Chapter 2

Consumer arithmetic

Essential mathematics: why skills with percentages and consumer arithmetic are important

Money management skills are essential for achieving personal financial independence and security, and for business success. The exchange of money is the basis of our economy, and percentages are used universally to describe changes of value.

- Essential skills for personal money management include making a personal budget, calculating the interest and repayments on loans, comparing discounted prices, and checking pay and tax amounts.
- Service businesses, such as web designers, hairdressers, mobile car mechanics and cake makers, all increase costs by a profit percentage and 10% GST.
- Successful food businesses (e.g. pizza shop, cafe) regularly calculate food costs as a percentage of sales revenue.
- Training for employment in finance, e.g. a bank teller, includes percentage calculations for loans, investments, insurance, pay scales, commission and tax.
- Investment advisors assist clients to make a budget; analyse investment growth forecasts and loan costs using simple and compound interest rates; and to compare insurance rates and cover.

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In this chapter

Victorian Curriculum

NUMBER AND ALGEBRA

Money and financial mathematics

Connect the compound interest formula to repeated applications of simple interest using appropriate digital technologies (VCMNA328)

Patterns and algebra

Substitute values into formulas to determine an unknown and re-arrange formulas to solve for a particular term (VCMNA333)

Online resources

A host of additional online resources are included as part of your Interactive Textbook, including HOTmaths content, video demonstrations of all worked examples, auto-marked quizzes and much more.

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Warm-up quiz

1 Find the following totals.

a $\$15.92 + \$27.50 + \$56.20$

b $\$134 + \$457 + \$1021$

c $\$457 \times 6$

d $\$56.34 \times 1\frac{1}{2}$

e $\$87\,560 \div 52$ (to the nearest cent)

2 Express the following fractions with denominators of 100.

a $\frac{1}{2}$ **b** $\frac{3}{4}$ **c** $\frac{1}{5}$ **d** $\frac{17}{25}$ **e** $\frac{9}{20}$

3 Write each of the following fractions as decimals.

a $\frac{1}{2}$ **b** $\frac{1}{4}$ **c** $\frac{1}{5}$ **d** $\frac{20}{50}$ **e** $\frac{1}{3}$

4 Round the following decimals to two decimal places.

a 16.7893 **b** 7.347 **c** 45.3444 **d** 6.8389 **e** 102.8999

5 Give the values of the pronumerals in the following table.

Hint: Net Income = gross income − deductions

Gross income ($)	Deductions ($)	Net income ($)
4976	456.72	a
72 156	21 646.80	b
92 411	c	62 839
156 794	d	101 916
e	18 472.10	79 431.36

6 Calculate the following annual incomes for each of these people.

a Tom: $1256 per week

b Sally: $15 600 per month

c Anthony: $1911 per fortnight

d Crystal: $17.90 per hour, for 40 hours per week, for 50 weeks per year

7 Without a calculator, find:

a 10% of $400 **b** 5% of $5000 **c** 2% of $100

d 25% of $844 **e** 20% of $12.80 **f** 75% of $1000

8 Find the simple interest on the following amounts.

a $400 at 5% p.a. for 1 year

b $5000 at 6% p.a. for 1 year

c $800 at 4% p.a. for 2 years

Hint: Simple Interest $= \frac{Prt}{100}$

9 Complete the following table, giving the values of the pronumerals.

Cost price	Deduction	Sale price
$34	$16	a
$460	$137	b
$500	c	$236
d	$45	$67
e	$12.65	$45.27

10 The following amounts include the 10% GST. By dividing each one by 1.1, find the original costs before the GST was added to each.

a $55 **b** $61.60 **c** $605

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2A Review of percentages

CONSOLIDATING

Learning intentions

- To understand that a percentage is a number out of 100
- To be able to convert decimals and fractions to percentages and vice versa
- To be able to find the percentage of a quantity

Key vocabulary: percentage, denominator

It is important that we are able to work with percentages in our everyday lives. Banks, retailers and governments use percentages every day to work out fees and prices.

Lesson starter: Which option should Jamie choose?

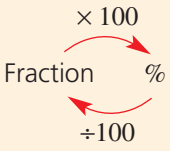
Jamie currently earns $\$68\,460$ p.a. (per year) and is given a choice of two different pay rises. Which should she choose and why?

Choice A: Increase of $\$25$ per week

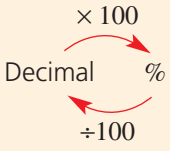
Choice B: Increase of 2% on per annum salary

Key ideas

- A **percentage** means 'out of 100'. It can be written using the symbol %, or as a fraction or a decimal.
  For example: 75 per cent $= 75\% = \frac{75}{100}$ or $\frac{3}{4}$ or 0.75.
- To convert a fraction or a decimal to a percentage, multiply by 100.
- To convert a percentage to a fraction, write it with a **denominator** of 100 and simplify.
  $15\% = \frac{15}{100} = \frac{3}{20}$



- To convert a percentage to a decimal, divide by 100.
  $15\% = 15 \div 100 = 0.15$
- To find a percentage of a quantity, write the percentage as a fraction or a decimal, then multiply by the quantity; i.e. $x\%$ of $P = \frac{x}{100} \times P$.



Exercise 2A

Understanding

1–3 | 3

1 Complete the following using the words *multiply* or *divide*.

a To convert a decimal to a percentage _____ by 100.

b To convert a percentage to a decimal _____ by 100.

c To convert a fraction to a percentage _____ by 100.

d To convert a percentage to a fraction _____ by 100.

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2A

2 Complete the following to express as a fraction in part **a** and a decimal in part **b**.

a **i** $7\% = \frac{7}{\square}$ **ii** $23\% = \frac{\square}{\square}$

b **i** $18\% = \square$ **ii** $5\% = \square$

3 Complete the following

a $10\% \text{ of } 50 = \frac{\square}{100} \times 50$

$= \square$

b $25\% \text{ of } 412 = \frac{\square}{100} \times \square$

$= \square$

c $2\% \text{ of } 60 = \frac{\square}{100} \times 60$

$= \square$

Hint: Cancel any fractions before multiplying.

Fluency

4–7(½) 4–8(½)

Example 1 Converting to a percentage

Write each of the following as a percentage.

a $\frac{19}{20}$ **b** $\frac{3}{8}$ **c** 0.07

Solution	Explanation
a $\frac{19}{20} = \frac{95}{100}$ $= 95\%$	Write using a denominator of 100. Alternatively, multiply the fraction by 100. $\frac{19}{\cancel{20}_{1}} \times \frac{\cancel{100}^{5}}{1} = 19 \times 5 = 95$
b $\frac{3}{\cancel{8}_{2}} \times \frac{\cancel{100}^{25}}{1} = \frac{75}{2}$ $= 37.5$ So $\frac{3}{8} = 37.5\%$	Multiply the fraction by 100. Cancel common factors, then simplify.
c $0.07 \times 100 = 7$ So $0.07 = 7\%$	Multiply the decimal by 100. Move the decimal point two places to the right.

Now you try

Write each of the following as a percentage.

a $\frac{6}{25}$ **b** $\frac{7}{16}$ **c** 0.15

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4 Convert each fraction to a percentage.

a $\frac{1}{2}$ **b** $\frac{1}{5}$ **c** $\frac{1}{4}$ **d** $\frac{1}{10}$

e $\frac{1}{100}$ **f** $\frac{7}{25}$ **g** $\frac{15}{50}$ **h** $\frac{3}{4}$

i $\frac{5}{8}$ **j** $\frac{19}{25}$ **k** $\frac{99}{100}$ **l** $\frac{47}{50}$

Hint: First write using a denominator of 100 or, alternatively, multiply by 100.

5 Write these decimals as percentages.

a 0.17 **b** 0.73 **c** 0.48 **d** 0.09

e 0.06 **f** 0.13 **g** 1.13 **h** 1.01

i 0.8 **j** 0.9 **k** 0.99 **l** 0.175

Hint: To multiply by 100, move the decimal point two places to the right.

Example 2 Writing percentages as simplified fractions

Write each of the following percentages as a simplified fraction.

a 37% **b** 58% **c** $6\frac{1}{2}\%$

Solution	Explanation
a $37\% = \frac{37}{100}$	Write the percentage with a denominator of 100.
b $58\% = \frac{58}{100}$	Write the percentage with a denominator of 100.
$= \frac{29}{50}$	Simplify $\frac{58}{100}$ by cancelling, using the HCF of 58 and 100, which is 2. $\frac{58^{29}}{100_{50}} = \frac{29}{50}$
c $6\frac{1}{2}\% = \frac{6\frac{1}{2}}{100}$	Write the percentage with a denominator of 100.
$= \frac{13}{200}$	Double the numerator $\left(6\frac{1}{2}\right)$ and the denominator (100) so that the numerator is a whole number.

Now you try

Write each of the following percentages as a simplified fraction.

a 23% **b** 64% **c** $10\frac{1}{2}\%$

6 Write each percentage as a simplified fraction.

a 71% **b** 80% **c** 25% **d** 55%

e 40% **f** 88% **g** 15% **h** $16\frac{1}{2}\%$

i $17\frac{1}{2}\%$ **j** $2\frac{1}{4}\%$ **k** $5\frac{1}{4}\%$ **l** $52\frac{1}{2}\%$

Hint: Write with a denominator of 100, then simplify if possible.

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2A

Example 3 Writing a percentage as a decimal

Convert these percentages to decimals.

a 93% b 7% c 30%

Solution	Explanation
a $93\% = 93 \div 100$ $= 0.93$	Divide the percentage by 100. This is the same as moving the decimal point two places to the left.
b $7\% = 7 \div 100$ $= 0.07$	Divide the percentage by 100.
c $30\% = 30 \div 100$ $= 0.3$	Divide the percentage by 100. Write 0.30 as 0.3.

Now you try

Convert these percentages to decimals.

a 28% b 3% c 60%

7 Convert these percentages to decimals.

a 61% b 83% c 75% d 45% e 9% f 90%
g 50% h 16.5% i 7.3% j 200% k 430% l 0.5%

Example 4 Finding a percentage of a quantity

Find 42% of $1800.

Solution	Explanation
42% of $1800 $= 0.42 \times 1800$ $= \$756$	Remember that 'of' means to multiply. Write 42% as a decimal or a fraction: $42\% = \frac{42}{100} = 0.42$ Then multiply by the amount. If using a calculator, enter 0.42×1800. Without a calculator: $\frac{42}{\cancel{100}_{1}} \times 18\cancel{00} = 42 \times 18 = 756$

Now you try

Find 36% of $2300.

8 Use a calculator to find the following.

a 10% of $250 b 50% of $300 c 75% of $80
d 12% of $750 e 9% of $240 f 43% of 800 grams
g 90% of $56 h 110% of $98 i $17\frac{1}{2}\%$ of 2000 m

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Problem-solving and reasoning 9–11 11–14

9 A 300 g pie contains 15 g of saturated fat.

a What fraction of the pie is saturated fat?

b What percentage of the pie is saturated fat?

Hint: 15 g out of 300 g.

10 About 80% of the mass of a human body is water. If Hugo is 85 kg, how many kilograms of water are in his body?

11 Rema spends 12% of the 6.6 hour school day in maths. How many minutes are spent in the maths classroom?

12 In a cricket match, Brett spent 35 minutes bowling.

His team's total fielding time was $3\frac{1}{2}$ hours.

What percentage of the fielding time, correct to two decimal places, did Brett spend bowling?

Hint: First convert hours to minutes, and then write a fraction comparing times.

13 Malcolm lost 8 kg, and now weighs 64 kg. What percentage of his original weight did he lose?

14 47.9% of a local council's budget is spent on garbage collection. If a rate payer pays $107.50 per quarter in total rate charges, how much do they contribute in a year to garbage collection?

Australia's statistics — 15

15 Below is the preliminary data on Australia's population growth, as gathered by the Australian Bureau of Statistics for June 2015.

	Population at end June quarter 2015 ('000)	Change over previous year ('000)	Change over previous year (%, one decimal place)
New South Wales	7618.2	104.3	
Victoria	5938.1	99.4	
Queensland	4779.4	58.4	
South Australia	1698.6	13.1	
Western Australia	2591.6	33.2	
Tasmania	516.6	1.9	
Northern Territory	244.6	0.9	
Australian Capital Territory	390.8	5.4	
Australia	23 777.9	316.6	

a Calculate the percentage change for each state and territory shown using the previous year's population, and complete the table.

b What percentage of Australia's overall population, correct to one decimal place, is living in:

i NSW? **ii** Vic? **iii** WA?

Hint: % Change $= \frac{\text{change}}{\text{population}} \times \frac{100}{1}$

c Use a spreadsheet to draw a pie chart (i.e. sector graph) showing the populations of the eight states and territories in the table. What percentage of the total is represented by each state/territory? Round your answer to the nearest per cent.

d In your pie chart for part **c**, what is the angle size of the sector representing Victoria?

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2B Applications of percentages

Learning intentions

- To understand what a percentage increase or decrease of a quantity represents
- To be able to increase and decrease an amount by a given percentage
- To be able to use percentage increase and decrease to calculate a selling price or a discounted price
- To be able to determine the profit made on an item and calculate this as a percentage profit

Key vocabulary: discount, profit, selling price, cost price

There are many applications of percentages. Prices are often increased by a percentage to create a profit or decreased by a percentage when on sale.

When goods are purchased by a store, the cost to the owner is called the cost price. The price of the goods sold to the customer is called the selling price. This price will vary according to whether the store is having a sale or decides to make a certain percentage profit.

Lesson starter: Discounts

Discuss as a class:

- Which is better: 20% off or a $\$20$ discount?
- If a discount of 20% or $\$20$ resulted in the same price, what was the original price?
- Why are percentages used to show discounts, rather than a dollar amount?

Key ideas

- To increase by a given percentage, multiply by the sum of 100% and the given percentage.
  For example: To increase by 12%, multiply by 112% or 1.12.
- To decrease by a given percentage, multiply by 100% minus the given percentage.
  For example: To decrease by 20%, multiply by 80% or 0.8.
- Profits and discounts:
  - The normal price of the goods recommended by the manufacturer is called the retail price.
  - When there is a sale and the goods are priced less than the retail price, they are said to be **discounted**.
  - **Profit** is the amount of money made by selling an item or service for more than its cost.
  - Profit = selling price − cost price, where **selling price** is the amount the item is sold for and **cost price** is the original cost to the seller.
  - Percentage profit $= \dfrac{\text{profit}}{\text{cost price}} \times 100$
  - Percentage discount $= \dfrac{\text{discount}}{\text{cost price}} \times 100$

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Exercise 2B

Understanding

1–4 | 4

1 By what number do you multiply to increase an amount by:
a 10%? **b** 20%? **c** 2%? **d** 18%?

Hint: 100% + 10% = 1.1
100% − 5% = 0.95

2 By what number do you multiply to decrease an amount by:
a 5%? **b** 30%? **c** 15%? **d** 50%?

3 Use the words *selling price* or *cost price* to complete the following.
a A profit is made when the _____ is more than the _____.
b A discount in a store reduces the _____.
c Profit = _____ − _____.

4 Decide how much profit or loss is made in each of the following situations.
a cost price = $15 selling price = $20
b cost price = $17.50 selling price = $20
c cost price = $250 selling price = $234

Fluency

5–7(½), 8–10 | 5–7(½), 8, 9, 11, 12

Example 5 Increasing by a given percentage

Increase $370 by 8%.

Solution	Explanation
$370 × 1.08 = $399.60	100% + 8% = 108% Write 108% as a decimal (or fraction) and multiply by the amount. Show two decimal places to represent the cents.

Now you try

Increase $650 by 12%.

5 **a** Increase $90 by 5%.
b Increase $400 by 10%.
c Increase $55 by 20%.
d Increase $490 by 8%.
e Increase $50 by 12%.
f Increase $7000 by 3%.
g Increase $49.50 by 14%.
h Increase $1.50 by 140%.

Hint: To increase by 5%, multiply by 100% + 5% = 1.05.

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2B

Example 6 Decreasing by a given percentage

Decrease $8900 by 7%.

Solution	Explanation
$8900 × 0.93 = $8277.00	100% − 7% = 93% Write 93% as a decimal (or fraction) and multiply by the amount. Remember to put the units in your answer.

Now you try

Decrease $2700 by 18%.

6 **a** Decrease $1500 by 5%. **b** Decrease $400 by 10%.
c Decrease $470 by 20%. **d** Decrease $80 by 15%.
e Decrease $550 by 25%. **f** Decrease $49.50 by 5%.
g Decrease $119.50 by 15%. **h** Decrease $47.10 by 24%.

Hint: To decrease by 5%, multiply by 100% − 5% = 0.95.

Example 7 Calculating profit and percentage profit

The cost price for a new car is $24 780 and it is sold for $27 600.
a Calculate the profit.
b Calculate the percentage profit, to two decimal places.

Solution	Explanation
a Profit = selling price − cost price	Write the rule.
= $27 600 − $24 780	Substitute the values and evaluate.
= $2820	
b Percentage profit = $\frac{\text{profit}}{\text{cost price}} \times 100$	Write the rule.
= $\frac{2820}{24\,780} \times 100$	Substitute the values and evaluate.
= 11.38%	Round your answer as instructed.

Now you try

The cost price for a new refrigerator is $888 and it is sold for $997.
a Calculate the profit.
b Calculate the percentage profit, to two decimal places.

7 Copy and complete the table on profits and percentage profit.

	Cost price	Selling price	Profit	Percentage profit
a	$10	$16		
b	$240	$300		
c	$15	$18		
d	$250	$257.50		
e	$3100	$5425		
f	$5.50	$6.49		

Hint: Percentage profit = $\frac{\text{profit}}{\text{cost price}} \times 100$

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Example 8 Finding the selling price

A retailer buys some calico material for $43.60 a roll. He wishes to make a 35% profit.

a What will be the selling price per roll?

b If he sells 13 rolls, what profit will he make?

Solution	Explanation
a Selling price = 135% of $43.60 = 1.35 × $43.60 = $58.86 per roll	For a 35% profit the unit price is 135%. Write 135% as a decimal (1.35) and evaluate.
b Profit per roll = $58.86 − $43.60 = $15.26	Selling price − cost price
Total profit = $15.26 × 13 = $198.38	There are 13 rolls at $15.26 profit per roll.

Now you try

A retailer buys swimsuits for $32 per suit. She wishes to make a 30% profit.

a What will be the selling price of each swimsuit?

b If she sells 20 swimsuits, what profit will she make?

8 A retailer buys some christmas snow globes for $41.80 each. She wishes to make a 25% profit.

a What will be the selling price per snow globe?

b If she sells a box of 25 snow globes, what profit will she make?

9 A second-hand car dealer bought a trade-in car for $1200 and wishes to resell it for a 28% profit. What is the resale price?

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2B

Example 9 Finding the discounted price

A shirt worth $25 is discounted by 15%.
a What is the selling price?
b How much is the saving?

Solution	Explanation
a Selling price = 85% of $25	15% discount means there must be 85% left (100% − 15%).
= 0.85 × $25	Convert 85% to 0.85 and multiply by the amount.
= $21.25	
b Saving = 15% of $25	You save 15% of the original price.
= 0.15 × $25	Convert 15% to 0.15 and multiply by the original price.
= $3.75	
or saving = $25 − $21.25	Saving = original price − discounted price
= $3.75	

Now you try

A suitcase worth $220 is discounted by 35%.
a What is the selling price?
b How much is the saving?

10 Samantha buys a wetsuit from the sports store where she works. Its original price was $79.95. Employees receive a 15% discount.
a What is the selling price?
b How much will Samantha save?

11 A travel agent offers a 12.5% discount on airfares if you travel during May or June.
The normal fare to London (return trip) is $2446.
a What is the selling price?
b How much is the saving?

12 A store sells second-hand goods at 40% off the recommended retail price. A lawn mower is valued at $369.
a What is the selling price?
b How much would you save?

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Problem-solving and reasoning 13–16 15–18

13 Ski jackets are delivered to a shop in packs of 50 for $3500. The shop owner wishes to make a 35% profit.

- **a** What will be the total profit made on a pack?
- **b** What is the profit on each jacket?

14 A pair of sports shoes is discounted by 47%. The recommended price was $179.

- **a** What is the amount of the discount?
- **b** What will be the discounted price?

15 Jeans are priced at a May sale for $89. If this is a saving of 15% off the selling price, what do the jeans normally sell for?

Hint: 85% of amount = $89. Find 1% then × 100 to find 100%.

16 Discounted tyres are reduced in price by 35%. They now sell for $69 each. Determine:

- **a** the normal price of one tyre
- **b** the saving if you buy one tyre

17 The local shop purchases a carton of containers for $54. Each container is sold for $4. If the carton had 30 containers, determine:

- **a** the profit per container
- **b** the percentage profit per container, to two decimal places
- **c** the overall profit per carton
- **d** the overall percentage profit, to two decimal places

18 A retailer buys a book for $50 and wants to sell it for a 26% profit. The 10% GST must then be added onto the cost of the book.

Hint: % Increase = $\frac{\text{increase}}{\text{cost price}} \times 100$

- **a** Calculate the profit on the book.
- **b** How much GST is added to the cost of the book?
- **c** What is the advertised price of the book, including the GST?
- **d** Find the overall percentage increase of the final selling price compared to the $50 cost price.

Building a gazebo — 19

19 Christopher designs a gazebo for a new house. He buys the timber from a retailer, who sources it at wholesale price and then marks it up before selling to Christopher at retail price. The table below shows the wholesale prices as well as the mark-up for each type of timber.

Quantity	Description	Cost/unit	Mark-up
6	Treated pine posts	$23	20%
11	300 × 50 oregon beams	$75	10%
5	Sheet lattice work	$86	15%
2	300 × 25 oregon fascias	$46	12%
8	Laserlite sheets	$32	10%

- **a** Determine Christopher's overall cost for the material, including the mark-up.
- **b** Determine the profit made by the retailer.
- **c** Determine the retailer's overall percentage profit, to two decimal places.
- **d** If the retailer pays 27% of his profits in tax, how much tax does he pay on this sale?

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2C Income

Learning intentions

- To understand a range of different ways in which employees can be paid
- To know how net income is calculated from gross income and deductions
- To be able to calculate wages for overtime and shift work
- To be able to calculate commission

Key vocabulary: wages, commission, salary, fees, gross income, overtime, deductions, net income, time and a half, double time, deductions

You may have earned money for baby-sitting or delivering newspapers or have a part-time job. As you move into the workforce it is important that you understand how you are paid.

Lesson starter: Who earns what?

As a class, discuss the different types of jobs held by different members of each person's family, and discuss how they are paid.

- What are the different ways that people can be paid?
- What does it mean when you work fewer than full-time hours?
- What does it mean when you work longer than full-time hours?

What other types of income can people in the class think of?

Key ideas

Methods of payment

- Hourly **wages**: You are paid a certain amount per hour worked.
- **Commission**: You are paid a percentage of the total amount of sales.
- **Salary**: You are paid a set amount per year, regardless of how many hours you work.
- **Fees**: You are paid according to the charges you set; e.g. doctors, lawyers, contractors.
- Some terms you should be familiar with include:
  - **Gross income**: the total amount of money you earn before taxes and other deductions
  - **Deductions**: money taken from your income before you are paid; e.g. taxation, union fees, superannuation
  - **Net income**: the amount of money you actually receive after the deductions are taken from your gross income

$$\text{Net income} = \text{gross income} - \text{deductions}$$

Payments by hourly rate

- If you are paid by the hour you will be paid an amount per hour for your normal working time. If you work **overtime** (hours beyond the normal working hours), the rates may be different.

  Usually, normal working time is 38 hours per week.

  Normal: $1.0 \times$ normal rate

  Time and a half: $1.5 \times$ normal rate

  Double time: $2.0 \times$ normal rate

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- If you work shift work the hourly rates may differ from shift to shift.

  For example:

6 a.m.–2 p.m.	$24.00/hour	(regular rate)
2 p.m.–10 p.m.	$27.30/hour	(afternoon shift rate)
10 p.m.–6 a.m.	$36.80/hour	(night shift rate)

Exercise 2C

Understanding

1–3 | 3

1 Match the job description on the left with the method of payment on the right.

a	Jennie is paid $85 600 per year	**A**	hourly wage
b	Danielle earns 3% of all the sales she makes	**B**	fee
c	Jett earns $18.90 per hour worked	**C**	commission
d	Stuart charges $450 for a consultation	**D**	salary

2 Callum earns $1090 a week and has annual deductions of $19 838. What is Callum's net income for the year? Assume 52 weeks in a year.

Hint: Net = total − deductions

3 If Tao earns $15.20 per hour, calculate his:

a time-and-a-half rate **b** double-time rate

Hint: Time-and-a-half rate = 1.5 × hourly rate

Fluency

4–8 | 5–9

Example 10 Finding gross and net income (including overtime)

Pauline is paid $13.20 per hour at the local stockyard to muck out the stalls. Her normal hours of work are 38 hours per week. She receives time and a half for the next 4 hours worked and double time after that.

a What will be her gross income if she works 50 hours?

b If she pays $220 per week in taxation and $4.75 in union fees, what will be her weekly net income?

Solution	Explanation
a Gross income = 38 × $13.20	Normal 38 hours
+ 4 × 1.5 × $13.20	Overtime rate for next 4 hours: time and a half = 1.5 × normal
+ 8 × 2 × $13.20	Overtime rate for next 8 hours: double time = 2 × normal
= $792	
b Net income = $792 − ($220 + $4.75)	Net income = gross income − deductions
= $567.25	

Now you try

Toby is paid $17.50 per hour at his supermarket job. His normal hours of work are 38 hours per week. He receives time and a half for the next 6 hours worked and double time after that.

a What will be his gross income if he works 48 hours in a week?

b If he pays $240 per week in taxation and $6.50 in union fees, what will be his weekly net income?

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2C

4 Jack is paid $14.70 per hour. His normal hours of work are 38 hours per week. He receives time and a half for the next 2 hours worked and double time after that.

a What will be his gross income if he works 43 hours?

b If he has $207.20 of deductions, what will be his weekly net income?

5 Copy and complete this table.

	Hourly rate	Normal hours worked	Time and a half hours	Double time hours	Gross income	Deductions	Net income
a	$15	38	0	0		$155	
b	$24	38	2	0		$220	
c	$13.15	38	4	1		$300	
d	$70	40	2	3		$510	
e	$17.55	35	4	6		$184	

Example 11 Calculating shift work

Michael is a shift worker and is paid $31.80 per hour for the morning shift, $37.02 per hour for the afternoon shift and $50.34 per hour for the night shift. Each shift is 8 hours. In a given fortnight he works four morning, two afternoon and three night shifts. Calculate his gross income.

Solution	Explanation
Gross income $= 4 \times 31.80 \times 8$	4 morning shifts at $31.80 per hour for 8 hours
$+ 2 \times 37.02 \times 8$	2 afternoon shifts at $37.02 per hour for 8 hours
$+ 3 \times 50.34 \times 8$	3 night shifts at $50.34 per hour for 8 hours
$= \$2818.08$	Gross income because tax has not been paid.

Now you try

Kate is a shift worker and is paid $26.20 per hour for the morning shift, $32.40 per hour for the afternoon shift and $54.25 per hour for the night shift. Each shift is 8 hours. In a given fortnight she works five morning, three afternoon and two night shifts. Calculate her gross income.

6 Greg works shifts at a processing plant. In a given rostered fortnight he works:

- 3 day shifts ($31.80 per hour)
- 4 afternoon shifts ($37.02 per hour)
- 4 night shifts ($50.34 per hour).

a If each shift is 8 hours long, determine Greg's gross income for the fortnight.

b If the answer to part **a** is Greg's average fortnightly income, what will be his gross income for a year (i.e. 52 weeks)?

Hint: A fortnight = 2 weeks

Many hospital workers work shift work.

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Example 12 Calculating income involving commission

Jeff sells memberships to a gym and receives $225 per week plus 5.5% commission on his sales. Calculate his gross income after a 5-day week.

Day	1	2	3	4	5
Sales ($)	680	450	925	1200	1375

Solution	Explanation
Total sales = $4630	Determine the total sales: $680 + 450 + 925 + 1200 + 1375$.
Commission = 5.5% of $4630 $= 0.055 \times \$4630$ $= \$254.65$	Determine the commission on the total sales at 5.5% by multiplying 0.055 by the total sales.
Gross income = $225 + $254.65 = $479.65	Gross income is $225 plus commission.

Now you try

Jin sells vacuum cleaners and receives $250 per week plus 4.3% commission on her sales. Calculate her gross income after a 5-day week.

Day	1	2	3	4	5
Sales ($)	1230	690	1422	1590	2648

7 A car salesman earns $5000 a month plus 3.5% commission on all sales. In the month of January his sales total was $56 000. Calculate:
- **a** his commission for January
- **b** his gross income for January

8 A real estate agent receives 2.75% commission on the sale of a house valued at $1 250 000. Find the commission earned.

9 Sarah earns an annual salary of $77 000 plus 2% commission on all sales. Find:
- **a** her weekly base salary before sales
- **b** her commission for a week when her sales totalled $7500
- **c** her gross weekly income for the week in part **b**
- **d** her annual gross income if over the year her sales totalled $571 250

Problem-solving and reasoning 10, 11 10–12

10 If Simone receives $10 000 on the sale of a property worth $800 000, calculate her rate of commission.

Hint: What percentage of $800 000 is $10 000?

11 Jonah earns a commission on his sales of fashion items. For goods to the value of $2000 he receives 6% and for sales over $2000 he receives 9% on the amount in excess of $2000. In a given week he sold $4730 worth of goods. Find the commission earned.

12 William earns 1.75% commission on all sales at the electrical goods store where he works. If William earns $35 in commission on the sale of one television, how much did the TV sell for?

Hint: 1.75% is $35. Find 1%, then 100%.

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2C

Elmo's payslip — 13

13 Refer to the payslip below to answer the following questions.

Kuger Incorporated			
Employee ID: 75403A			Page: 1
Name: Elmo Rodriguez			Pay Period: 21/05/2016
Pay Method: EFT		Tax Status: Gen Exempt	
Bank account name: E. Rodriguez			
Bank: Mathsville Credit Union			
BSB: 102-196 Account No: 00754031			
Payment Details this pay:			
Amount	Days	Payment Description	Rate/Frequency
2 777.15	14.00	Normal time	$72 454/annum
Before tax deductions:			
This pay		Description	
170		Salary sacrifice: car pre-tax deduction	
Miscellaneous deductions:			
This pay		Description	
52.90		Health fund	
23.10		Union fees	
76.00			
Reconciliation details:			
This pay	YTD	Description	
2 607.15	62 571.60	Taxable gross pay	
616.00	14 784.00	less income tax	
76.00	1 824.00	less miscellaneous deductions	
1 915.15	45 963.60		

a Which company does Elmo work for?

b What is the name of Elmo's bank and what is his account number?

c How much gross pay does Elmo earn in 1 year?

d How often does Elmo get paid?

e How much, per year, does Elmo salary sacrifice?

f How much is Elmo's health fund contribution each week?

g Calculate 1 year's union fees.

h Using the information on this payslip, calculate Elmo's annual tax and also his annual net income.

i If Elmo works Monday to Friday from 9 a.m. to 5 p.m. each day for an entire year, calculate his effective hourly rate of pay. Use Elmo's fortnightly payment as a starting point.

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2D Income taxation ★

Learning intentions

- To understand how the key components of the Australian taxation system work
- To be able to calculate a person's taxable income
- To be able to calculate a person's tax payable using Australian tax brackets

Key vocabulary: taxation, employer, employee, tax return, taxable income, tax bracket, levy, deductions, p.a. (per annum)

It has been said that there are only two sure things in life: death and taxes! The Australian Taxation Office (ATO) collects taxes on behalf of the government to pay for education, hospitals, roads, railways, airports and services, such as the police and fire brigades.

In Australia, the financial year runs from July 1 to June 30 the following year. People engaged in paid employment are normally paid weekly or fortnightly. Most of them pay some income tax every time they are paid for their work. This is known as the Pay-As-You-Go system (PAYG).

At the end of the financial year (June 30), people who earned an income complete an income tax return to determine if they have paid the correct amount of income tax during the year. If they paid too much, they will receive a refund. If they did not pay enough, they will be required to pay more.

The Australian tax system is very complex and the laws change frequently. This section covers the main aspects only.

Lesson starter: The ATO website

The Australian Taxation Office website has some income tax calculators. Use one to find out how much income tax you would need to pay if your taxable income is:

$5200 per annum (i.e. $100 per week)

$10 400 per annum (i.e. $200 per week)

$15 600 per annum (i.e. $300 per week)

$20 800 per annum (i.e. $400 per week)

$26 000 per annum (i.e. $500 per week)

Does a person earning $1000 per week pay twice as much tax as a person earning $500 per week?

Does a person earning $2000 per week pay twice as much tax as a person earning $1000 per week?

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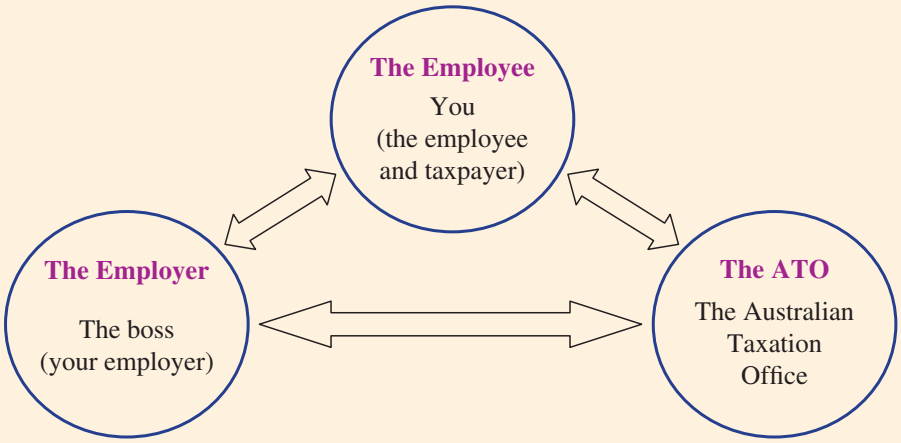
Key ideas



- The PAYG tax system works in the following way.
  - The employee works for and gets paid by the employer every week, fortnight or month.
  - The employer calculates the tax that the employee should pay for the amount earned by the employee.
  - The employer sends that tax to the ATO every time the employee gets paid.
  - The ATO passes the income tax to the federal government.
  - On June 30, the employer gives the employee a payment summary to confirm the amount of tax that has been paid to the ATO on behalf of the employee.
  - Between July 1 and October 31, the employee completes a **tax return** and sends it to the ATO. Some people pay a registered tax agent to do this return for them.
  - On this tax return, the employee lists the following.
    - *All* forms of income, including interest from investments.
    - Legitimate deductions shown on receipts and invoices, such as work-related expenses and donations.
  - **Taxable income** is calculated using the formula:
    Taxable income = gross income − deductions
  - There are tables and calculators on the ATO website, such as the following.

Taxable income	Tax on this income
0 − $18 200	Nil
$18 201 − $37 000	19c for each $1 over $18 200
$37 001 − $80 000	$3572 plus 32.5c for each $1 over $37 000
$80 001 − $180 000	$17 547 plus 37c for each $1 over $80 000
$180 001 and over	$54 547 plus 45c for each $1 over $180 000

  This table can be used to calculate the amount of tax you *should have* paid (i.e. the tax payable), as opposed to the tax you *did* pay during the year (i.e. the tax withheld). Each row in the table is called a **tax bracket**.
  - You may also need to pay the Medicare **levy**. This is a scheme in which all Australian taxpayers share in the cost of running the medical system. For many people this is currently 2% of their taxable income.
  - It is possible that you may have paid too much tax during the year and will receive a tax refund.
  - It is also possible that you may have paid too little tax and will receive a letter from the ATO asking for the tax liability to be paid.

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Exercise 2D

Understanding

1–3 | 2, 3

Note: The questions in this exercise relate to the tax table given in Key ideas, unless stated otherwise.

1 Complete this statement: Taxable income = _____ income minus _____.

2 Based on the table in the key ideas, determine if the following statements are true or false?

a A taxable income of $10 400 requires no tax to be paid.

b The highest income earners in Australia pay 45 cents tax for every dollar they earn.

3 In the 2019/2020 financial year, Ann's taxable income was $80 000, which puts her at the very top of the middle tax bracket in the tax table. Ben's taxable income was $80 001, which puts him in a higher tax bracket. Ignoring the Medicare levy, how much extra tax did Ben pay compared to Ann?

Fluency

4, 5 | 4–6

Example 13 Calculating income tax payable

During the 2019/2020 financial year, Richard earned $1050 per week ($54 600 per annum) from his employer and other sources, such as interest on investments. He has receipts for $375 for work-related expenses and donations.

a Calculate Richard's taxable income.

b Use this tax table to calculate Richard's tax payable amount.

Taxable income	Tax on this income
0 – $18 200	Nil
$18 201 – $37 000	19c for each $1 over $18 200
$37 001 – $80 000	$3572 plus 32.5c for each $1 over $37 000
$80 001 – $180 000	$17 547 plus 37c for each $1 over $80 000
$180 001 and over	$54 547 plus 45c for each $1 over $180 000

c Richard must also pay the Medicare levy of 2% of his taxable income. How much is the Medicare levy?

d Add the tax payable and the Medicare levy amounts.

e Express the total tax in part **d** as a percentage of Richard's taxable income, to one decimal place.

f During the financial year, Richard's employer sent a total of $7797 in tax to the ATO. Has Richard paid too much tax or not enough? Calculate his refund or liability.

Solution	Explanation
a Gross income = $54 600 Deductions = $375 Taxable income = $54 225	Taxable income = gross income – deductions
b Tax payable: $3572 + 0.325 \times (\$54\,225 - \$37\,000)$ = $9170.13	Richard is in the middle tax bracket in the table, in which it says: $3572 plus 32.5c for each $1 over $37 000 Note: 32.5 cents is $0.325.
c $\frac{2}{100} \times 54\,225 = \$1084.50$	Medicare levy is 2% of the taxable income.

Continued on next page

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2D

d $\$9170.13 + \$1084.50 = \$10\,254.63$ — This is the total amount of tax that Richard should have paid.

e $\frac{10\,254.63}{54\,225} \times 100 = 18.9\%$ (to 1 d.p.) — This implies that Richard paid approximately 18.9% tax on every dollar. This is sometimes read as '18.9 cents in the dollar'.

f Richard paid \$7797 in tax during the year. He should have paid \$10 254.63. Richard has not paid enough tax. He must pay another \$2457.63 in tax. — This is known as a shortfall or a liability. He will receive a letter from the ATO requesting payment of the difference. $\$10\,254.63 - \$7797 = \$2457.63$

Now you try

During the 2019/2020 financial year, Francesca earned \$82 300 per annum from her employer and other sources, such as interest on investments. She has receipts for \$530 for work-related expenses and donations.

a Calculate Francesca's taxable income.
b Use the tax table from the Key ideas to calculate Francesca's tax payable amount.
c Francesca must also pay the Medicare levy of 2% of her taxable income. How much is the Medicare levy?
d Add the tax payable and the Medicare levy amounts.
e Express the total tax in part **d** as a percentage of Francesca's taxable income, to one decimal place.
f During the financial year, Francesca's employer sent a total of \$17 445 in tax to the ATO. Has Francesca paid too much tax or not enough? Calculate her refund or liability.

4 During the 2019/2020 financial year, Liam earned \$94 220 per annum from his employer and other sources, such as interest on investments. He has receipts for \$615 for work-related expenses and donations.

a Calculate Liam's taxable income.
b Use the tax table from the Key ideas to calculate Liam's tax payable amount.
c Liam must also pay the Medicare levy of 2% of his taxable income. How much is the Medicare levy?
d Add the tax payable and the Medicare levy amounts.
e Express the total tax in part **d** as a percentage of Liam's taxable income, to one decimal place.
f During the financial year, Liam's employer sent a total of \$25 249 in tax to the ATO. Has Liam paid too much tax or not enough? Calculate his refund or liability.

5 Use the tax table in the key ideas to calculate the income tax payable on these taxable incomes.
a \$30 000 **b** \$60 000 **c** \$150 000 **d** \$200 000

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6 Lee has come to the end of her first financial year employed as a website developer. On June 30 she made the following notes about the financial year.

Gross income from employer	$58 725
Gross income from casual job	$7500
Interest on investments	$75
Donations	$250
Work-related expenses	$425
Tax paid during the financial year	$13 070

Hint: Taxable income = all incomes − deductions

a Calculate Lee's taxable income.
b Use the tax table shown in Example 13 to calculate Lee's tax payable amount.
c Lee must also pay the Medicare levy of 2% of her taxable income. How much is the Medicare levy?
d Add the tax payable and the Medicare levy.
e Express the total tax in part **d** as a percentage of Lee's taxable income, to one decimal place.
f Has Lee paid too much tax or not enough? Calculate her refund or liability.

Problem-solving and reasoning

7, 8, 10, 11 | 7, 9, 11–13

7 Alec's Medicare levy is $1750. This is 2% of his taxable income. What is Alec's taxable income?

8 Tara is saving for an overseas trip. Her taxable income is usually about $20 000. She estimates that she will need $5000 for the trip, so she is going to do some extra work to raise the money. How much extra will Tara need to earn in order to save the extra $5000 after tax?

9 When Saled used the tax table to calculate his income tax payable, it turned out to be $23 097. What is his taxable income?

Hint: Use the tax table given in Example 13 to determine in which tax bracket Saled falls.

10 Explain the difference between a tax refund and a tax liability.

11 Gordana looked at the last row of the tax table and said, 'It is so unfair that people in that tax bracket must pay 45 cents in every dollar in tax.' Explain why Gordana is incorrect.

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2D

12 The most recent significant change to Australian income tax rates was first applied in the 2012/2013 financial year. Consider the tax tables for the two consecutive financial years 2011/2012 and 2012/2013. Note that the amounts listed first in each table are often called the tax-free threshold (i.e. the amount that a person can earn before they must pay tax).

2011/2012	
Taxable income	**Tax on this income**
$0 – $6000	Nil
$6001 – $37 000	15c for each $1 over $6000
$37 001 – $80 000	$4650 plus 30c for each $1 over $37 000
$80 001 – $180 000	$17 550 plus 37c for each $1 over $80 000
$180 001 and over	$54 550 plus 45c for each $1 over $180 000
2012/2013	
Taxable income	**Tax on this income**
0 – $18 200	Nil
$18 201 – $37 000	19c for each $1 over $18 200
$37 001 – $80 000	$3572 plus 32.5c for each $1 over $37 000
$80 001 – $180 000	$17 547 plus 37c for each $1 over $80 000
$180 001 and over	$54 547 plus 45c for each $1 over $180 000

a There are some significant changes between the financial years 2011/2012 and 2012/2013. Describe three of them.

b The following people had the same taxable income during both financial years. Find the difference in their tax payable amounts and state whether they were advantaged or disadvantaged by the changes, or not affected at all?

i Ali: Taxable income = $5000
ii Xi: Taxable income = $15 000
iii Charlotte: Taxable income = $30 000
iv Diego: Taxable income = $50 000

13 Below is the tax table for people who are not residents of Australia but are working in Australia.

Taxable income	Tax on this income
$1 – $90 000	32.5c for each $1
$90 001 – $180 000	$29 250 plus 37c for each $1 over $90 000
$180 001 and over	$62 550 plus 45c for each $1 over $180 000

Compare this table to the one in the example for Australian residents.
What difference would it make to the amount of tax paid by these people if they were non-residents rather than residents?

a Ali: Taxable income = $5000
b Xi: Taxable income = $15 000
c Charlotte: Taxable income = $30 000
d Diego: Taxable income = $100 000

What are legitimate tax deductions? — 14

14 a Choose an occupation or career in which you are interested. Imagine that you are working in that job. During the year you will need to keep receipts for items you have bought that are legitimate work-related expenses. Do some research on the internet and write down some of the things that you will be able to claim as work-related expenses in your chosen occupation.

b i Imagine your taxable income is $80 000. What is your tax payable amount?
ii You just found a receipt for a $100 donation to a registered charity. This decreases your taxable income by $100. By how much does it decrease your tax payable amount?

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2E Budgeting

Learning intentions

- To know the types of expenses that are included in a budget
- To understand how a budget is affected by fixed and variable expenses
- To be able to calculate savings and other expenses based on the information in a budget
- To be able to calculate the best buy (cheapest deal) from a range of options

Key vocabulary: budget, fixed expenses, variable expenses

Once people have been paid their income for the week, fortnight or month, they must plan how to spend it. Most families work on a budget, allocating money for fixed expenses such as the mortgage or rent and the varying (i.e. changing) expenses of petrol, food and clothing.

Lesson starter: Expenses for the month

Write down everything that you think your family would spend money on for the week and the month, and estimate how much those things might cost for the entire year. Where do you think savings could be made? What would be some additional annual expenses?

Key ideas

- A **budget** is an estimate of income and expenses for a period of time.
- Managing money for an individual is similar to operating a small business. Expenses can be divided into two areas:
  - **Fixed expenses** (these do not change during a time period): payment of loans, mortgages, regular bills etc.
  - **Variable expenses** (these costs change over a time period): clothing, entertainment, food etc. (these are estimates)
- When your budget is completed you should always check that your figures are reasonable estimates.
- By looking at the budget you should be able to see how much money is remaining; this can be used as savings or to buy non-essential items.

Exercise 2E

Understanding 1–3 3

1 Classify each expense listed below as most likely a fixed expense or a variable expense.
- **a** monthly rent
- **b** monthly phone bill payment plan
- **c** take away food
- **d** stationery supplies for work

2 Binh has an income of $956 a week. His expenses, both fixed and variable, total $831.72 of his income. How much money can Binh save each week?

3 Roslyn has the following monthly expenses. Mortgage = $1458, mobile phone = $49, internet = $60, council rates = $350, water = $55, electricity = $190. What is the total of Roslyn's monthly expenses?

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2E

Fluency 4–7 4, 5, 7, 8

Example 14 Budgeting using percentages

Fiona has a net annual income of $36 000 after deductions. She allocates her budget on a percentage basis.

	Mortgage	Car loan	Food	Education	Sundries	Savings
Expenses (%)	20	15	25	20	10	10

a Determine the amount of fixed expenses, including the mortgage, car loan and education.
b How much should Fiona save?
c Is the amount allocated for food reasonable?

Solution	Explanation
a Fixed expenses = 55% of $36 000 = 0.55 × $36 000 = $19 800	The mortgage, car loan and education are 55% in total. Change 55% to a decimal and multiply by the net income.
b Savings = 10% of $36 000 = 0.1 × $36 000 = $3600	Savings are 10% of the budget. Change 10% to a decimal and multiply by the net income.
c Food = 25% of $36 000 = 0.25 × $36 000 = $9000 per year, or $173 per week This seems reasonable.	Food is 25% of the budget. Change 25% to a decimal and calculate. Divide the yearly expenditure by 52 to make a decision on the reasonableness of your answer.

Now you try

Kyle has a net annual income of $64 200 after deductions. He allocates his budget on a percentage basis.

	Rent	Food	Entertainment	Bills	Transport	Sundries	Savings
Expenses (%)	30	10	10	15	5	10	20

a Determine the amount of fixed expenses including the rent and bills.
b How much should Kyle save?
c Is the amount allocated for transport reasonable?

4 Paul has an annual income of $75 000 after deductions. He allocates his budget on a percentage basis.

	Mortgage	Car loan	Personal loan	Clothing	Food	Other
Expenses (%)	20	10	25	5	10	30

a Determine the amount of fixed expenses, including the mortgage and loans.
b How much should Paul have left over after paying for his mortgage, car loan and personal loan?
c Is the amount allocated for food reasonable?

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5 Lachlan has an income of $2120 per month. If he budgets 5% for clothes, how much will he actually have to spend on clothes each month?

Example 15 Budgeting using fixed values

Running a certain type of car involves yearly, monthly and weekly expenditure. Consider the following vehicle's costs.

- lease $210 per month
- registration $475 per year
- insurance $145 per quarter
- servicing $1800 per year
- petrol $37 per week

a Determine the overall cost to run this car for a year.

b What percentage of a $70 000 salary would this be, correct to one decimal place?

Solution		Explanation
a Overall cost =	210×12	Leasing cost: 12 months in a year
+	475	Registration cost
+	145×4	Insurance cost: 4 quarters in a year
+	1800	Servicing cost
+	37×52	Petrol cost: 52 weeks in a year
=	$7299	The overall cost is found by adding the individual totals.
The overall cost to run the car is $7299.		
b % of salary $= \frac{7299}{70\,000} \times 100$		Percentage $= \frac{\text{car cost}}{\text{total salary}} \times 100$
$= 10.4\%$ (to 1 d.p.)		Round as required.

Now you try

Running a boat involves yearly, monthly and weekly expenditure. Consider the following boat's costs.

- registration $342 per year
- insurance $120 per quarter
- servicing $360 per year
- fuel $300 per month
- storing boat $2400 per year

a Determine the overall cost to run this boat for a year.

b What percentage of a $82 000 salary would this be, correct to one decimal place?

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2E

6 Eliana is a student and has the following expenses in her budget.

- rent $270 per week
- electricity $550 per quarter
- phone and internet $109 per month
- car $90 per week
- food $170 per week
- insurance $2000 a year

Hint: Use 52 weeks in a year, 12 months in a year and 4 quarters in a year.

a Determine Eliana's costs for a year.

b What percentage of Eliana's net annual salary of $45 000 would this be, correct to one decimal place?

7 The costs of sending a student to Modkin Private College are as follows.

- fees per term (4 terms) $1270
- subject levies per year $489
- building fund per week $35
- uniforms and books per year $367

a Determine the overall cost per year.

b If the school bills twice a year, covering all the items above, what would be the amount of each payment?

c How much should be saved per week to make the biannual payments?

8 A small business owner has the following expenses to budget for.

- rent $1400 a month
- phone line $59 a month
- wages $1200 a week
- electricity $430 a quarter
- water $120 a quarter
- insurance $50 a month

a What is the annual budget for the small business?

b How much does the business owner need to make each week just to break even?

c If the business earns $5000 a week, what percentage of this needs to be spent on wages?

Problem-solving and reasoning

9, 10, 12–14 | 10–12, 14, 15

9 Francine's petrol budget is $47 from her weekly income of $350.

a What percentage of her budget is this? Give your answer to two decimal places.

b If petrol costs $1.59 per litre, how many litres of petrol, correct to two decimal places, is Francine budgeting for in a week?

10 Grant works a 34-hour week at $15.50 per hour. His net income is 65% of his gross income.

a Determine his net weekly income.

b If Grant spends 12% of his net income on entertainment, determine the amount he actually spends per year on entertainment.

c Grant saves $40 per week. What percentage of his net income is this (to two decimal places)?

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11 Dario earns $432 per fortnight at a take-away pizza shop. He budgets 20% for food, 10% for recreation, 13% for transport, 20% for savings, 25% for taxation and 12% for clothing.

a Determine the actual amount budgeted for each category every fortnight.

Dario's wage increases by 30%.

b Determine how much he would now save each week.

c What percentage increase is the answer to part **c** on the original amount saved?

d Determine the extra amount of money Dario saves per year after his wage increase.

e If transport is a fixed expense, its percentage of Dario's budget will change. Determine the new percentage.

Example 16 Calculating best buys

Soft drink is sold in three convenient packs at the local store.

- carton of 36 (375 mL) cans at $22.50
- a six-pack of (375 mL) cans at $5.00
- 2-litre bottles at $2.80

Determine the cheapest way to buy the soft drink.

Solution	Explanation
Buying by the carton:	
Cost = $22.50 ÷ (36 × 375)	Total mL = 36 × 375
= $0.0017 per mL	Divide to work out the cost per mL.
Buying by the six-pack:	
Cost = $5 ÷ (6 × 375)	Total mL = 6 × 375
= $0.0022 per mL	
Buying by the bottle:	
Cost = $2.80 ÷ 2000	Total mL = 2 × 1000, since 1 L = 1000 mL.
= $0.0014 per mL	
∴ The cheapest way to buy the soft drink is to buy the 2-litre bottle.	Compare the three costs per mL.

Now you try

A brand of toilet rolls are sold in three pack types at the supermarket.

- a pack of 18 rolls for $8.82
- a pack of 6 rolls for $3.30
- a pack of 4 double length rolls for $3.68

Determine the cheapest way to buy the toilet rolls.

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2E

12 Tea bags can be purchased from the supermarket in three forms.

- 25 tea bags at $2.36
- 50 bags at $4.80
- 200 bags at $15.00

What is the cheapest way to buy tea bags?

13 A weekly train concession ticket costs $16. A day ticket costs $3.60. If you are going to school only 4 days next week, is it cheaper to buy one ticket per day or a weekly ticket?

14 A holiday caravan park offers its cabins at the following rates.

- $87 per night (Sunday–Thursday)
- $187 for a weekend (Friday and Saturday)
- $500 per week

a Determine the nightly rate in each case.
b Which price is the best value?

15 Tomato sauce is priced at:

- 200 mL bottle $2.35
- 500 mL bottle $5.24

a Find the cost per mL of the tomato sauce in each case.
b Which is the cheapest way to buy tomato sauce?
c What would be the cost of 200 mL at the 500 mL rate?
d How much would be saved by buying the 200 mL bottle at this rate?
e Suggest why the 200 mL bottle is not sold at this price.

Minimum cost of tennis balls — 16

16 Safeserve has a sale on tennis balls for one month.
When you buy:

- 1 container, it costs $5
- 6 containers, it costs $28
- 12 containers, it costs $40
- 24 containers, it costs $60

You need 90 containers for your club to have enough for a season.

a Determine the minimum cost if you buy exactly 90 containers.

b Determine the overall minimum cost, and the number of extra containers you will have in this situation.

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2F Simple interest

Learning intentions

- To understand how simple interest is calculated
- To be able to calculate interest using the simple interest formula
- To be able to determine the rate of interest based on the interest earned
- To be able to calculate the amount owing on a loan and calculate repayments

Key vocabulary: principal, rate of interest, simple interest, annual, invest, borrow

Borrowed or invested money usually has an associated interest rate. The consumer needs to establish the type of interest they are paying and the effects it has on the amount borrowed or invested over time. Some loans or investments deliver the full amount of interest using only the initial loan or investment amount in the interest calculations. These types are said to use simple interest.

Lesson starter: How long to invest?

Marcus and Brittney each have $\$200$ in their bank accounts. Marcus earns $\$10$ a year in interest. Brittney earns 10% p.a. simple interest.

For how long must each of them invest their money for it to double in value?

Key ideas

- **Simple interest** is a type of interest that is calculated on the amount **invested** or **borrowed**.
- The terms needed to understand simple interest are:
  - **Principal (P)**: the amount of money borrowed or invested
  - **Rate of interest (r)**: the **annual** (yearly) percentage rate of interest (e.g. 3% p.a.)
  - Time (t): the number of years for which the principal is borrowed or invested
  - Interest (I): the amount of interest accrued over a given time.
- The formula for calculating simple interest is:

$$I = \text{principal} \times \text{rate} \times \text{time}$$

$$I = \frac{Prt}{100} \text{ (Since the rate is a percentage)}$$

- Total repaid = amount borrowed + interest

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Exercise 2F

Understanding

1, 2 | 2

1 In the formula $I = \frac{Prt}{100}$:

a I is the _____
b P is the _____
c r is the _____
d t is the _____.

2 Calculate interest earned (I) if:

a $P = 1000$, $r = 4$, $t = 5$
b $P = 2500$, $r = 3$, $t = 4$

Hint: Use $I = \frac{Prt}{100}$

Fluency

3–6 | 4–7

Example 17 Using the simple interest formula

Use the simple interest formula, $I = \frac{Prt}{100}$, to find:

a the interest (I) when \$600 is invested at 8% p.a. for 18 months
b the annual interest rate (r) when \$5000 earns \$150 interest in 2 years

Solution

a
$P = 600$
$r = 8$
$t = 18 \text{ months} = \frac{18}{12} = 1.5 \text{ years}$
$I = \frac{Prt}{100}$
$= \frac{600 \times 8 \times 1.5}{100}$
$= 72$
The interest is \$72 in 18 months.

Explanation

Write out the information that you know and the formula.

Substitute into the formula using years for t.

b
$P = 5000$
$I = 150$
$t = 2 \text{ years}$
$I = \frac{Prt}{100}$
$150 = \frac{5000 \times r \times 2}{100}$
$150 = 100 \times r$
$r = 1.5$
The simple interest rate is 1.5% per year.

Write the formula and the information known.
Substitute the values into the formula and solve the equation to find r.

$\frac{5000 \times r \times 2}{100} = 100r$

Write the rate as a percentage.

Now you try

Use the simple interest formula, $I = \frac{Prt}{100}$, to find:

a the interest (I) when \$450 is invested at 5% p.a. for 30 months
b the annual interest rate (r) when \$3500 earns \$210 interest in 3 years

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3 Use the simple interest formula, $I = \frac{Prt}{100}$, to find:

- **a** the interest (I) when \$500 is invested at 6% p.a. for 24 months
- **b** the annual interest rate (r) when \$3000 earns \$270 interest in 3 years

4 Copy and complete this table of values for I, P, r and t.

Hint: Use $I = \frac{Prt}{100}$

	P	Rate	Time	I
a	\$700	5% p.a.	4 years	
b	\$2000	7% p.a.	3 years	
c	\$3500	3% p.a.	22 months	
d	\$750	$2\frac{1}{2}$% p.a.	30 months	
e	\$22 500		3 years	\$2025
f	\$1770		5 years	\$354

Example 18 Calculating repayments with simple interest

\$3000 is borrowed at 12% p.a. simple interest for 2 years.

- **a** What is the total amount owed over the 2 years?
- **b** If repayments of the loan are made monthly, how much would each payment need to be?

Solution	Explanation
a $P = \$3000,\ r = 12,\ t = 2$	List the information you know.
$I = \frac{Prt}{100}$	Write the formula.
$= \frac{3000 \times 12 \times 2}{100}$	Substitute the values and evaluate.
$= \$720$	
Total amount $= \$3000 + \$720$	Total amount is the original amount *plus* the interest.
$= \$3720$	
b Amount of each payment $= \$3720 \div 24$	2 years = 24 months
$= \$155$ per month	There are 24 payments to be made. Divide the total by 24.

Now you try

\$5400 is borrowed at 9% p.a. simple interest for 4 years.

- **a** What is the total amount owed over the 4 years?
- **b** If repayments of the loan are made monthly, how much would each payment need to be?

5 \$5000 is borrowed at 11% p.a. simple interest for 3 years.

- **a** What is the total amount owed over the 3 years?
- **b** If repayments of the loan are made monthly, how much would each payment need to be?

Hint: Calculate the interest first.

6 Under hire purchase, John bought a second-hand car for \$11 500. He paid no deposit and decided to pay the loan off in 7 years. If the simple interest is 6.45%, determine:

- **a** the total interest paid
- **b** the total amount of the repayment
- **c** the payments per month

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2F

7 $10 000 is borrowed to buy a second-hand BMW. The interest is calculated at a simple interest rate of 19% p.a. over 4 years.

- **a** What is the total interest on the loan?
- **b** How much is to be repaid?
- **c** What is the monthly repayment on this loan?

Problem-solving and reasoning 8–10 10–13

8 How much interest will Giorgio receive if he invests $7000 in stocks at 3.6% p.a. simple interest for 4 years?

9 Rebecca invests $4000 for 3 years at 5.7% p.a. simple interest paid yearly.

- **a** How much interest will she receive in the first year?
- **b** What is the total amount of interest Rebecca will receive over the 3 years?
- **c** How much money will Rebecca have after the 3-year investment?

10 An investment of $15 000 receives an interest payment over 3 years of $7200. What was the rate of simple interest per annum?

Hint: Substitute into the formula $I = \frac{Prt}{100}$ and solve the resulting equation.

11 Jonathon wishes to invest $3000 at 8% per annum. How long will he need to invest for his total investment to double?

12 Ivan wishes to invest some money for 5 years at 4.5% p.a. paid yearly. If he wishes to receive $3000 in interest payments per year, how much should he invest? Round your answer to the nearest dollar.

13 Gretta's interest payment on her loan totalled $1875. If the interest rate was 5% p.a. and the loan had a life of 5 years, what amount did she borrow?

Which way is best? — 14

14 A shed manufacturer offers finance with a rate of 3.5% p.a. paid at the end of 5 years with a deposit of 10%, or a rate of 6.4% repaid over 3 years with a deposit of 20%.
Melania and Donald decide to purchase a fully erected four-square shed for $12 500.

- **a** How much deposit will they need to pay in each case?
- **b** What is the total interest they will incur in each case?
- **c** If they decided to pay per month, what would be their monthly repayment?
- **d** Discuss the benefits of the different types of purchasing methods.

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Progress quiz

2A **1** Express:

a 32% as a decimal

b 8% as a simplified fraction

c $\frac{11}{25}$ as a percentage

d $\frac{5}{16}$ as a percentage

e 0.252 as a percentage

f $15\frac{1}{2}\%$ as a fraction

2A **2** Gina puts 36% of her $6000 monthly salary in a savings account. How much does she have left over?

2B **3** Complete the following.

a Increase $230 by 24%

b Increase 180 mL by 8%

c Decrease 156 cm by 15%

2B **4** A $299 coffee machine is discounted by 35%. What is the discounted price?

2B **5** An illegal scalper buys a concert ticket for $150 and sells it for $210. What is the percentage profit?

2C **6** Find the gross income for a particular week in the following work situations.

a Pippa is a door-to-door sales representative for an air conditioning company. She earns $300 per week plus 8% commission on her sales. In a particular week she makes $8200 worth of sales.

b Ari is paid $15.70 per hour in his job as a shop assistant. The first 36 hours he works in a week are paid at the normal hourly rate, the next 4 hours at time and a half and then double time after that. Ari works 42 hours in a particular week.

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2D

7 During the 2019/2020 financial year, Cameron earned $76 300 per annum. He had receipts for $425 for donations and work-related expenses.

a Calculate Cameron's taxable income.

b Use this tax table to calculate Cameron's tax payable amount, to the nearest cent.

Taxable income	Tax on this income
0 – $18 200	Nil
$18 201 – $37 000	19c for each $1 over $18 200
$37 001 – $80 000	$3572 plus 32.5c for each $1 over $37 000
$80 001 – $180 000	$17 547 plus 37c for each $1 over $80 000
$180 001 and over	$54 547 plus 45c for each $1 over $180 000

c Cameron also must pay the Medicare levy of 2% of his taxable income. How much is the levy, to the nearest cent?

d During the financial year, Cameron's employer sent a total of $15 255 in tax to the ATO on his behalf. By adding together your answers from parts **b** and **c**, calculate the amount Cameron must pay or will be refunded on his tax return.

2E

8 Charli has the following expenses in her household budget.

- rent $320 per week
- phone and internet $119 per month
- electricity $72 per quarter
- car registration $700 per year
- other car costs $120 per month
- food $110 per week
- clothing $260 per month
- medical and other insurance $160 per month

a Determine the overall cost for running the household for the year. (Use 52 weeks in a year.)

b What percentage of an $82 000 annual salary does your answer to part **a** represent? Round your answer to one decimal place.

2F

9 Use the simple interest formula $I = \frac{Prt}{100}$ to find:

a the amount owed when $4000 is borrowed at 6% p.a. for 3 years

b the investment period, in years, if an investment of $2500 at 4% p.a. earns $450 in interest

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2G Compound interest

Learning intentions

- To understand how compound interest is calculated
- To be able to apply the compound interest formula to calculate the total amount
- To be able to use the compound interest formula with different time periods such as months

Key vocabulary: compound interest, principal, rate of interest

For simple interest, the interest is always calculated on the principal amount. Sometimes, however, interest is calculated on the actual amount present in an account at each time period that interest is calculated. This means that the interest is added to the amount, then the next lot of interest is calculated again using this new amount. This process is called compound interest.

Compound interest can be calculated using updated applications of the simple interest formula or by using the compound interest formula.

Lesson starter: Investing using updated simple interest

Consider investing \$400 at 12% per annum. What is the balance at the end of 4 years if interest is added to the amount at the end of each year?

Copy and complete the table to find out.

Time	Amount (A)	Interest (I)	New amount
1st year	\$400	\$48	\$448
2nd year	\$448	\$53.76	\$501.76
3rd year	\$501.76		
4th year			

As you can see, the amount from which interest is calculated is continually changing.

Key ideas

- **Compound interest** is a type of interest that is paid on a loan or earned on an investment, which is calculated not only on the initial principal but also on the interest accumulated during the loan/investment period.
- Compound interest can be found by using updated applications of the simple interest formula. For example, \$100 compounded at 10% p.a. for 2 years.

  Year 1: $100 + 10\%$ of $100 = \$110$

  Year 2: $110 + 10\%$ of $110 = \$121$, so compound interest = \$21.
- The total amount in an account using compound interest for a given number of time periods is given by:

  $A = P\left(1 + \frac{r}{100}\right)^n$, where:

  - Principal (P) = the amount of money borrowed or invested
  - Rate of interest (r) = the percentage applied to the principal per period of investment
  - Periods (n) = the number of time periods the principal is invested
  - Amount (A) = the total amount of your investment
- Interest = amount (A) − principal (P)

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Exercise 2G

Understanding

1–3 | 3

1 Consider $500 invested at 10% p.a. compounded annually.

a How much interest is earned in the first year?

b What is the balance of the account once the first year's interest is added?

c How much interest is earned in the second year?

d What is the balance of the account at the end of the second year?

Hint: For the second year, you need to use $500 plus the interest from the first year.

2 $1200 is invested at 4% p.a. compounded annually for 3 years. Complete the following.

a The value of the principal P is _____

b 4% is the _____, r.

c The number of time periods the money is invested is _____.

3 Fill in the missing numbers.

a $700 invested at 8% p.a. compounded annually for 2 years.

$A = \square\,(1.08)^{\square}$

b $1000 invested at 15% p.a. compounded annually for 6 years.

$A = 1000\,(\square)^{6}$

c $850 invested at 6% p.a. compounded annually for 4 years.

$A = 850\,(\square)^{\square}$

Hint: For compound interest, $A = P\left(1 + \frac{r}{100}\right)^{n}$.

Fluency

4, 5–6(½), 7, 8(½) | 4–6(½), 8(½)

Example 19 Using the compound interest formula

Determine the amount after 5 years when $4000 is compounded annually at 8%.

Solution	Explanation
$P = 4000,\ n = 5,\ r = 8$	List the values for the terms you know.
$A = P\left(1 + \frac{r}{100}\right)^{n}$	Write the formula.
$= 4000\left(1 + \frac{8}{100}\right)^{5}$	Substitute the values.
$= 4000(1.08)^{5}$	Simplify and evaluate.
$= \$5877.31$	Write your answer to two decimal places, (nearest cent).

Now you try

Determine the amount after 4 years when $3000 is compounded annually at 6%.

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4 Determine the amount after 5 years when:

a \$4000 is compounded annually at 5%
b \$8000 is compounded annually at 8.35%
c \$6500 is compounded annually at 16%
d \$6500 is compounded annually at 8%

Hint: $A = P\left(1 + \frac{r}{100}\right)^n$

5 Determine the amount when \$100 000 is compounded annually at 6% for:

a 1 year **b** 2 years **c** 3 years
d 5 years **e** 10 years **f** 15 years

Example 20 Converting rates and time periods

Calculate the number of periods and the rates of interest offered per period for each of the following.

a 6% p.a. over 4 years paid monthly
b 18% p.a. over 3 years paid quarterly

Solution	Explanation
a $n = 4 \times 12 = 48$ $\quad r = 6 \div 12 = 0.5$	4 years is the same as 48 months, as 12 months = 1 year. 6% p.a. = 6% in one year. Divide by 12 to find the monthly rate.
b $n = 3 \times 4 = 12$ $\quad r = 18 \div 4 = 4.5$	There are four quarters in 1 year.

Now you try

Calculate the number of periods and the rates of interest offered per period for each of the following.

a 3% p.a. over 2 years paid monthly
b 7% p.a. over 4 years paid bi-annually (twice yearly)

6 Calculate the number of periods (n) and the rates of interest (r) offered per period for the following. (Round the interest rate to three decimal places where necessary.)

a 6% p.a. over 3 years paid biannually
b 12% p.a. over 5 years paid monthly
c 4.5% p.a. over 2 years paid fortnightly
d 10.5% p.a. over 3.5 years paid quarterly
e 15% p.a. over 8 years paid quarterly
f 9.6% p.a. over 10 years paid monthly

Hint: 'Bi-annually' means 'twice a year'. 26 fortnights = 1 year

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2G

Example 21 Finding compounded amounts using months

Tony's investment of $4000 is compounded at 8.4% p.a. over 5 years. Determine the amount he will have after 5 years if the interest is paid monthly.

Solution	Explanation
$P = 4000$	List the values of the terms you know.
$n = 5 \times 12$ $= 60$	Convert the time in years to the number of periods (in this question, months); i.e. 60 months = 5 years.
$r = 8.4 \div 12$ $= 0.7$	Convert the rate per year to the rate per period (i.e. months) by dividing by 12.
$A = P\left(1 + \frac{r}{100}\right)^n$	Write the formula.
$= 4000(1 + 0.007)^{60}$	Substitute the values.
$= 4000(1.007)^{60}$	Simplify and evaluate.
$= \$6078.95$	

Now you try

Sally's investment of $6000 is compounded at 4.8% p.a. over 4 years. Determine the amount she will have after 4 years if the interest is paid monthly.

7 An investment of $8000 is compounded at 12% p.a. over 3 years. Determine the amount the investor will have after 3 years if the interest is compounded monthly.

8 Calculate the value of the following investments if interest is compounded monthly.

a $2000 at 6% p.a. for 2 years
b $34 000 at 24% p.a. for 4 years
c $350 at 18% p.a. for 8 years
d $670 at 6.6% p.a. for $2\frac{1}{2}$ years
e $250 at 7.2% p.a. for 12 years

Hint: Convert years to months and the annual rate to the monthly rate.

Problem-solving and reasoning 9, 10 10–12

9 Shafiq invests $5000 compounded monthly at 18% p.a. Determine the value of the investment after:

a 1 month
b 3 months
c 5 months

Hint: 18% p.a. = 1.5% each month

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10 **a** Calculate the amount of compound interest paid on $8000 at the end of 3 years for each rate below.

i 12% compounded annually
ii 12% compounded biannually (twice a year)
iii 12% compounded monthly
iv 12% compounded weekly
v 12% compounded daily

Hint: Use: 1 year = 12 months
1 year = 52 weeks
1 year = 365 days

b What is the difference in the interest paid between annual and daily compounding in this case?

11 The following are expressions relating to compound interest calculations. Determine the principal (P), number of periods (n), rate of interest per period (r), annual rate of interest (R) and the overall time (t).

a $300(1.07)^{12}$, biannually
b $5000(1.025)^{24}$, monthly
c $1000(1.00036)^{65}$, fortnightly
d $3500(1.000053)^{30}$, daily
e $10\,000\ (1.078)^{10}$, annually

Hint: For 12 time periods with interest paid twice a year, this is 6 years

12 Ellen needs to decide whether to invest her $13 500 for 6 years at 4.2% p.a. compounded monthly or 5.3% compounded biannually. Decide which investment would be the best for Ellen.

Double your money — 13

13 You have $100 000 to invest and wish to double that amount. Use trial and error in the following.

a Determine, to the nearest whole number of years, the length of time it will take to do this using the compound interest formula at rates of:

i 12% p.a. **ii** 6% p.a. **iii** 8% p.a.
iv 16% p.a. **v** 10% p.a. **vi** 20% p.a.

b If the amount of investment is $200 000 and you wish to double it, determine the time it will take using the same interest rates as above.

c Are the lengths of time to double your investment the same in part **a** and part **b**?

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2H Investments and loans ★

Learning intentions

- To understand that a loan can be repaid in instalments that include interest
- To be able to calculate the total payment for a purchase or loan involving repayments
- To be able to calculate bank interest using the minimum monthly balance

Key vocabulary: investment, loan, repayment, interest, deposit, debit

When you borrow money, interest is charged, and when you invest money, interest is earned. When you invest money, the institution in which you invest (e.g. bank or credit union) pays you interest. However, when you borrow money, the institution from which you borrow charges you interest, so that you must pay back the money you initially borrowed, plus the interest.

Lesson starter: Credit card statements

Refer to Allan's credit card statement below.

a How many days were there between the closing balance and the due date?

b What is the minimum payment due?

c If Allan pays only the minimum, on what balance is the interest charged?

d How much interest is charged if Allan pays $475.23 on 25/5?

Statement Issue Date: 2/5/20		
Date of purchase	**Details**	**Amount**
3/4/20	Opening balance	314.79
5/4/20	Dean's Jeans	59.95
16/4/20	Tyre Warehouse	138.50
22/4/20	Payment made—thank you	−100.00
27/4/20	Cottonworth's Grocery Store	58.64
30/4/20	Interest charges	3.35
2/5/20	Closing balance	475.23
Percentage rate	**Due date**	**Min. payment**
18.95%	25/5/20	23.75

Key ideas

- Interest rates are associated with many loan and savings accounts.
- Bank accounts:
  - accrue interest each month on the minimum monthly balance
  - may incur account-keeping fees each month
- **Investments** are amounts put into a bank account or similar with the aim of earning interest on the money.
- **Loans** (money borrowed) have interest charged to them on the amount left owing (i.e. the balance).
- **Repayments** are amounts paid to the bank, usually each month, to repay a loan plus interest within an agreed time period.

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Exercise 2H

Understanding

1–3 | 3

1 State if the following are examples of investments, loans or repayments.

a Kara pays $160 per month to pay off her holiday loan.

b Sam deposits a $2000 prize in an account with 3% p.a. interest.

c Georgia borrows $6500 from the bank to finance setting up her small business.

2 Donna can afford to repay $220 a month. How much does she repay over:

a 1 year? **b** 18 months? **c** 5 years?

3 Sarafina buys a new bed on a 'buy now, pay later' offer. No interest is charged if she pays for the bed in 2 years. Sarafina's bed costs $2490 and she pays it back over a period of 20 months in 20 equal instalments. How much is each instalment?

Fluency

4–8 | 4, 6–9

Example 22 Repaying a loan

Wendy takes out a personal loan of $7000 to fund her trip to South Africa. Repayments are made monthly for 3 years at $275 a month. Find:

a the total cost of Wendy's trip

b the interest charged on the loan

Solution	Explanation
a Total cost = $275 × 36	3 years = 3 × 12 = 36 months
= $9900	Cost = 36 lots of $275
b Interest = $9900 − $7000	Interest = total paid − amount borrowed
= $2900	

Now you try

Jacob takes out a personal loan of $13 000 to buy a car. He makes repayments monthly for 2 years at $680 a month. Find:

a the total cost of the car

b the interest charged on the loan

4 Jason has a personal loan of $10 000. He is repaying the loan over 5 years. The monthly repayment is $310.

a Calculate the total amount Jason repays over the 5 year loan.

b How much interest is he charged?

Hint: How many monthly repayments in 5 years?

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2H

5 Robert borrows $5500 to buy a second-hand motorbike. He repays the loan in 36 equal monthly instalments of $155.
- a Calculate the total cost of the loan.
- b How much interest does Robert pay?

6 Alma borrows $250 000 to buy a house. The repayments are $1736 a month for 30 years.
- a How many repayments does Alma make?
- b What is the total amount Alma pays for the house?
- c How much interest is paid over the 30 years?

Example 23 Paying off a purchase

Harry buys a new $2100 computer on the following terms.
- 20% deposit
- monthly repayments of $90 for 2 years

Find:
a the deposit paid
b the total paid for the computer
c the interest charged

Solution	Explanation
a Deposit $= 0.2 \times 2100$ $= \$420$	Find 20% of 2100.
b Repayments $= \$90 \times 24$ $= \$2160$	2 years = 24 months Repay 24 lots of $90.
Total paid $= \$2160 + \$420$ $= \$2580$	Repay = deposit + repayments
c Interest $= \$2580 - \$2100$ $= \$480$	Interest = total paid − original price

Now you try

Sophie pays $3180 for a holiday apartment rental on the following terms.
- 30% deposit
- monthly repayments of $195 for 1 year

Find:
a the deposit paid
b the total paid for the apartment
c the interest charged

7 George buys a car for $12 750 on the following terms: 20% deposit and monthly repayments of $295 for 3 years.
- a Calculate the deposit.
- b Find the total of all the repayments.
- c Find the cost of buying the car on these terms.
- d Find the interest George pays on these terms.

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Example 24 Calculating interest

An account has a minimum monthly balance of $200 and interest is credited monthly on this amount at 1.5%.

a Determine the amount of interest to be credited at the end of the month.

b If the bank charges a fixed administration fee of $5 per month and other fees totalling $1.07, what will be the net amount credited or debited to the account at the end of the month?

Solution	Explanation
a Interest = 1.5% of $200	Interest is 1.5% per month.
$= 0.015 \times \$200$	Change 1.5% to a decimal and calculate.
$= \$3$	
b Net amount $= 3 - (5 + 1.07)$	Subtract the deductions from the interest.
$= -3.07$	
$3.07 will be debited from the account.	A negative amount is called a debit.

Now you try

An account has a minimum monthly balance of $180 and interest is credited monthly on this amount at 2.2%.

a Determine the amount of interest to be credited at the end of the month.

b If the bank charges a fixed administration fee of $4.50 per month and other fees totalling $1.18, what will be the net amount credited or debited to the account at the end of the month?

8 A bank account has a minimum monthly balance of $300 and interest is credited monthly at 1.5%.

a Determine the amount of interest to be credited each month.

b If the bank charges a fixed administration fee of $3 per month and fees of $0.24, what will be the net amount credited to the account at the end of the month?

9 An account has no administration fee. The monthly balances for May–October are in the table below. If the interest payable on the minimum monthly balance is 1%, how much interest will be added:

a for each separate month? b over the 6-month period?

May	June	July	August	September	October
$240	$300	$12	$500	$208	$73

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2H

Problem-solving and reasoning

10, 12, 13 | 11, 13, 14

10 Supersound offers the following two deals on a sound system worth $7500.

- Deal A: no deposit, interest free and nothing to pay for 18 months
- Deal B: 15% off for cash

Hint: 15% off is 85% of the original amount.

a Nick chooses deal A. Find:
- **i** the deposit he must pay
- **ii** the interest charged
- **iii** the total cost if Nick pays the system off within 18 months

b Phil chooses deal B. What does Phil pay for the same sound system?

c How much does Phil save by paying cash?

11 Camden Finance Company charges 35% flat interest on all loans.

a Mei borrows $15 000 from Camden Finance over 6 years.
- **i** Calculate the interest on the loan.
- **ii** What is the total repaid (i.e. loan + interest)?
- **iii** What is the value of each monthly repayment?

b Lancelle borrows $24 000 from the same company over 10 years.
- **i** Calculate the interest on her loan.
- **ii** What is the total repaid?
- **iii** What is the value of each monthly instalment?

12 A list of transactions that Emma made over a 1-month period is shown. The bank calculates interest *daily* at 0.01% and adds the total to the account balance at the end of this period. It has an administrative fee of $7 per month and other fees over this time total $0.35.

a Copy and complete the balance column of the table.

Hint: In part **b**, interest is calculated on the end-of-the-day balance.

Date	Deposit	Withdrawal	Balance
1 May			$3010
3 May	$490		
5 May		$2300	
17 May	$490		
18 May		$150	
20 May		$50	
25 May		$218	
31 May	$490		

b Determine the amount of interest added over this month.

c Determine the final balance after all calculations have been made.

d Suggest what the regular deposits might be for.

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13 The table below shows the interest and monthly repayments on loans when the simple interest rate is 8.5% p.a.

	18-month term		24-month term		36-month term	
Loan amount	Interest ($)	Monthly payments ($)	Interest ($)	Monthly payments ($)	Interest ($)	Monthly payments ($)
1000	127.50	62.64	170.00	48.75	255.00	34.86
1100	140.25	68.90	187.00	53.63	280.50	38.35
1200	153.00	75.17	204.00	58.50	306.00	41.83
1300	165.75	81.43	221.00	63.38	331.50	45.32
1400	178.50	87.69	238.00	68.25	357.00	48.81
1500	191.25	93.96	255.00	73.13	382.50	52.29
1600	204.00	100.22	272.00	78.00	408.00	55.78
1700	216.75	106.49	289.00	82.88	433.50	59.26
1800	229.50	112.75	306.00	87.75	459.00	62.75
1900	242.25	119.01	323.00	92.63	484.50	66.24
2000	255.00	125.28	340.00	97.50	510.00	69.72

a Use the table to find the monthly repayments for a loan of:
- **i** $1500 over 2 years
- **ii** $2000 over 3 years
- **iii** $1200 over 18 months

b Damien and Lisa can afford monthly repayments of $60. What is the most they can borrow and on what terms?

14 Part of a credit card statement is shown here.

Understanding your account

CLOSING BALANCE
$403.80

CLOSING BALANCE
This is the amount you owe at the end of the statement period

MINIMUM PAYMENT DUE
$10.00

MINIMUM PAYMENT DUE
This is the minimum payment that must be made towards this account

PAYABLE TO MINIMISE FURTHER INTEREST CHARGES
$403.80

PAYABLE TO MINIMISE FURTHER INTEREST CHARGES
This amount you must pay to minimise interest charges for the next statement period

a What is the closing balance?

b What is due on the card if only the minimum payment is made on the due date?

c This card charges 21.9% p.a. interest calculated daily on the unpaid balance. To find the daily interest amount, the company multiplies this balance by 0.0006. What does it cost in interest per day if only the minimum payment is made?

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2H

Reducing the balance of loans (a spreadsheet approach) — 15

15 When you take out a loan from a lending institution you will be asked to make regular payments (usually monthly) for a certain period of time to repay the loan completely. The larger the repayment, the shorter the term of the loan.

Loans work mostly on a reducing balance and you can find out how much balance is owing at the end of each month from a statement, which is issued on a regular basis.

Let's look at an example of how the balance is reducing.

If you borrow \$15 000 at 17% p.a. and make repayments of \$260 per month, at the end of the first month your statement would be calculated as shown.

$$\text{Interest due} = \frac{15\,000 \times 0.17}{12}$$
$$= \$212.50$$
$$\text{Repayment} = \$260$$
$$\text{Amount owing} = \$15\,000 + \$212.50 - \$260$$
$$= \$14\,952.50$$

This process would be repeated for the next month:

$$\text{Interest due} = \frac{14\,952.50 \times 0.17}{12}$$
$$= \$211.83$$
$$\text{Repayment} = \$260$$
$$\text{Amount owing} = \$14\,952.50 + \$211.83 - \$260$$
$$= \$14\,904.33$$

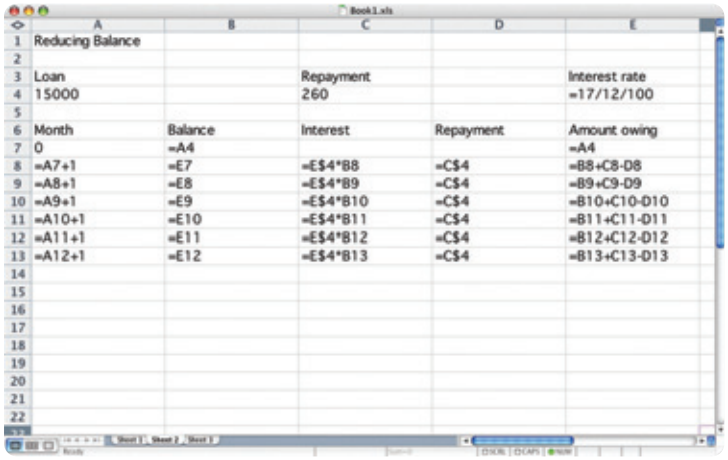
As you can see, the amount owing is decreasing and so is the interest owed each month. Meanwhile, more of your repayment is actually reducing the balance of the loan.

A statement might look like this:

Balance	Interest	Repayment	Amount owing
15 000	212.50	260	14 952.50
14 952.50	211.83	260	14 904.33
14 904.33	211.14	260	14 855.47
14 855.47	210.45	260	14 805.92
14 805.92	209.75	260	14 755.67

Check to see that all the calculations are correct on the statement above.

As this process is repetitive, the calculations are best done by means of a spreadsheet. To create a spreadsheet for the process, copy the following, extending your sheet to cover 5 years.



	A	B	C	D	E
1	Reducing Balance				
2					
3	Loan		Repayment		Interest rate
4	15000		260		=17/12/100
5					
6	Month	Balance	Interest	Repayment	Amount owing
7	0	=A4			=A4
8	=A7+1	=E7	=E$4*B8	=C$4	=B8+C8-D8
9	=A8+1	=E8	=E$4*B9	=C$4	=B9+C9-D9
10	=A9+1	=E9	=E$4*B10	=C$4	=B10+C10-D10
11	=A10+1	=E10	=E$4*B11	=C$4	=B11+C11-D11
12	=A11+1	=E11	=E$4*B12	=C$4	=B12+C12-D12
13	=A12+1	=E12	=E$4*B13	=C$4	=B13+C13-D13
14					
15					
16					
17					
18					
19					
20					
21					
22					

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2I Comparing interest using technology ★

Learning intentions

- To understand how technology can be used to efficiently compare interest calculations
- To be able to use technology to calculate interest and final amounts and compare interest plans

Key vocabulary: simple interest, compound interest

Both compound interest and simple interest calculations involve formulas. Technology including scientific and CAS calculators, spreadsheets or even computer programs can be used to make simple and compound interest calculations.

These allow for quick, repeated calculations where values can be adjusted and the interest from different accounts compared.

Lesson starter: Who earns the most?

- Ceanna invests \$500 at 8% p.a. compounded monthly over 3 years.
- Huxley invests \$500 at 10% p.a. compounded annually over 3 years.
- Loreli invests \$500 at 15% p.a. simple interest over 3 years.
  - How much does each person have at the end of the 3 years?
  - Who earned the most?

Key ideas

You can calculate the total amount of your investment for either form of interest using technology.

- Using formulas in calculators
  - Simple interest $I = \frac{Prt}{100}$
  - Compound interest $A = P\left(1 + \frac{r}{100}\right)^n$

- **Simple code**
  To create programs for the two types of interest, enter the data shown at right.
  This will allow you to calculate both types of interest for a given time period. If you invest \$100 000 at 8% p.a. paid monthly for 2 years, you will be asked for P, $R = \frac{r}{100}$, t or n and the calculator will do the work for you.
  Note: Some modifications may be needed for the CAS or other calculators or other technology.

```
PROGRAM:SIMPLE
:Input   P,R,T
:PRT→I
:Output"INTEREST"
,I
:I+P→A
:Output"AMOUNT",A
```

```
PROGRAM:COMPOUND
:Input   P,R,N
:P(1+R)^N→A
:Output"AMOUNT",A

:A-P→I
:Output"INTEREST"
,I
```


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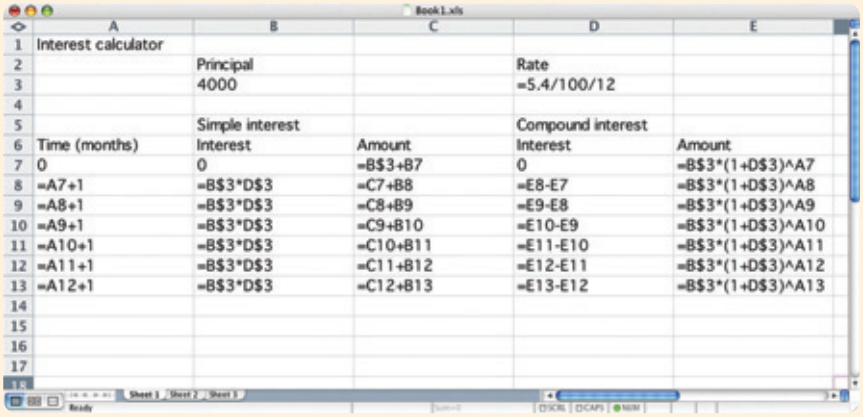
Spreadsheet

Copy and complete the spreadsheet as shown below to compile a simple interest and compound interest sheet.

Fill in the principal in B3 and the rate per period in D3. For example, for \$4000 invested at 5.4% monthly, B3 will be 4000 and D3 will be $\frac{0.054}{12}$.



	A	B	C	D	E
1	Interest calculator				
2		Principal		Rate	
3		4000		=5.4/100/12	
4					
5		Simple interest		Compound interest	
6	Time (months)	Interest	Amount	Interest	Amount
7	0	0	=B$3+B7	0	=B$3*(1+D$3)^A7
8	=A7+1	=B$3*D$3	=C7+B8	=E8-E7	=B$3*(1+D$3)^A8
9	=A8+1	=B$3*D$3	=C8+B9	=E9-E8	=B$3*(1+D$3)^A9
10	=A9+1	=B$3*D$3	=C9+B10	=E10-E9	=B$3*(1+D$3)^A10
11	=A10+1	=B$3*D$3	=C10+B11	=E11-E10	=B$3*(1+D$3)^A11
12	=A11+1	=B$3*D$3	=C11+B12	=E12-E11	=B$3*(1+D$3)^A12
13	=A12+1	=B$3*D$3	=C12+B13	=E13-E12	=B$3*(1+D$3)^A13
14					
15					
16					
17					

Exercise 2I

Understanding 1–3 3

1 Write down the values of P, r and n for an investment of \$750 at 7.5% p.a., compounded annually for 5 years.

2 Write down the values of P, r and t for an investment of \$300 at 3% p.a. simple interest over 300 months.

3 Which is better on an investment of \$100 for 2 years:
- **A** simple interest calculated at 20% p.a.?
- **B** compound interest calculated at 20% p.a. and paid annually?

Hint: Recall: For simple interest $I = \frac{Prt}{100}$

For compound interest $A = P\left(1 + \frac{r}{100}\right)^n$

Fluency 4, 5 4, 5

Example 25 Using technology

Find the total amount of the following investments, using technology.
- **a** \$5000 at 5% p.a. compounded annually for 3 years
- **b** \$5000 at 5% p.a. simple interest for 3 years

Solution	Explanation
a \$5788.13	Use $A = P\left(1 + \frac{r}{100}\right)^n$ or a spreadsheet (see Key ideas).
b \$5750	Use $I = \frac{Prt}{100}$ with your chosen technology.

Now you try

Find the total amount of the following investments, using technology.
- **a** \$6000 at 4% p.a. compounded annually for 5 years
- **b** \$6000 at 4% p.a. simple interest for 5 years

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4 **a** Find the total amount of the following investments, using technology.
- **i** $6000 at 6% p.a. compounded annually for 3 years
- **ii** $6000 at 3% p.a. compounded annually for 5 years
- **iii** $6000 at 3.4% p.a. compounded annually for 4 years
- **iv** $6000 at 10% p.a. compounded annually for 2 years
- **v** $6000 at 5.7% p.a. compounded annually for 5 years

b Which of the above yields the most interest?

5 **a** Find the total amount of the following investments, using technology where possible.
- **i** $6000 at 6% p.a. simple interest for 3 years
- **ii** $6000 at 3% p.a. simple interest for 6 years
- **iii** $6000 at 3.4% p.a. simple interest for 7 years
- **iv** $6000 at 10% p.a. simple interest for 2 years
- **v** $6000 at 5.7% p.a. simple interest for 5 years

b Which of the above yields the most interest?

Problem-solving and reasoning 6, 7 6–8

6 **a** Determine the total simple and compound interest accumulated on the following.
- **i** $4000 at 6% p.a. payable annually for:
  - **I** 1 year **II** 2 years **III** 5 years **IV** 10 years
- **ii** $4000 at 6% p.a. payable biannually for:
  - **I** 1 year **II** 2 years **III** 5 years **IV** 10 years
- **iii** $4000 at 6% p.a. payable monthly for:
  - **I** 1 year **II** 2 years **III** 5 years **IV** 10 years

Hint: 6% p.a. paid biannually is 3% per 6 months.
6% p.a. paid monthly is $\frac{6}{12} = 0.5\%$ per month.

b Would you prefer the same rate of compound interest or simple interest if you were investing money and paying off the loan in instalments?

c Would you prefer the same rate of compound interest or simple interest if you were borrowing money?

7 **a** Copy and complete the following table if simple interest is applied.

Principal	Rate	Overall time	Interest	Amount
$7000		5 years		$8750
$7000		5 years		$10 500
	10%	3 years	$990	
	10%	3 years	$2400	
$9000	8%	2 years		
$18 000	8%	2 years		

Hint: $I = \frac{Prt}{100}$
$A = P + I$

b Explain the effect on the interest when we double the:
- **i** rate **ii** period **iii** overall time

8 Copy and complete the following table if compound interest is applied. You may need to use a calculator and trial and error to find some of the missing values.

Principal	Rate	Period	Overall time	Interest	Amount
$7000		Annually	5 years		$8750
$7000		Annually	5 years		$10 500
$9000	8%	Fortnightly	2 years		
$18 000	8%	Fortnightly	2 years		

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21

Changing the parameters — 9, 10

9 If you invest $5000, determine the interest rate per annum (to two decimal places) if the total amount is approximately $7500 after 5 years and if interest is:

a compounded annually

b compounded quarterly

c compounded weekly

Comment on the effect of changing the period for each payment on the rate needed to achieve the same total amount in a given time.

10 **a** Determine, to one decimal place, the equivalent simple interest rate for the following investments over 3 years.

i $8000 at 4% compounded annually

ii $8000 at 8% compounded annually

b If you double or triple the compound interest rate, how is the simple interest rate affected?

Essential Mathematics for the Victorian Curriculum CORE Year 10 ISBN 978-1-108-87859-3

Maths@Work: Finance manager

A bookkeeper and an accounts manager are both occupations that deal with numbers and budgets. They require employees to have good communication and mathematical skills. Employees also need a commitment to detail and to be honest, as they deal with other people's money.

Excellent number skills are essential in these fields. Bookkeepers need to work with spreadsheets, percentages, tax systems and business plans.

Complete these questions that a finance manager may face in their day-to-day job.

1 Consider the information supplied in a section of a business budget for a 3-month period. Round all answers to two decimal places.

- **a** Calculate the total income for the month of July.
- **b** Calculate the total income for the month of August.
- **c** Calculate the total income for the month of September.
- **d** Which month had the highest income and by how much?
- **e** What contributed to this increase in income?
- **f** What percentage of the total income for the 3 months shown came from a fixed fee?
- **g** What was the monthly fixed fee before the 25% reduction occurred?

Income	July	August	September
Fixed fee (with 25% reduction)	$52 813	$52 813	$52 813
Variable fee (with 25% reduction)	$53 906	$53 906	$53 906
Associate members fees (with 25% reduction)	$1563	$1563	$1563
Shared costs billed EAL	$0	$0	$0
CBA interest earned	$25	$25	$25
Operating costs	$167	$167	$167
Term deposit	$0	$2500	$0
Miscellaneous income	$0	$0	$0
Total Income	**a**	**b**	**c**

Hint: % of total = $\frac{\text{amount}}{\text{total}} \times \frac{100}{1}$

2 The office expenses for the same company for the same 3-month period are given below.

- **a** Calculate the percentage of the total office expenses for July spent in rent.
- **b** What is the cost of electricity shown in the table, and in what month is it shown?
- **c** Why does the electricity not appear in the other two months?
- **d** What is the projected cost of electricity for the year?

Office expenses	July	August	September
Rent	$7200	$7200	$7200
Property outgoings (costs)	$220	$220	$220
Cleaning	$250	$250	$250
Maintenance	$50	$50	$50
Capital expenditure	$100	$100	$100
Electricity	$0	$1200	$0
Total office expenses	**$7820**	**$9020**	**$7820**

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3 The employment expenses for the three months of October, November and December are shown.

Employment expenses	October	November	December
Superannuation	$4800	$4800	$4800
Employees' salaries	$50 424	$50 424	$50 424
Payroll tax	$1200	$1200	$4500
Consultant	$0	$0	$0
Workers compensation	$0	$0	$0
Performance review	$0	$0	$75 000
Training	$335	$335	$335
Parking	$400	$400	$400
Total employment expenses	**$57 159**	**$57 159**	**a**

a Calculate the total employment expenses for the month of December.

b What is the whole number percentage increase of November's total employment expenses from November to December? What was the cause of this increase?

c The company has 11 full-time employees. What is an employee's average:

i salary per month?

ii annual salary?

d The company has total expenses for the month of November of $92 117. What percentage of the total expenses for November comes from the employment expenses?

Using technology

4 A trucking business has invested in a new prime mover for hauling cattle by road train. It has a bank loan of $230 000 at 9% per annum charged monthly. The business requires an Excel spreadsheet to show the progress of the debt repayment.

a Develop the following table in an Excel spreadsheet by entering formulas into the yellow shaded cells to calculate their values. Use the notes below to help you.

Hint: After entering your formulas, check specific results with a calculator.

	B	C	D	E	F	G
1	Debt repayment table					
2	Payment date	Starting balance	Scheduled payment	Interest due	Principal paid	Ending balance
3	1-Jan	$230,000.00	$5,780.00			
4	1-Feb		$5,780.00			
5	1-Mar		$5,780.00			

Notes:

The interest due per month is $\frac{1}{12}$ of 9% of the starting balance for that month.

The principal (i.e. debt) paid will be the scheduled payment minus the interest due.

The ending balances will equal the starting balance minus the principal paid.

The next month's starting balance equals the previous month's ending balance.

b Extend the table for 12 payments and answer the following questions.

i What is the amount of debt remaining on July 1?

ii What is the interest paid in October?

iii Use an Excel formula to find the difference between the principal paid in December and the principal paid in January.

iv Enter 'sum' formulas to determine the total interest paid in the year and the total principal paid off in the year.

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1 Find and define the 10 terms related to consumer arithmetic and percentages hidden in this wordfind.

C	O	M	M	I	S	S	I	O	N	Q	R	W
P	G	S	L	E	R	S	T	B	L	D	U	J
H	L	A	A	P	I	E	C	E	W	O	R	K
U	F	N	U	L	N	Q	B	D	Z	T	J	L
V	K	N	S	T	A	M	O	N	T	H	L	Y
B	H	U	A	I	G	R	O	S	S	U	B	S
N	E	A	C	Y	K	S	Y	E	T	Y	M	D
M	A	L	O	V	E	R	T	I	M	E	Q	T
S	F	O	R	T	N	I	G	H	T	L	Y	S

2 How do you stop a bull charging you? Answer the following problems and match the letters to the answers below to find out.

$\$19.47 - \$8.53$ E	5% of \$89 T	50% of \$89 I
$12\frac{1}{2}\%$ of \$100 A	If 5% = \$8.90 then 100% is? S	\$4.48 to the nearest 5 cents R
6% of \$89 W	Increase \$89 by 5% H	10% of \$76 O
\$15 monthly for 2 years D	$12\frac{1}{2}\%$ as a decimal K	$\$50 - \$49.73$ U
Decrease \$89 by 5% C	$\$15.96 + \$12.42$ Y	

☐ ☐ ☐
\$28.38 \$7.60 27c

☐ ☐ ☐ ☐
\$4.45 \$12.50 0.125 \$10.94

☐ ☐ ☐ ☐
\$12.50 \$5.34 \$12.50 \$28.38

☐ ☐ ☐
\$93.45 \$44.50 \$178

☐ ☐ ☐ ☐ ☐ ☐
\$84.55 \$4.50 \$10.94 \$360 \$44.50 \$4.45

☐ ☐ ☐ ☐
\$84.55 \$12.50 \$4.50 \$360

3 How many years does it take \$1000 to double if it is invested at 10% p.a. compounded annually?

4 The chance of Jayden winning a game of cards is said to be 5%. How many consecutive games should Jayden play to be 95% certain he has won at least one of the games played?

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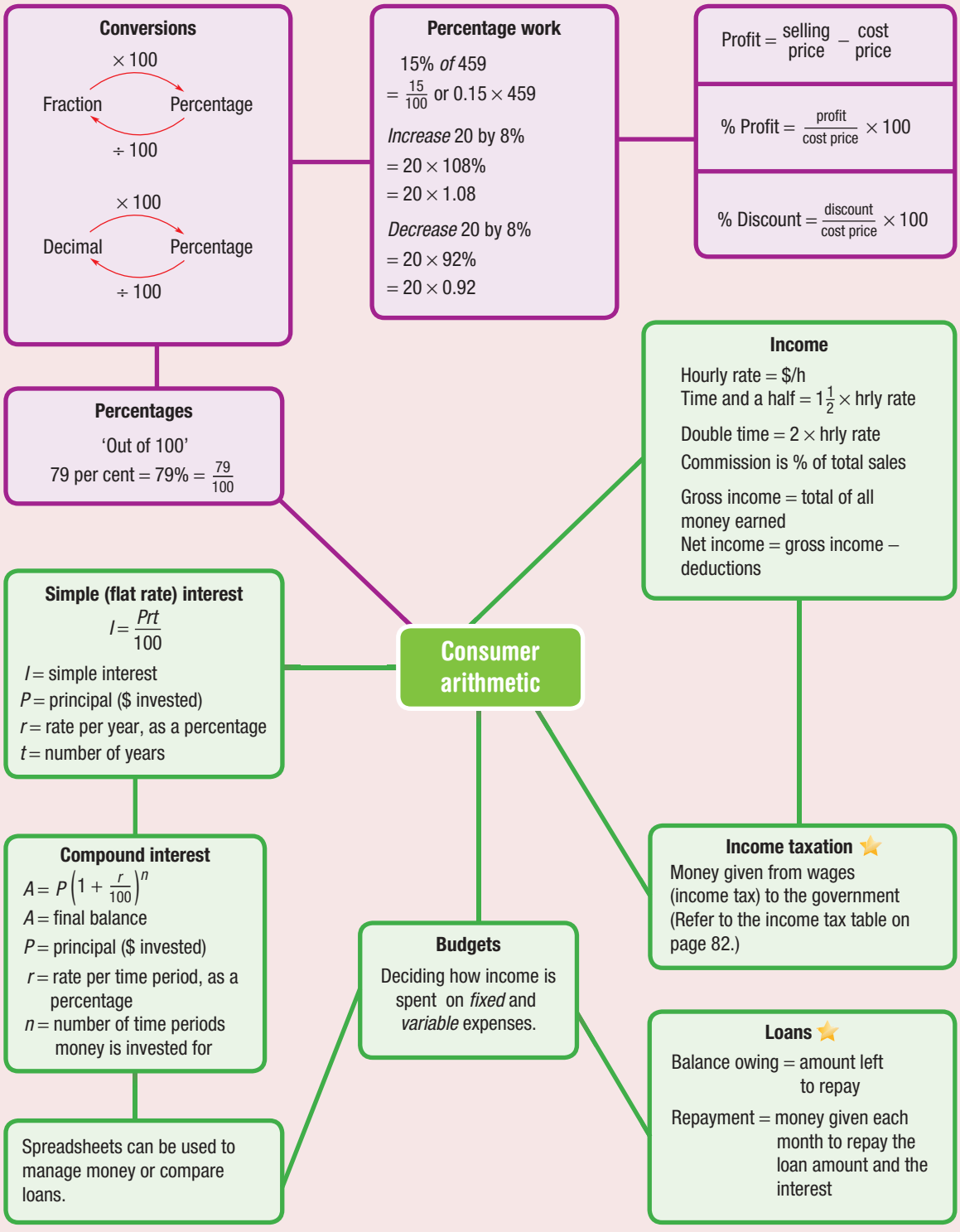
Chapter summary



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Chapter checklist

A version of this checklist that you can print out and complete can be downloaded from your Interactive Textbook.

		✔
2A	**1 I can convert to a percentage.** e.g. Write each of the following as a percentage. **a** $\frac{7}{40}$ **b** 0.24	
2A	**2 I can write percentages as simplified fractions and decimals.** e.g. Write each of the following percentages as both a simplified fraction and a decimal. **a** 53% **b** 4% **c** 10.5%	
2A	**3 I can find the percentage of a quantity.** e.g. Find 64% of $1400.	
2B	**4 I can increase and decrease by a given percentage.** e.g. For the amount of $800: **a** increase $800 by 6% **b** decrease $800 by 15%	
2B	**5 I can calculate percentage profit.** e.g. Jimmy buys a second-hand desk for $145 and restores it to a good condition. If he sells if for $210, calculate his profit and the percentage profit, correct to one decimal place.	
2B	**6 I can find the selling price.** e.g. Jo buys t-shirts for $24 each and wishes to make a 28% profit on the purchase. What should be her selling price and what will be the profit on the sale of 20 t-shirts?	
2B	**7 I can calculate a discount.** e.g. A $849 television is discounted by 18%. What is the selling price of the television?	
2C	**8 I can find gross and net income involving overtime.** e.g. Anika earns $21.40 per hour and has normal working hours of 38 hours per week. She earns time and a half for the next 4 hours worked and double time after that. She pays $190 per week in tax and other deductions. Calculate her gross and net income for a week in which she works 45 hours.	
2C	**9 I can calculate income involving commission.** e.g. Tia earns $300 per week plus a commission of 6% on her sales of solar panels. If she sells $8200 worth of solar panels in a week, what is her gross income for the week?	
2D	**10 I can calculate income tax payable.** e.g. Noah earns $78 406 per year, including interest on investments. He has receipts for donations and work related expenses of $445. **a** Calculate Noah's taxable income. **b** Use the tax table in the Key ideas on page 82 to calculate Noah's tax payable amount, to the nearest cent. **c** If Noah also has to pay $1559 for the Medicare levy, calculate his tax refund if his employer sent $19 200 to the ATO.	
2E	**11 I can budget using percentages.** e.g. Ash has a net annual income of $54 800 after deductions. She allocates her budget on a percentage basis.	

	Rent	Holiday loan	Clothing	Food	Other	Savings
Expenses (%)	25	10	5	10	35	15

a Determine the amount of fixed expenses (rent and the loan).
b Determine how much she budgets to save each month.

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Chapter checklist

		✔
2E	**12 I can budget from fixed values.** e.g. Running a certain type of motorbike involves the following costs: registration $520 per year insurance $120 per quarter servicing $310 per year petrol $64 per month Determine the overall cost to run the bike for a year and what percentage of an $80 000 salary this would be, correct to one decimal place.	
2E	**13 I can calculate a best buy.** e.g. Packets of chips can be bought in the following ways at the store: • 20 packs (20 grams each) for $5.50 • 6 packs (20 grams each) for $3.35 • 2 share bags (60 grams each) for $4 Determine the cheapest way to buy the chips.	
2F	**14 I can use the simple interest formula to find interest.** e.g. Use the simple interest formula to calculate the interest when $800 is invested at 5% p.a. for 3 years.	
2F	**15 I can calculate repayments using simple interest.** e.g. If a simple interest loan of $4000 is borrowed for 2 years at a simple interest rate of 4% p.a., what is the total amount owed over the 2 years and if repayments are made monthly, how much would each payment need to be?	
2F	**16 I can use the simple interest formula to find the rate of interest.** e.g. Use the simple interest formula to calculate the rate of interest when $2800 earns $294 interest in 3 years.	
2G	**17 I can use the compound interest formula.** e.g. Determine the amount after 6 years when $8000 is compounded annually at 3%.	
2G	**18 I can use compound interest with different time periods.** e.g. An investment of $5500 is compounded at 6% p.a. over 4 years. Determine the amount he will have after 4 years if interest is paid monthly.	
2H	**19 I can work with repayments to calculate a purchase cost.** e.g. Vanessa pays for a $8600 travel package with a travel agent with a 30% deposit and monthly repayments of $300 for 2 years. Calculate: **a** the deposit paid, **b** the total amount paid for the travel package and hence the interest paid.	
2H	**20 I can calculate interest earned on an account.** e.g. An account has a minimum monthly balance of $140 and interest is credited monthly on this amount at 1.8%. Determine the amount of interest to be credited at the end of the month and the total amount credited or debited if the bank charges $5 per month in account keeping fees.	
2I	**21 I can use technology to calculate interest and final amounts.** e.g. Use technology to find the total amount on the following investments. **a** $7000 at 4% p.a. compounded annually for 5 years **b** $7000 at 4% p.a. simple interest for 5 years	

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Short-answer questions

2A **1** Find 16% of $9000.

2B **2** **a** Increase $968 by 12%.
b Decrease $4900 by 7%.

2B **3** The cost price of an item is $7.60. If this is increased by 50%, determine:
a the retail price
b the profit made

2B **4** An airfare of $7000 is discounted 40% if you fly off-peak. What would be the discounted price?

2B **5** A sofa is discounted to $375. If this is a 35% discount, find the recommended retail price.

2C **6** Josephine budgets 20% of her income for entertainment. If her yearly income is $37 000, how much could be spent on entertainment in:
a a year?
b a month?
c a week (taking 52 weeks in a year)?

2C **7** Mariah works a 34-hour week at $25.43 per hour. Her net income is 62% of her wage.
a Work out her weekly net income.
b If 15% is spent on clothing, determine the amount she can spend each week.
c If she saves $100, what percentage (to two decimal places) of her gross weekly income is this?

2E **8** Frank has the following expenses to run his car:

- hire purchase payment $350 per month
- registration $885 per year
- insurance $315 per quarter
- servicing $1700 per year
- petrol $90 per week

a Find the total cost of running his vehicle for 1 year.
b What percentage (to the nearest percentage) of the overall cost to run the car is the cost of the petrol?

2E **9** Ronan works 36 hours in a week at $39.20 per hour. He pays $310 in tax and $20.50 in superannuation in the week. Determine:
a his gross wage in a week
b his net pay in a week

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Chapter review

2D **10** Lil receives an annual taxable income of $90 000.

a Using the tax table shown, calculate the amount of tax she pays over the year.

Taxable income	Tax on this income
0 – $18 200	Nil
$18 201 – $37 000	19c for each $1 over $18 200
$37 001 – $80 000	$3572 plus 32.5c for each $1 over $37 000
$80 001 – $180 000	$17 547 plus 37c for each $1 over $80 000
$180 001 and over	$54 547 plus 45c for each $1 over $180 000

b If Lil pays the 2% Medicare levy on her taxable income, find this amount.

2C **11** Zane receives 4.5% commission on sales of $790. Determine the amount of his commission.

2F **12** Find the interest paid on a $5000 loan under the following conditions.

a 8% p.a. simple interest over 4 years

b 7% p.a. simple interest over 3 years and 4 months

2G **13** Find the interest paid on a $5000 loan under the following conditions.

a 4% p.a. compounded annually over 3 years

b 9.75% p.a. compounded annually over 2 years

c 6% p.a. compounded monthly over 2 years

2H **14** A vehicle worth $7000 is purchased on a finance package. The purchaser pays 15% deposit and $250 per month over 4 years.

a How much deposit is paid?

b What are the total repayments?

c How much interest is paid over the term of the loan?

Multiple-choice questions

2A **1** 28% of $89 is closest to:

A $28.00 **B** $64.08 **C** $113.92 **D** $2492 **E** $24.92

2A **2** As a percentage, $\frac{21}{60}$ is:

A 21% **B** 3.5% **C** 60% **D** 35% **E** 12.6%

2E **3** If a budget allows 30% for car expenses, how much is allocated from a weekly wage of $560?

A $201 **B** $145 **C** $100 **D** $168 **E** $109

2C **4** The gross income for 30 hours at $5.26 per hour is:

A $35.26 **B** $389.24 **C** $157.80 **D** $249.20 **E** $24.92

2C **5** If Simon receives $2874 on the sale of a property worth $195 800, his rate of commission, to one decimal place, is:

A 21% **B** 1.5% **C** 60% **D** 15% **E** 12.6%

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2C **6** In a given rostered fortnight, Bilal works the following number of 8-hour shifts:

- three day shifts ($10.60 per hour)
- three afternoon shifts ($12.34 per hour)
- five night shifts ($16.78 per hour).

His total income for the fortnight is:

A $152.72 **B** $1457.34 **C** $1000 **D** $168.84 **E** $1221.76

2B **7** A computer tablet is discounted by 26%. What is the price if it was originally $329?

A $85.54 **B** $243.46 **C** $156.05 **D** $77.78 **E** $206.90

2H **8** A $5000 loan is repaid by monthly instalments of $200 for 5 years. The amount of interest charged is:

A $300 **B** $7000 **C** $12 000 **D** $2400 **E** $6000

2F **9** The simple interest earned on $600 invested at 5% p.a. for 4 years is:

A $570 **B** $630 **C** $120 **D** $720 **E** $30

2G **10** The compound interest earned on $4600 invested at 12% p.a. for 2 years is:

A $1104 **B** $5704 **C** $4600 **D** $5770.24 **E** $1170.24

Extended-response questions

1 $5000 is invested at 4% p.a. compounding annually for 3 years.

a What is the value of the investment after the 3 years?

b How much interest is earned in the 3 years?

c Using $r = \frac{100I}{Pt}$, what simple interest rate results in the same amount?

d How much interest is earned on the investment if it is compounded monthly at 4% p.a. for the 3 years?

2 Your bank account has an opening July monthly balance of $217.63. You have the following transactions over the month.

Date	Withdrawals	Date	Deposits
7 July	$64.00	July 9th	$140
11 July	$117.34	July 20th	$20
20 July	$12.93	July 30th	$140

a Design a statement of your records if $0.51 is taken out as a fee on 15 July.

b Find the minimum balance.

c If interest is credited monthly on the minimum balance at 0.05%, determine the interest for July, rounded to the nearest cent.

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