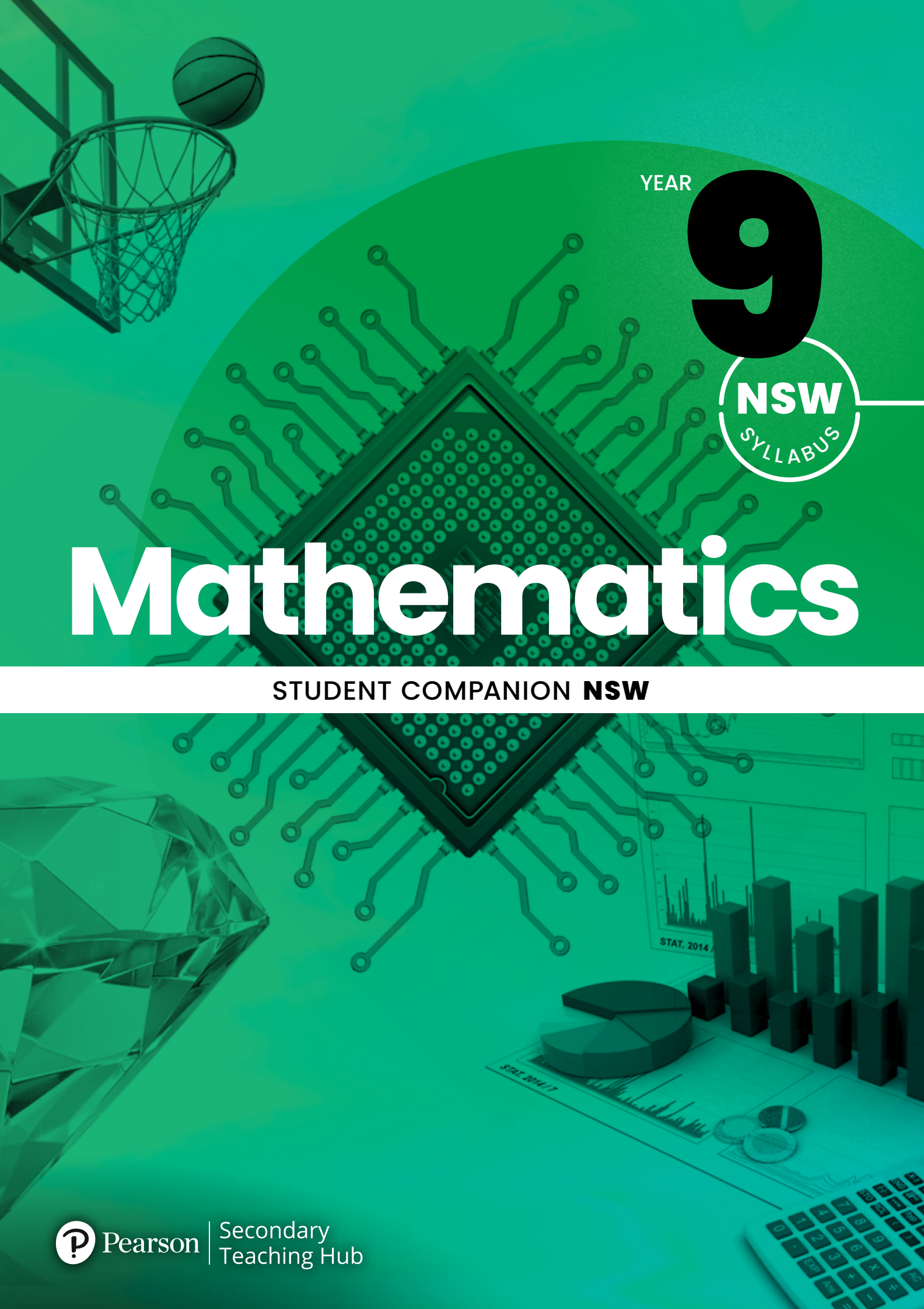

YEAR 9

NSW SYLLABUS

Mathematics

STUDENT COMPANION **NSW**

Pearson | Secondary Teaching Hub

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Pearson Secondary Teaching Hub Maths 9 NSW

Student Companion

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Pearson acknowledges the Traditional Custodians of the lands upon which the many schools throughout Australia are located.

We respect the living cultures of Aboriginal and Torres Strait Islander peoples and their ongoing connection to Country across lands, sky, seas, waterways and communities. We celebrate the richness of Indigenous Knowledge systems, shared with us and with schools Australia-wide.

We pay our respects to Elders, past and present.

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How to use this Student Companion

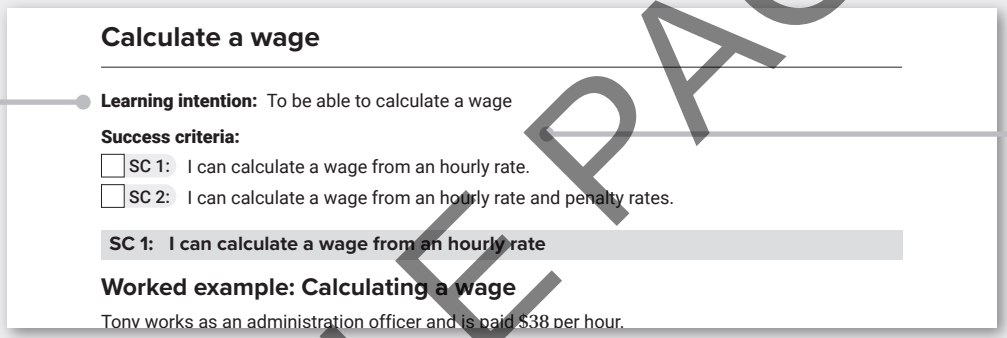
The *Student Companion* is a complementary resource that offers a print medium for corresponding lessons in *Pearson Secondary Teaching Hub*. It is designed to support teaching and learning by providing learners with a place to create a portfolio of learning to suit their individual needs, whether you are:

- supporting a blended classroom using the strengths of print and digital
- preparing for exams by creating a study guide or bound reference
- needing a tool to differentiate learning or
- looking for meaningful homework tasks.

Learners can develop their portfolio of learning as part of classroom learning or at home as an additional opportunity to engage and re-engage with the knowledge and skills from the lesson.

This could be done as prior learning in a flipped classroom environment or as an additional revision or homework task.

Learning intention and success criteria



Learning intentions are provided for every lesson. The learning intentions are goals or objectives that align to the corresponding digital lesson. They describe what learners should know, understand or be able to do by the end of the lesson.

Success criteria clarify expectations and describe what success looks like. The success criteria are specific, concrete and measurable so learners can actively engage with and reflect on their evidence of learning within each lesson.

Worked examples

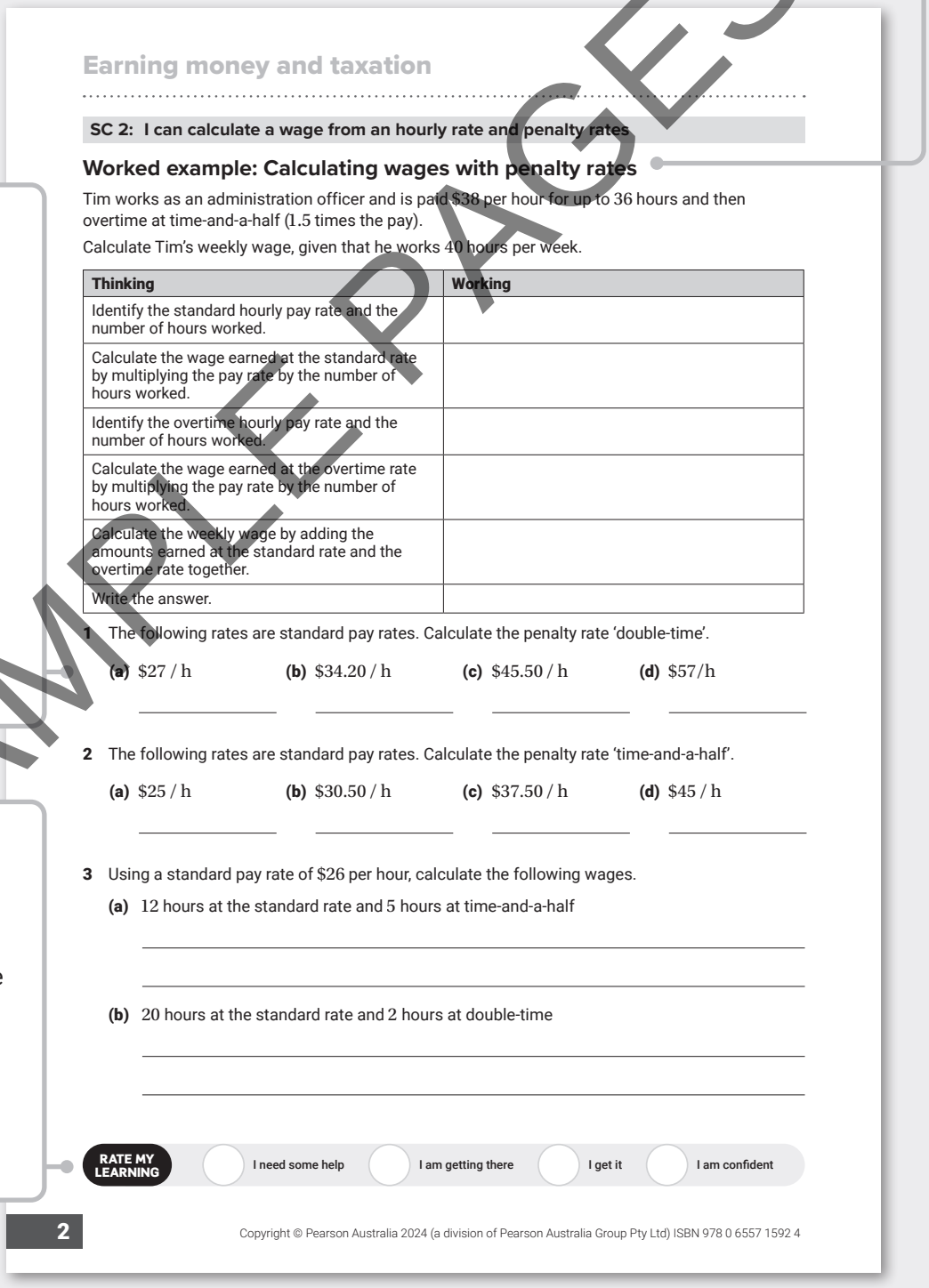
Worked examples provide learners with a step-by-step solution to a problem. The worked examples in the *Student Companion* correspond to those in the digital lesson and are provided for each skill to:

- scaffold learning
- support skill acquisition
- reduce the cognitive load.

The **worked examples** are an effective tool to demonstrate what success looks like. The 'try yourself' format of the worked examples in the *Student Companion* support the gradual release of responsibility. Learners can view a completed worked example and a video walkthrough of the worked example in the corresponding digital lesson and then apply the scaffolded steps themselves to solve a unique problem.

Practice questions are provided in the *Student Companion* so that learners can apply the knowledge and skills obtained in the worked example given. These questions are designed to ensure learners build confidence and demonstrate efficiency. They follow on from the Check your understanding questions beside the corresponding worked example in the digital lesson.

Each lesson in the *Student Companion* contains a space for students to reflect on their understanding. The simple and intuitive design of the **lesson reflection tool** allows students to scale their confidence, reflect on their learning and identify areas in which they need support.



Earning money and taxation

SC 2: I can calculate a wage from an hourly rate and penalty rates

Worked example: Calculating wages with penalty rates

Tim works as an administration officer and is paid $38 per hour for up to 36 hours and then overtime at time-and-a-half (1.5 times the pay).

Calculate Tim's weekly wage, given that he works 40 hours per week.

Thinking	Working
Identify the standard hourly pay rate and the number of hours worked.	
Calculate the wage earned at the standard rate by multiplying the pay rate by the number of hours worked.	
Identify the overtime hourly pay rate and the number of hours worked.	
Calculate the wage earned at the overtime rate by multiplying the pay rate by the number of hours worked.	
Calculate the weekly wage by adding the amounts earned at the standard rate and the overtime rate together.	
Write the answer.	

1 The following rates are standard pay rates. Calculate the penalty rate 'double-time'.

(a) $27 / h **(b)** $34.20 / h **(c)** $45.50 / h **(d)** $57/h

2 The following rates are standard pay rates. Calculate the penalty rate 'time-and-a-half'.

(a) $25 / h **(b)** $30.50 / h **(c)** $37.50 / h **(d)** $45 / h

3 Using a standard pay rate of $26 per hour, calculate the following wages.

(a) 12 hours at the standard rate and 5 hours at time-and-a-half

(b) 20 hours at the standard rate and 2 hours at double-time

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2

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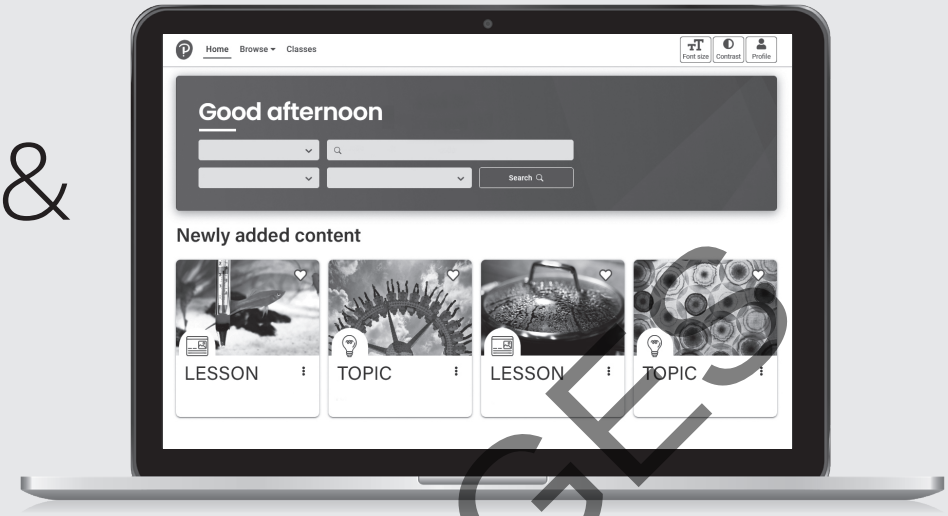
Simplify teaching & energise learning

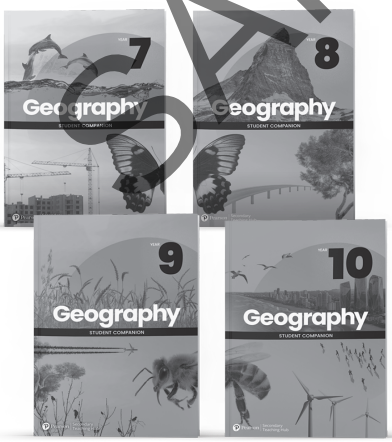


Discover *Pearson Secondary Teaching Hub* for years 7 to 10.

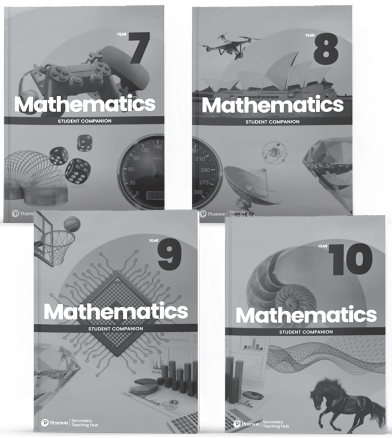
Pearson Secondary Teaching Hub has been designed to simplify teaching and energise learning across multiple subjects. Every *Secondary Teaching Hub* subject offers best-practice learning design delivered in flexible formats for the modern classroom, plus uniquely developed content structures and features for each subject.

This solution provides continuity for students from one class to the next and a rare whole-school view for school leadership while still delivering the rigour and support teachers need to help students meet the specific outcomes of their curriculum area.

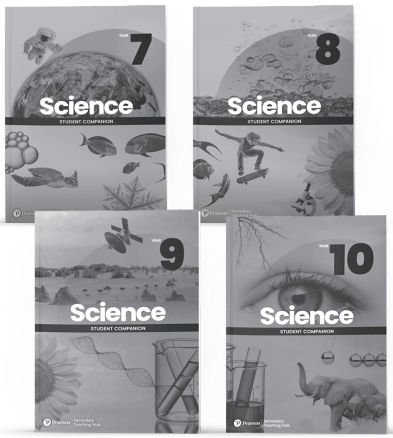
Geography



Mathematics



Science



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Simple interest

Understand and use the simple interest formula

Learning intention: To understand and use the simple interest formula

Success criteria:

- ☐ SC 1: I can convert annual interest rates into an equivalent decimal.
- ☐ SC 2: I can calculate the interest earned on an amount after one year.
- ☐ SC 3: I can calculate the simple interest earned after n years.
- ☐ SC 4: I can use a graph to calculate simple interest.

SC 1: I can convert annual interest rates into an equivalent decimal

Worked example: Converting an interest rate into a decimal

Convert the bank interest rates into decimals.

(a) 21%

Thinking	Working
To express a percentage as a decimal, divide the percentage by 100.	

(b) 6.25%

Thinking	Working
To express a percentage as a decimal, divide the percentage by 100.	

1 Convert the following percentages into decimals.

(a) 300% **(b)** 30% **(c)** 3% **(d)** 0.3%

2 Complete the table by converting each of the bank interest rates into decimals.

Interest rate	Decimal
3.5%	
2.7%	
6.25%	
4.05%	

3 Convert the following percentages into exact decimal form.

(a) $2\frac{1}{2}\%$ **(b)** $5\frac{1}{4}\%$ **(c)** $3\frac{3}{5}\%$ **(d)** $1\frac{7}{20}\%$

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SC 2: I can calculate the interest earned on an amount after one year

Worked example: Calculating annual interest

Calculate the interest charged/earned on the following items after one year.

(a) A loan for $\$42\,300$ for an electric car at 10.5% interest per year

Thinking	Working
Express the percentage as a decimal by dividing the percentage by 100.	
Multiply the decimal by the quantity and calculate the answer.	
Write the answer.	

(b) A bank account containing $\$5600$ invested at a rate of $2\frac{3}{4}\%$ p.a.

Thinking	Working
Express the percentage as a decimal by first expressing the mixed number as an improper fraction, then dividing by 100.	
Multiply the decimal by the quantity and calculate the answer.	
Write the answer.	

1 Calculate the following annual interest amounts owed.

(a) $\$4500$ borrowed at 6.75% p.a.

(b) $\$10\,480$ borrowed at $3\frac{3}{5}\%$ p.a.

2 Calculate the following annual interest amounts earned. If necessary, state the answers correct to the nearest cent.

(a) $\$3520$ deposited at 2.45% p.a.

(b) $\$1020$ deposited at $1\frac{1}{8}\%$ p.a.

3 Cameron is saving for an e-bike. She has deposited $\$2500$ into an account paying 2.275% p.a. How much interest will this account earn in a year?

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SC 3: I can calculate the simple interest earned after n years

Worked example: Calculating simple interest

Hayley wishes to take a trip to Paris and deposits $\$10\,800$ into a savings account, earning 4% p.a. in simple interest.

(a) How much simple interest does Hayley earn after one year?

Thinking	Working
Express the percentage as a decimal by dividing the percentage by 100.	
Recall the simple interest formula.	$I = Prn$
Identify the known values in the simple interest formula.	
Substitute the values into the formula and calculate the value of I.	
Write the answer.	

(b) How much simple interest does Hayley earn after 3 years?

Thinking	Working
Identify the known values in the simple interest formula.	
Substitute the values into the simple interest formula and calculate the interest earned I.	
Write the answer.	

(c) After three years, Hayley decides to reinvest the money and all the interest earned for a further 15 months at a simple interest rate of 5% p.a.

Determine the account balance after the 15 months.

Thinking	Working
Determine the principal amount being invested P.	
Identify the values of n and r.	
Substitute the values into the simple interest formula and calculate the interest earned I.	
The account balance, A is the sum of the principal, P and the interest, I.	
Write the answer.	

1 Use the simple interest formula to calculate the earnings (interest paid) when $\$5000$ is invested at 6% p.a. for the following periods of time.

(a) 1 year

(b) 2 years

(c) 5 years

(d) 15 months

(e) 18 months

(f) 19 months

2 Given that an invested amount earned $\$5000$ simple interest in one month, what will it earn over $2, 3, 4$ and 5 months, respectively?

3 Use the simple interest formula to calculate the earnings (interest paid) when $\$4000$ is invested for one year at the following rates.

(a) 1.5% p.a.

(b) 3% p.a.

(c) 3.5% p.a.

(d) 5% p.a.

(e) 8% p.a.

(f) 10% p.a.

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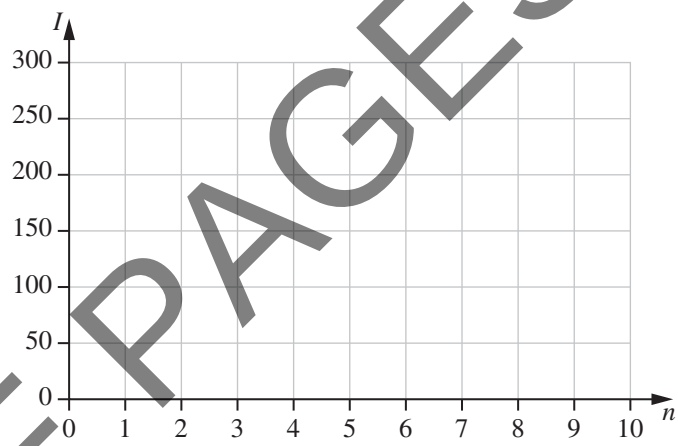
SC 4: I can use a graph to calculate simple interest

Worked example: Using a graph to calculate simple interest

(a) Construct a graph to represent the amount of simple interest payable over n years, for up to 10 years, where the principal is $\$2000$ and the interest rate is 1.5% p.a.

Thinking	Working
Write down the key values for the simple interest formula.	
Substitute the known values into the simple interest formula.	
Construct a graph for this rule, with I on the vertical axis and n on the horizontal axis.	

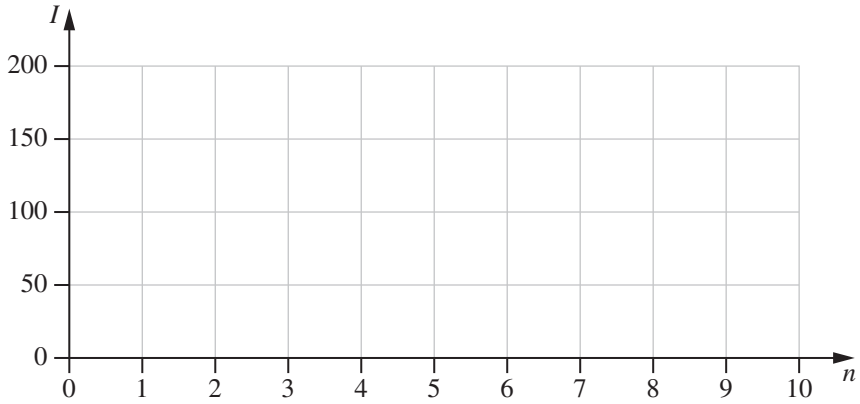
(b) Use the graph to calculate the interest payable after $6\frac{1}{2}$ years.

Thinking	Working
Locate the specified time on the horizontal axis and draw a vertical line to meet the graph. Draw a horizontal line from this point to the vertical axis. Read off the answer.	

(c) Use the graph to calculate the number of years required to reach $\$120$ interest.

Thinking	Working
Locate the specified interest amount on the vertical axis and draw a horizontal line across to meet the graph. Draw a vertical line down to the horizontal axis. Read off the answer.	

1 Construct a graph to represent the amount of simple interest payable over n years, for up to 10 years, when the principal is $\$800$ and the interest rate is 2.2% p.a.



Use the graph to determine

(a) the amount of interest payable after 8 years and 3 months

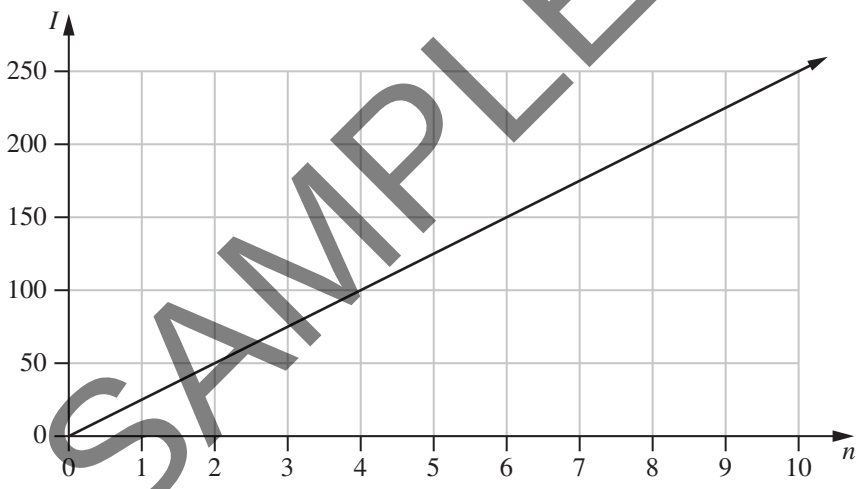
(b) the time period that would generate $\$88$ interest.

2 Complete the following statements.

(a) Graphs representing simple interest only need to show the first quadrant because _____ .

(b) Using the formula $I = Prn$, the value of the gradient of a graph of I in terms of n has a gradient of _____ .

3 Consider the following graph.



(a) Complete the following ordered pairs from the graph: $(5, \_\_\_)$ and $(10, \_\_\_)$.

(b) Calculate the gradient of the line. _____

(c) Given that the graph represents simple interest using the formula $I = Prn$, determine the value of r when:

(i) $P = 1000$ _____

(ii) $P = 2000$ _____

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Use the simple interest formula for different durations

Learning intention: To be able to use the simple interest formula for different durations

Success criteria:

- ☐ SC 1: I can adjust the simple interest rate (r) to weekly, fortnightly and monthly time periods.
- ☐ SC 2: I can calculate the simple interest earned for different time periods.
- ☐ SC 3: I can calculate the final amount of an investment after simple interest.

SC 1: I can adjust the simple interest rate (r) to weekly, fortnightly and monthly time periods

Worked example: Converting interest rates

Convert 12.4% p.a. into a decimal, then express it as a weekly rate, a fortnightly rate and a monthly rate, correct to 4 decimal places.

Thinking	Working
Write the annual rate as a decimal.	
To convert an annual interest rate r into a weekly rate, divide r by 52.	
To convert an annual interest rate r into a fortnightly rate, divide r by 26.	
To convert an annual interest rate r into a monthly rate, divide r by 12.	

1 Calculate the equivalent interest rate for 10.35% p.a. as a decimal, for the following time periods. State your answers correct to 4 decimal places.

(a) monthly _____ **(b)** weekly _____ **(c)** half-yearly _____ **(d)** fortnightly _____

_____ _____ _____ _____

2 Complete the following statements.

(a) To convert an interest rate per quarter to per month, you need to _____

(b) To convert an interest rate per fortnight to per week, you need to _____

(c) To convert an interest rate per week to a half-yearly one, you need to _____

(d) To convert an interest rate per month to per fortnight, you need to _____

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SC 2: I can calculate the simple interest earned for different time periods

Worked example: Investing with simple interest over different periods of time

Harry has been given $\$15\,000$ by his grandparents to be deposited in a bank for his future university fees. The bank offers simple interest at a rate of 7.5% p.a.

Calculate the amount of interest earned after

(a) 10 weeks

Thinking	Working
Recall the simple interest formula.	$I = Prn$
Identify the values for the simple interest formula, calculating the fraction of a year represented by the stated time.	$P =$ $r =$ $n =$
Substitute the known values into the simple interest formula to calculate I.	$I = Prn$ $=$
Write the answer.	

(b) 10 fortnights

Thinking	Working
Identify the values for the simple interest formula. Calculate the fraction of a year represented by the stated time.	$P =$ $r =$ $n =$
Substitute the known values into the simple interest formula to calculate I.	$I = Prn$ $=$
Write the answer.	

(c) 10 months

Thinking	Working
Identify the values for the simple interest formula. Calculate the fraction of a year represented by the stated time.	$P =$ $r =$ $n =$
Substitute the known values into the simple interest formula to calculate I.	$I = Prn$ $=$
Write the answer.	

1 Write the following durations as a fraction of one year. Do not simplify the fractions.

(a) 50 days _____

(b) 40 weeks _____

(c) 10 fortnights _____

(d) 17 quarters _____

2 Calculate the amount of simple interest earned in each of the following situations.

(a) $5000 invested at 2.6% p.a. for 22 weeks.

(b) $12 480 borrowed at 14.9% p.a. for 30 fortnights.

(c) $6520 invested at 5.01% p.a. for 15 months.

(d) $8022 borrowed at 8.75% p.a. for 5 quarters.

3 Insert < or > in each of the following to make true statements.

(a) 27 days _____ 4 weeks

(b) 15 months _____ 40 fortnights

(c) 20 months _____ 500 days

(d) 9 quarters _____ 55 fortnights

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SC 3: I can calculate the final amount of an investment after simple interest

Worked example: Calculating the final amount of an investment

Giles is saving for a deposit on a small apartment near his workplace. He puts $\$50\,800$ into a savings account earning simple interest at 6.5%p.a. How much money can he withdraw after 20 fortnights?

Thinking	Working
Recall the simple interest formula.	$I = Prn$
Identify the values for the simple interest formula. Calculate the fraction of a year represented by the stated time.	$P =$ $r =$ $n =$
Substitute the values into the simple interest formula to calculate the interest.	
Calculate the total amount in the account, A after the stated time by adding the principal, P and interest, I.	$A = P + I$ $=$
Write the answer.	

1 Calculate the final balance on the following simple interest investments. Give your answers correct to the nearest cent.

(a) $\$6000$ invested for 7 years at 3.2% p.a.

(b) $\$395$ invested for 14 months at 6.31% p.a.

(c) $\$24\,600$ invested for 5 weeks at 9.4% p.a.

(d) $\$100\,000$ invested for 350 days at 1.85% p.a.

2 In each of the following, calculate the annual interest rate that applies as a percentage, correct to 2 decimal places.

(a) After 15 months, an investment of $\$2800$ has become $\$2905$.

(b) After 400 days, an investment of $\$4200$ has become $\$4365$.

(c) After 7 quarters, an investment of $\$10\,800$ has become $\$12542.32$.

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Solve problems involving the simple interest formula

Learning intention: To be able to solve problems involving the simple interest formula

Success criteria:

- ☐ SC 1: I can use the simple interest formula to determine the principal invested.
- ☐ SC 2: I can use the simple interest formula to determine the number of periods for an investment.
- ☐ SC 3: I can use the simple interest formula to determine the simple interest rate per period.

SC 1: I can use the simple interest formula to determine the principal invested

Worked example: Using the simple interest formula to determine the principal

Determine the initial amount of an investment that earns $\$340$ interest after 2 years of simple interest at 5.4% p.a. Give your answer correct to the nearest cent.

Thinking	Working
Recall the transposed simple interest formula with the principal as the subject.	$P = \frac{I}{rn}$
Identify the values in the formula.	
Substitute the values into the formula to calculate the value of the principal.	

1 Determine the principal invested in each of the following cases when $\$8000$ of simple interest is earned at 4% p.a., when invested for:

(a) 1 year **(b)** 2 years **(c)** 5 years **(d)** 10 years

2 Determine the principal invested for each of the following when $\$300$ of simple interest is earned at 5% p.a., when invested for:

(a) 1 week **(b)** 1 month **(c)** 1 year **(d)** 10 years

3 Determine the principal invested for each of the following when a 5-year investment earns $\$400$ simple interest, invested at a rate of:

(a) 2% p.a. **(b)** 4% p.a. **(c)** 8% p.a. **(d)** 10% p.a.

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SC 2: I can use the simple interest formula to determine the number of periods for an investment

Worked example: Using the simple interest formula to determine the time

Determine the time required, in years, for $\$12500$ to reach a value of $\$14000$ at 3.4% simple interest. Write your answer correct to the nearest month.

Thinking	Working
Calculate the amount of interest earned, I by finding the difference between the final amount, A and the principal invested, P.	
Recall the transposed simple interest formula with the number of periods as the subject.	
Identify the values in the formula.	
Substitute the values into the formula to calculate the value of n.	
Round up to the nearest integer and write the answer.	

1 Determine the simple interest earned when $\$20000$ is invested and the investment grows to:

(a) $\$22\,800$ **(b)** $\$25\,400$ **(c)** $\$30\,000$ **(d)** $\$35\,000$

2 Determine the duration of an investment, to the nearest month, when $\$20000$ is invested at 3.85% p.a. simple interest and the investment grows to:

(a) $\$22\,800$ **(b)** $\$25\,400$ **(c)** $\$30\,000$ **(d)** $\$35\,000$

3 Determine the amount of time required, to the nearest number of months, for an investment of $\$35\,000$ to grow to $\$35\,640$ at 4.5% p.a. simple interest.

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SC 3: I can use the simple interest formula to determine the simple interest rate

Worked example: Using the simple interest formula to determine the interest rate

Determine the rate of simple interest that would result in an initial investment of $\$5000$ growing to $\$5600$ in 4 years. Write the answer as a percentage.

Thinking	Working
Calculate the amount of interest earned, I by finding the difference between the final amount, A and the principal invested, P.	
Recall the transposed simple interest formula with the rate as the subject.	
Identify the values in the formula.	
Substitute the known values into the transposed simple interest formula to calculate r.	

1 Determine the annual rate of simple interest, as a percentage, when $\$5000$ is invested for 1 year and earns the following amounts of simple interest.

(a) $\$95$ **(b)** $\$100$ **(c)** $\$115$ **(d)** $\$220$

2 Determine the annual rate of simple interest, as a percentage, for each of the following investments.

(a) $\$10\,000$ invested for 2 years amounts to $\$11\,400$.

(b) $\$18\,000$ invested for 5 years amounts to $\$20\,025$.

(c) $\$15\,000$ invested for 10 years amounts to $\$21\,000$.

(d) $\$20\,000$ invested for 20 years amounts to $\$50\,000$.

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