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SAMANTHA HORROCKS
TRISH JELBART
MICHAEL O'CONNOR

Suitable for VET and VCAL courses

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Using Foundation Mathematics

Foundation Mathematics (Third edition) has been completely revised to meet the requirements of the VCE Foundation Mathematics Study Design (2016–18). The series also meets the requirements of VCAL Numeracy and VET courses in Victoria and foundation mathematics courses in other states and territories. This edition offers a range of print, digital and blended resources geared towards practical outcomes.

Student Book

The Student Book is divided into two parts:

PART 1: APPLICATIONS

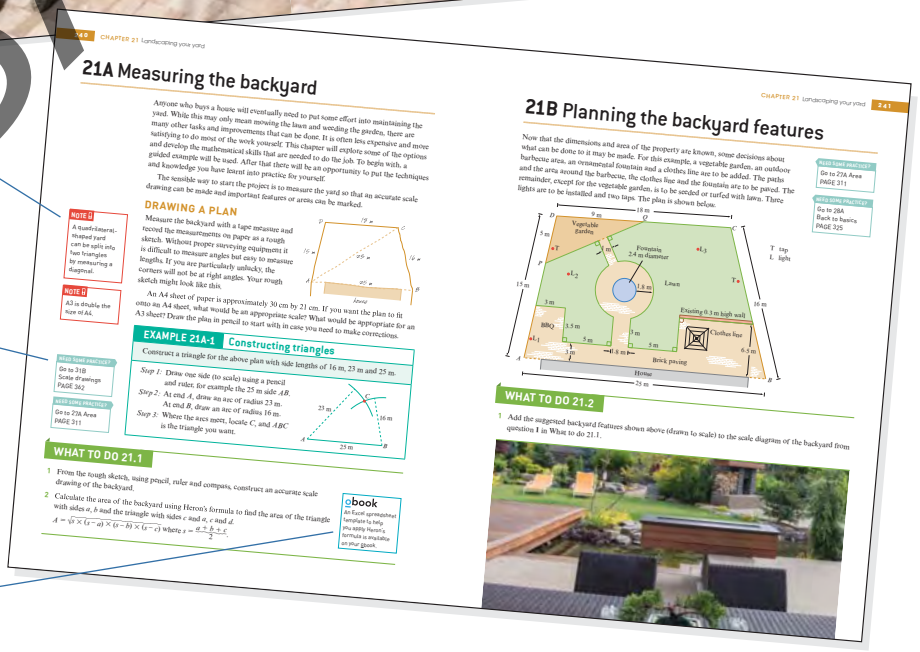
Part 1 chapters are organised according to key life skills and popular vocational areas, such as building and construction, hospitality, sport sciences, travel and tourism, and health sciences. Topics encourage students to apply mathematical skills to real-life situations.

Chapters cover a wide range of practical, vocational topics designed to engage students.

Each chapter begins with an **Are you ready?** quiz to gauge if students have the necessary skills and knowledge to complete the chapter.

Each quiz is divided into two sections: with a calculator and without a calculator.

Each question in the quiz is linked to a skills chapter so students can find the help they need.



NOTE! boxes explain tricky mathematical terms and concepts or offer reminders about the best formulas or concepts to apply.

Need some practice? boxes refer students to a related skill or concept in a part 2 chapter, to find support and practise the required skills.

obook boxes show students when digital extras (such as spreadsheet templates and project worksheets) are available on the obook.

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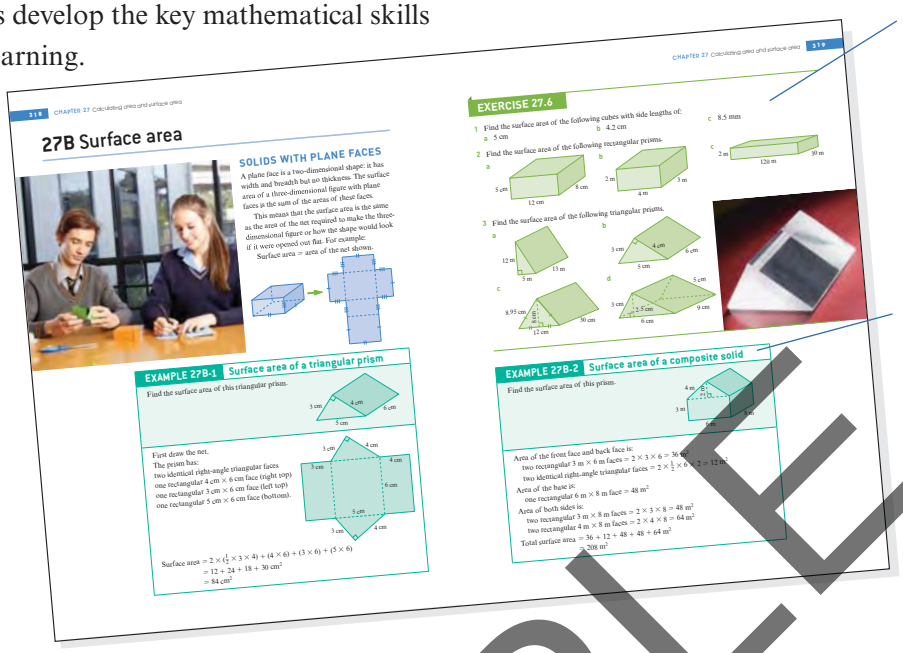
PART 2: MATHEMATICAL SKILLS

Part 2 chapters develop the key mathematical skills that support learning.



EXERCISES provide opportunities for students to practise key skills before applying them to a real-world context.

WORKED EXAMPLES clearly model the key skill that will be practised in the activity that follows.

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- access all of the student book content in digital format (known as obook)
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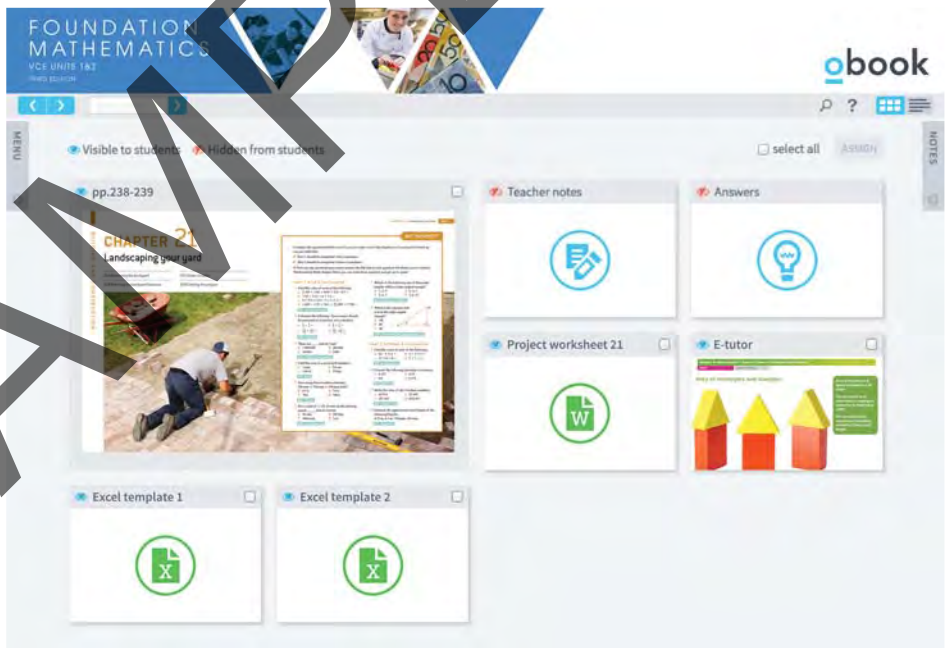

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- create and set class tests
- monitor student progress and manage results
- access answers for all activities and worksheets
- access course planning grids
- access correlation grids for VCAL Numeracy and VET courses.

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Mathematical symbols

$=$	equals	$\therefore$	therefore	h	height	$\triangle$	triangle
$\approx$	is approximately equal to	$\frac{2}{4}$	fraction/division	s	side	sin	sine ratio
				P	perimeter	cos	cosine ratio
$\neq$	is not equal to	4^2	power, index	SA	surface area	tan	tangent ratio
$+$	add	2.4	decimal point	C	circumference of a circle	40°	40 degrees
$-$	subtract	2 : 4	ratio of 2 to 4			4′2″	4 minutes 2 seconds
$+4$	positive number	$\sqrt{}$	square root	r	radius of a circle		right angle
-4	negative number	Σ	sum of	d	diameter of a circle		
± 4	plus/minus	%	per cent	π	pi (approximately 3.14)		parallel sides
$4 > 2$	greater than	/	per	m	gradient		equal sides
$2 < 4$	less than	A	area	b	y-intercept		
$\div$	divide	l	length	(x, y)	x- and y-coordinates	mean	$\bar{x}$ (read 'x bar')
$\times$	multiply	b	breadth; base	r	correlation coefficient	f	frequency
( )	brackets (parentheses)	w	width	$\angle$	angle	IQR	interquartile range

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PART

1

APPLICATIONS

SAMPLE

CHAPTER 1

Balancing your budget

1A Budgeting

1B Your personal budget

SAMPLE

ARE YOU READY?

Complete the questions below to see if you are ready to start this chapter, or if you need to brush up on your skills first.

- Part 1 should be completed *with* a calculator.
- Part 2 should be completed *without* a calculator.

If there are any questions you cannot answer, the link below each question will direct you to a related Mathematical Skills chapter where you can revise basic concepts and get up to speed.

PART 1 WITH A CALCULATOR

1 Find the value of the following.

a $46\,370 - 45\,370 =$
b $100 - (-10) =$
c $11 + 7 + 2 - 3 - 1 - 2 =$
d $-2 \times 5 =$

23A Fundamental concepts

2 Find the value of the following.

a $12 \div 4 \times 65 =$ **b** $12 \div 4 + 65 =$
c $12 \div (4 + 65) =$ **d** $12 + 4 \div 4 =$

23A Fundamental concepts

3 Which of the following is two hundred and forty-five thousand, two hundred and nine?

A 245 209 **B** 20 045 000 209
C 204 5290 **D** 245 290

23A Fundamental concepts

4 Find the value of the following.

a $26 + 1\frac{1}{2} =$ **b** $26 - 1\frac{1}{2} =$

23B Fractions

5 **a** What is $\frac{1}{6}$ of 360?
b Write the calculator button sequence you would use to find you answer for part **a**.

23C Fractions of quantities

6 Find the value of the '5' in each of the following numbers.

a 125 **b** 12.5
c 12.05 **d** 512

23D Decimal numbers

PART 2 WITHOUT A CALCULATOR

7 Round these numbers to 1 decimal place.

a 37.1485 **b** 37.1513
c 37.1499 **d** 37.1555

23D Decimal numbers

8 Convert the following to percentages.

a 75 out of 100 **b** 0.305 out of 1
c $\frac{5}{8}$ **d** $\frac{2}{3}$

24A Converting to percentages

9 What is 10% of each of these numbers?

a 10 **b** 90
c 555 **d** 1009

24B Percentage of a quantity

10 Determine the following percentages.

a 6% of \$300 **b** 20% of 11 g
c 55% of 3500 m **d** 35% of 620 L

24B Percentage of a quantity

11 **a** What would be the new weight if 85 kg is increased by 20%?
b How much would \$100 be if it is decreased by 5%?

24C Percentage change

12 A \$150-dollar dress has been reduced to \$75. By what percentage has the price decreased?

A 12% **B** 50%
C 66.6% **D** 75%

24C Percentage change

SAMPLE

1A Budgeting

Every year the government releases its 'budget'. Companies and other businesses are always trying to 'meet budget'. Your parents tell you 'it's not in the budget' or 'we can't afford it'. So what exactly is a budget and how are budgets worked out?

The method of preparing a budget is the same for a whole country as it is for a family. In this chapter you will prepare a personal budget to help develop the necessary skills. But first you need to get your definitions right.

NEED SOME PRACTICE?
Go to 23A Fundamental concepts PAGE 263

- A *budget* is a detailed statement of income and expenses.
- Income is also called *revenue* and expenses are also called *expenditures*.
- A budget *deficit* occurs when expenses are greater than income. When a budget is in deficit, the person, business or country goes into debt.
- A budget *surplus* occurs when income is greater than expenses. When a budget is in surplus, a person, business or country can save money for the future.
- A *balanced* budget occurs when income is the same as expenses. The goal when preparing a budget is to make it balance or end up with a surplus.

SAMPLE

DECIDING ON A TIME FRAME

Budgets are prepared for different lengths of time depending on what they are being used for. For example, a government budget is a plan for income and spending generally over a whole year. Special events budgets cover the time from the start of collecting revenue to the end of the event. For example, a holiday budget may include the time needed to save the money for the holiday and the length of the holiday itself.

Personal budgets are usually planned around a week, a fortnight or a month. This is because most people are paid weekly, fortnightly or monthly. For the personal budget section of this chapter, a weekly time frame will be used, so all revenue and expenses must be converted into weekly amounts. For the project section of the topic you will need to decide on and justify your own time frame.

NEED SOME PRACTICE?
Go to 23B Fractions PAGE 267

Converting to weekly amounts

Whether income or expenses are being considered, the conversion into a weekly amount follows the same rules.

1 **Fortnightly** (every 2 weeks, for example a pay slip)
   - If the fortnightly amount ends in an even number of cents, divide by 2.
     For example:
     To convert a fortnightly wage of $432 to an amount per week:
     $$\$432 \div 2 = \$216 \text{ a week}$$
   - If the fortnightly amount ends in an odd number of cents, add 1 cent and divide the amount by 2.
     For example:
     To convert a fortnightly wage of $330.35 to an amount per week, change the amount to $330.36:
     $$\$330.36 \div 2 = \$165.18 \text{ a week}$$

2 Monthly (for example rent, phone bill)

▶ Monthly payments are calendar months, not months of exactly 4 weeks. A calendar month can have between 28 and 31 days. A 4-week month always has 28 days. In order to even out the differences between calendar months, first convert to a yearly amount by multiplying by 12 (the number of months in the year), then to a weekly amount by dividing by 52 (the number of weeks in a year).

For example:

To convert a monthly rent bill of $1278 into an amount per week:

$1278 × 12 ÷ 52 = $294.92 a week

NOTE

Monthly rent is not the same as four times the weekly rent.

3 Bimonthly (every 2 months, for example gas bills)

▶ To convert from a bimonthly amount to a weekly amount, multiply by 6 (to get the yearly amount), then divide by 52 (the number of weeks in a year).

For example:

To convert a bimonthly gas bill of $233 into an amount per week:

$233 × 6 ÷ 52 = $26.884 6… = $26.88 a week

NEED SOME PRACTICE?

Go to 23D Decimal numbers PAGE 271

4 Quarterly (four times per year, for example electricity bill, water rates)

▶ To convert from a quarterly amount to a weekly amount, multiply by 4 (to get the yearly amount), then divide by 52 (the number of weeks in a year).

For example:

To convert a quarterly electricity bill of $412 into an amount per week:

$412 × 4 ÷ 52 = $31.692 3….. = $31.69 a week

NOTE

When dividing by anything other than two:

- Round the number up only if the first unwanted digit is 5, 6, 7, 8 or 9.
- Round the number down only if the first unwanted digit is 0, 1, 2, 3 or 4.

5 Yearly (for example council or shire rates, car registration, insurance)

▶ To convert from a yearly amount to a weekly amount, divide by 52 (the number of weeks in a year).

For example:

To convert an annual council rates bill of $1743 to an amount per week:

$1743 ÷ 52 = $33.519 2… = $33.52 a week

SAMPLE

WHAT TO DO 1.1

1 Convert these fortnightly amounts into weekly amounts.

a $234 **b** $128 **c** $146.50 **d** $211.40
e $204.75 **f** $28.43 **g** $126.57 **h** $228.91

2 Convert these monthly amounts into weekly amounts.

a $400 **b** $500 **c** $146.50 **d** $37
e $250.40 **f** $112.30 **g** $126.57 **h** $228.91

3 Convert these bimonthly amounts into weekly amounts.

a $390 **b** $234 **c** $158.60 **d** $102.40

4 Convert these quarterly amounts into weekly amounts.

a $130 **b** $520 **c** $230.50 **d** $145.90

5 Convert these yearly amounts into weekly amounts.

a $442 **b** $152 **c** $1508.56 **d** $2553.20

1B Your personal budget

Imagine you are 18 years old. You have just completed Year 12 and are preparing to either go on to further study or find a job. In order to be ready for either possibility, you need to prepare a budget based on the assumption that you will be living away from home and paying more than $100 per week in rent.

INCOME

Income is money received from other people. This can be in the form of a wage or salary, payments like Youth Allowance from the government, or an allowance from your parents. Your total income is the sum of all the money you receive from all sources. The first step in preparing a budget is to determine what your income will be.

Youth Allowance

The Youth Allowance offers financial help for people aged 16 to 24 years. Payments are made through Centrelink. You may be eligible if you are:

- 16 to 21 years old and looking for full-time work or undertaking approved activities
- 18 to 24 years old and studying full-time
- 16 and 17 years old and have completed Year 12 or equivalent, need to live away from home in order to study, or are considered independent for Youth Allowance
- 16 to 24 years old and undertaking a full-time Australian Apprenticeship.

NOTE

To keep things simple, assume that there are no other dependent children in your family.

Youth Allowance (per fortnight) as of January 2015

Family situation	Full allowance
Single, with no children, under 18 years and living at parental home	$233.60
Single, with no children, 18 years or more and living at parental home	$281.00
Single, with no children, 18 years or more and required to live away from parental home	$426.80

Two other factors that determine how much Youth Allowance you are able to claim are your parents' combined income and your own income.

In order for you to get the full Youth Allowance as of January 2015, your parents needed to earn less than $50 151 annually. For every $1 over this amount, your Youth Allowance is reduced by 20 cents per fortnight.

You are also allowed to earn some money while receiving Youth Allowance.

- You can earn up to $427 before tax per fortnight before your payment is affected.
- If you earn over $427 and up to $512 per fortnight, your payment reduces by 50 cents for each dollar you earn over $427.
- If you earn more than $512 per fortnight, your payment reduces by $42.50 plus 60 cents for each dollar you earn over $512.
- If you are single, under 18 years and living at home, your payment reduces to $0 once your income reaches the maximum of $837.00 per fortnight.

If you need to check your status, visit this website: http://www.humanservices.gov.au/customer/enablers/centrelink/youth-allowance/eligibility-for-youth-allowance

SAMPLE

Net income

Net income is the amount of money you have to spend after tax has been taken out. Your annual income while on Youth Allowance is likely to be under the tax threshold so you will probably not need to pay tax. But, in order to get an idea of the effect of income tax on how much you have to spend, follow these steps.

Step 1: Multiply your calculated weekly income by 52 to find the annual gross income.

Step 2: Go to the Australian Tax Office Tax Calculator: http://atotaxcalculator.com.au/. Enter the gross annual income into the calculator and select the current tax year.

Step 3: The calculator will give you the weekly and annual values of your net income after tax and other deductions.

NOTE

Another chapter in this book deals with taxation.

SAMPLE

WHAT TO DO 1.2

1 Use the table below to find the Youth Allowance entitlement per fortnight for a single 17-year-old student who is living at home and studying full-time. The maximum Youth Allowance per fortnight is $233.60. Assume that her parents' combined annual income is $50 550 and that she has a part-time job where her average earnings are $440 per fortnight.

Youth Allowance (after parental income test)		
A	Parental income (per annum)	$
B	Subtract $50 151	$
C	Divide the answer in B by 5 (or multiply by 20 cents)	$
Youth Allowance (after personal earnings)		
D	Your income (per fortnight)	$
E	If a student or apprentice earning between $427 and $512 a fortnight, subtract $427 from D	$
F	Divide the answer in E by 2 (or multiply by 50 cents)	$
G	Divide the answer in C by 26	$
Youth Allowance entitlement per fortnight		
H	Subtract amounts F and G from $233.60. This is your youth allowance per fortnight.	$

2 In groups of three, draw up a table with the following headings. Now consider the situation of a typical 17-year-old person, living at home and studying full-time. List all the income sources, the pre-tax income from each source and how often it is received. Your group must decide the typical income sources and amounts for a person of your age. Next, use the previous procedures to work out the weekly equivalent from each income source. Finally, add up the amounts in the fourth column to give you a total weekly income.

Income source	Amount	Frequency	Weekly equivalent
Youth Allowance			
Part-time job			

EXPENSES

NOTE

Water rates, car registration and insurance are also examples of committed expenses. This means a set amount must be paid.

An expense is money spent to buy goods and services. Food and household items, transport, entertainment, clothing, education, rent and bills are all expenses. Expenses can be divided into two types.

- *Committed expenses* are those a person has agreed to pay for (or is stuck with), often in advance. Committed expenses include rent and utility bills.
- *Discretionary expenses* are those that a person can decide to do without or reduce. Discretionary expenses include entertainment, clothing, types of food and household items. This means that the amount spent is a matter of choice.

obook

An Excel spreadsheet template to help you calculate an electricity bill is available on your obook.

Committed expenses

The main committed expense may be rent. You will need to find somewhere to live and you will probably need to share this expense with house mates.

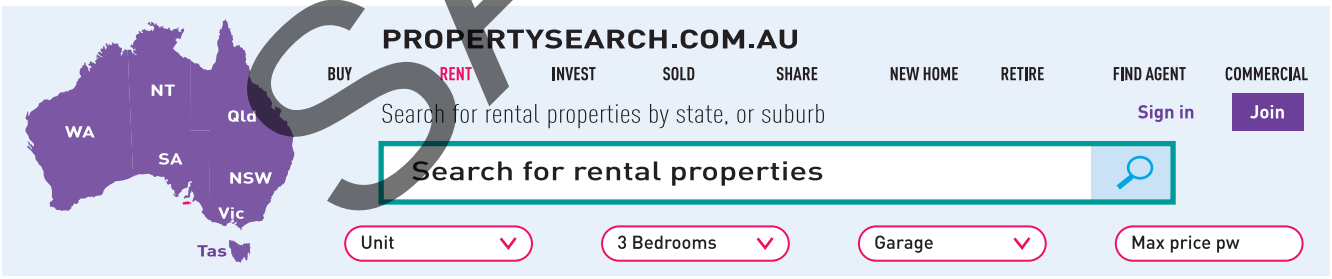
Services you use in your home, such as electricity, gas, water and telecommunications, are often referred to as *utilities*. The cost of these services depends on several factors, including equipment rental fees and usage. Telecommunications covers the fixed line telephone and internet connections, although many households now only rely on their mobile phones for communication and data access. Failing to pay utility bills by the due date may result in the services being disconnected. Having these services reconnected after you have paid your bills often costs an additional reconnection fee.

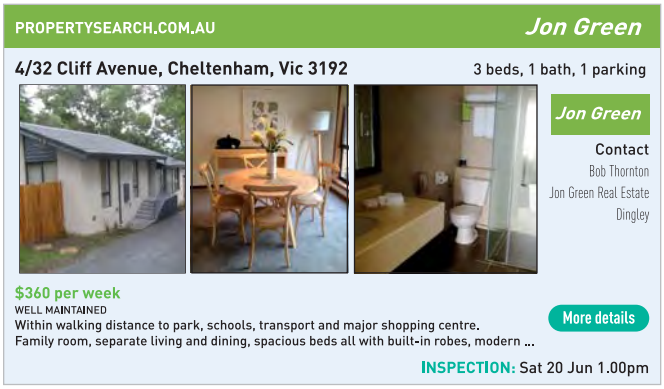
Examples of comitted expense bills are provided in What to do 1.3. Questions relating to each bill will help you work out how much you can expect to pay for each service.

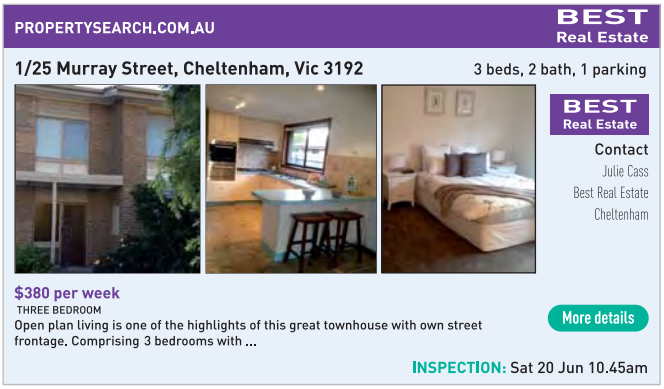
SAMPLE

WHAT TO DO 1.3

1 Use a real-estate website to find a three-bedroom flat or house that you would all like to live in. Record the rent in the committed expenses table in question **5**.







2 Consider the electricity bill shown below.

a What is the amount payable for this electricity bill?

b What is the billing period (number of days)? Is the bill bimonthly or quarterly?

c What is the rate for peak usage? Is the amount charged for peak usage correct?

d Add up the energy usage to check if the total amount charged is correct.

e For this bill, what is the average daily amount of electricity used?

f Briefly explain what the graph indicates about electricity usage. Give reasons for your answer.

g Based on this bill, what would be the average weekly electricity cost per person for a household of three? Enter this value into the committed expenses table in question **5**.

NOTE

To check the cost, multiply the energy used (number of kWh) by the rate (cost in cents per kWh). kWh means kilowatt hours.

SAMPLE

FIRST LIGHT energy

Quarterly Electricity Account

Customer Number	0126485
Due Date	17 June 2015
Amount Payable	$679.15

LOCATION: 71 Winter Grove, SUMMERTON

Previous Amount Payable		**621.41**
Payment Received — Thank You		–621.41 Cr
Electricity (23/02/2015 to 23/05/2015)	**$617.41**	
Total GST Payable 10%	61.74	
Total Charges including GST		679.15
Total Amount Payable		**$679.15**

Energy Used & Costs

METER ID	THIS READING	–	LAST READING	=	ENERGY USED	x	RATE	=	COST
Peak Energy Rate — Contract (23/02/2015 to 23/05/2015)									
EDX009745/001	595.6		0.0		595.6 kWh		48.50c		$288.87
Shoulder Energy Charge — Contract (23/02/2015 to 23/05/2015)									
EDX009745/002	950.2		0.0		950.2 kWh		20.40c		$193.84
Off-Peak (Night Rate) Energy Rate — Contract (23/02/2015 to 23/05/2015)									
EDX009745/003	290.7		0.0		290.7 kWh		12.90c		$37.50
Electricity Service Availability Charge	90 days						108.00c/day		$97.20
Total Electricity Before GST					**1836.5 kWh**				**$617.41**

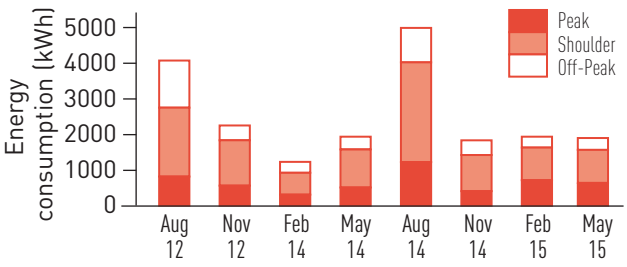
PowerSmart Home Electricity Usage Summary

Supply Period:
23 February 2015 to 23 May 2015 — 89 days

USAGE BREAKDOWN

Peak	596 kWh	32.44%
Shoulder	950 kWh	51.71%
Off-Peak	291 kWh	15.84%
TOTAL ENERGY	**1837 kWh**	

ELECTRICITY USAGE COMPARISON



3 a Consider the gas bill shown below. What is the amount of the gas bill?
b What is the billing period of the bill? Is the bill bimonthly or quarterly?
c What is the total amount of gas used in both cubic metres and megajoules?
d Is the amount charged correct? (Remember how you checked the amount for the electricity bill.)
e What is the average amount of gas used daily for this bill?
f Briefly explain what the graph indicates about gas usage for this household. Give reasons for your answer.
g Based on this bill, what would be the average weekly gas cost per person for a household of three? Enter this value into your committed expenses table in question **5**.

obook
An Excel spreadsheet template to help you calculate a natural gas bill is available on your obook.

GREEN EDGE

Gas account

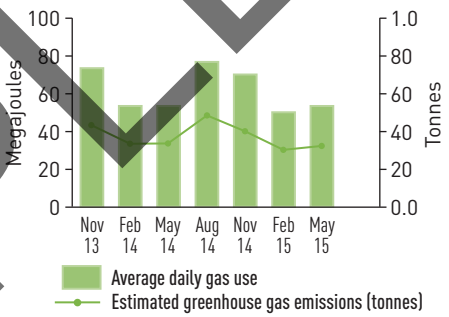
SAMPLE

Your account number	0123456
Due date	**27 May 2015**
Total amount due	**$187.87**

Your account summary

Supply period	2 Feb 2015 to 3 May 2015
Previous balance	$183.47
Payment received	$183.47 cr
Balance brought forward	$0.00
New charges and credits (see details below)	
Usage and supply charges	$170.79
Total GST for new charges	$17.08
Total amount due	**$187.87**

Your overall picture



Usage

Average usage per day in this billing period	**53.30 MJ**
Same time last year	**53.33 MJ**
Average cost per day	**$2.06**
ESTIMATED GREENHOUSE GAS EMISSIONS FOR THIS BILL	**0.3 tonnes**

Your account in detail

DPI	51408525661
Reading type	Actual read on 3 May 2015 for 91 days
Tariff description	Residential Standard
Meter number	EA186971

Previous reading	Current reading	Units (m^3)	Multiplier value	Heating factor	Conversion	Usage MJ
7486	7611.01	125.01	1	38.27165	1.013730	4850

Usage and supply charges		
Gas consumption 3740 MJ @ $0.02967	$110.97	
Next 1110 MJ @ $0.01758	$19.51	
Supply charge	$40.31	
Total usage and supply charges		$170.79
Total GST for new charges		$17.08
Total amount due		**$187.87**

4 a Consider the water bill shown below. What is the amount owed?
b What is the billing period? Is the bill bimonthly or quarterly?
c What is the total amount of water used?
d What is the rate charged for water usage? Is this correct?
e What is the rate charged for sewage disposal? Is this correct?
f Add up the items in the bill. Check if the total is correct.
g What is the average amount of water used daily?
h Briefly explain what the graph indicates about water usage. Give reasons for your answers.
i Based on this bill, what would be the average weekly water cost per person for a household of three? Enter this value into your committed expenses table in question **5**.

PORT PHILLIP WATER

METER READING DETAILS

Meter number	Current reading	Previous reading	Consumption (kL)
ABCD12345	250	201	49

Customer Number	22988505
Due Date	23 July 2015
Amount	$231.05

ACCOUNT DETAILS

Usage charges (GST does not apply)
For period 01/04/2015 to 30/06/2015 (91 days)

Water usage	
27.93 kL @ $2.5044 per kL =	$69.95
Sewage disposal	
20.95 kL @ $1.8686 per kL =	$39.15
Total Usage Charges	**$109.10**
Service Charge Details (GST does not apply)	
Water Service Charge	$27.19
Sewerage Service Charge	$94.76
Total Service Charges	**$121.95**
Total Current Charges	**$231.05**

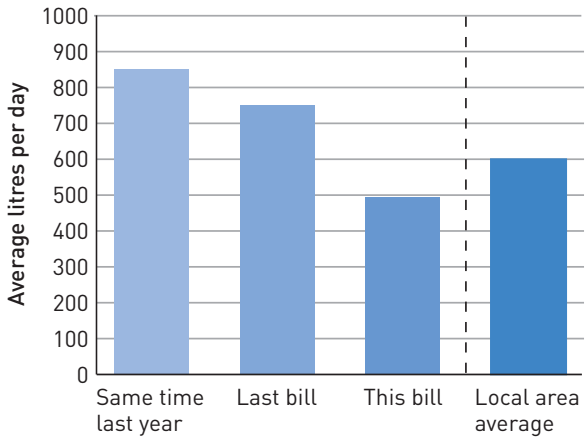
YOUR CHARGES EXPLAINED

Water Usage
Recorded by your water meter, this charge covers the amount of water used at your property. This charge is billed per kilolitre (kL) of water you use.

Service Charges
Your water and sewerage service charges are fixed charges for access to our water supply and sewerage systems. They also help us maintain, renew and expand these systems so we can continue to provide you with high-quality drinking water and safe sewage removal now and into the future.

NOTICEBOARD

Your average daily water usage comparison



Targets for water-efficient households

People per household	Average daily water use per person (in L)
1	791
2	396
3	264
4	198
5	158
6	132

SAMPLE

5 In the same group of three from the previous exercise, draw up a table such as the one below. Add in all your committed expenses from the answers to the previous three questions. Use the rent value previously determined. Complete the table.

Committed expenses	Amount	Frequency	Weekly equivalent
Rent			
Electricity			
Gas			
Water			
	Total weekly committed expenses		

Discretionary expenses

Discretionary expenses are expenses that are not essential. This means they can be reduced or avoided completely. One way to reduce a discretionary expense might be to eat baked beans on toast for dinner instead of ordering a home delivery meal. Another way might be to wait until a movie is available for rent rather than going to see it at the cinema. Or you may choose a new mobile phone plan that costs less.

What to do 1.4 will help you establish what level of discretionary spending you are likely to have living away from home.

WHAT TO DO 1.4

1 As a class, make a list of all the items that an average 18-year-old needs to spend money on. Begin with these five main categories. Add more categories if you can think of any that you consider to be important.
- food and household
- clothing
- transport
- education/training/job seeking
- entertainment

2 In your group of three, work out the total costs per week of each of the categories.
- You can bring shopping dockets from home covering all household purchases for a week as a way of determining the household expenses.
- Think about the clothes you wear and how often you replace them. It is best to work out how much is spent on clothes in an entire year first, and then work out the weekly equivalent.

SAMPLE

3 Fill in a table of discretionary expenses based on the one below.

Category	Amount	Frequency	Weekly equivalent
Food and household			
Clothing			
Transport			
Education/training/job seeking			
Entertainment			
Other			
	Total weekly discretionary expenses		

DEFICIT OR SURPLUS?

Which is greater, your net income or your total expenses? If your expenses are more than your income, your answer will be negative. This is called a deficit. You must reduce or eliminate some of the expenses until the answer is zero or positive. If your income is more than your expenses, your answer will be positive. This is called a surplus.

WHAT TO DO 1.5

1 When you have achieved a surplus budget, write up your findings and submit them to your teacher for assessment. Your submission must include:

- an income table
- a net income calculation
- a committed expenses table
- a statement of rules for phone usage/payment
- a discretionary expenses table
- a zero or surplus budget calculation
- lists of items you consider are necessary expenses. Do not supply individual prices for the items.

SAMPLE

PROJECT 1

obook assess TEACHER

BUDGETING TO MOVE OUT OF HOME

Can you afford to move out of home and get your own place?

A project worksheet for this chapter is available on the Teacher obook/assess. Ask your teacher to print it out for you. Completing this activity will help you make the right choices when budgeting for all the costs you will need to cover when renting your own place.