PEARSON

Mathematics

STUDENT BOOK | 3RD EDITION

9

AUSTRALIAN CURRICULUM

Contents

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Contents

COVER **Shutterstock**: BetterPhoto, basketball; Crusitu, Robert Lucian (microchip); empics, graphs and calculator; Retouch man, diamond.

TOPIC

7

Circles and cylinders

Why learn this?

Understanding the properties of circles and cylinders is valuable in various fields. In architecture and engineering, the ability to calculate the circumference, area and volume of these shapes is essential for design and construction. In everyday life, understanding these concepts can help in tasks like calculating the amount of paint needed for a circular surface or determining the capacity of a cylindrical container. Moreover, these concepts are fundamental in advanced mathematical topics, such as trigonometry and calculus.

RECALL

I can round decimals for different purposes

1 Round each of the following numbers to the number of decimal places stated in the brackets.

(a) 8.386 (2) **(b)** 83.71 (0) **(c)** 8.5985 (3) **(d)** 0.999 (2)

I can multiply decimals

1 Evaluate the following.

(a) 3.5×2.5 **(b)** 10.15×0.4 **(c)** 6.25×4.25 **(d)** 8.21×0.029

I can convert between units of length

1 Complete each of the following length conversions.

(a) 700 cm to m **(b)** 5.31 cm to mm **(c)** 185 mm to cm

(d) 3575 mm to m **(e)** 0.094 m to cm **(f)** 0.001 km to cm

I can calculate the area of squares and rectangles

1 Calculate the area of the following.

(a) A square with sides of length 8 cm

(b) A rectangle with length 14.5 m and width 6 m

I can calculate the circumference and area of circles to 1 decimal place

1 Calculate the circumference of the circles with the following dimensions, correct to 1 decimal place.

(a) Radius 10 cm **(b)** Diameter 12 mm

2 Calculate the area of the circles with the following dimensions using $A = \pi r^2$, correct to 1 decimal place.

(a) Radius 4 cm **(b)** Diameter 6 m

I can calculate the volume of prisms

1 Calculate the volume of the following prisms.

(a) A rectangular prism of height 2.5 m with a cross-sectional area of 15 m^2

(b) A triangular prism with a cross-sectional area of 24 cm^2 and a perpendicular height of 30 cm.

(c) A cube with a cross-sectional area of 36 mm^2.

7.1 Calculate circumference and area in terms of pi

Learning intention: To be able to calculate circumference and area in terms of pi

Success criteria:

SC 1 I can calculate circumference as a value in terms of pi.

SC 2 I can calculate the area of a circle as a value in terms of pi.

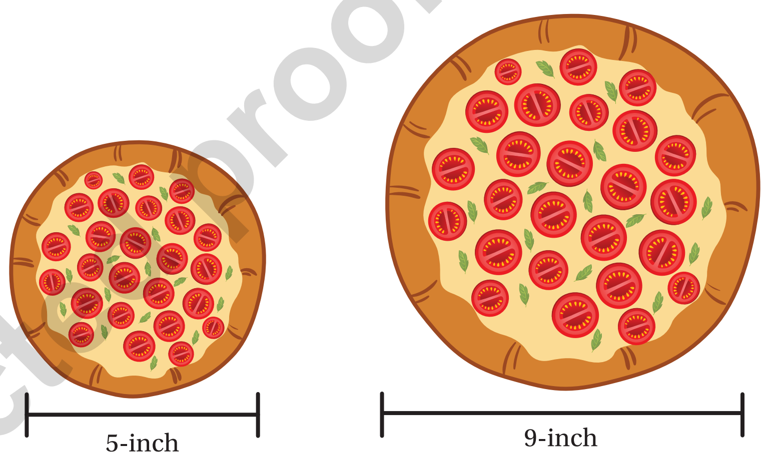
Lesson warm-up

Is this a good deal?

In June 2022 a Twitter user @cretiredroy wrote:

I ordered a 9-inch pizza. After a while, the waiter brought two 5-inch pizzas and said, 'The 9-inch pizza is not available, so I am giving you two 5-inch pizzas.'

When I asked about the difference, the waiter replied, 'You can have the extra 1 inch for free.'

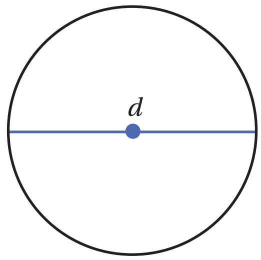
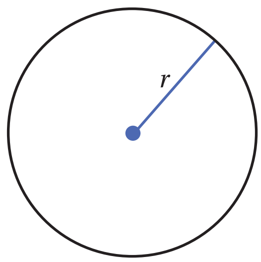


Mathematically, what should have actually happened in this scenario?

SC 1 I can calculate circumference as a value in terms of pi

Circle calculations nearly always involve rounding values to a required degree of accuracy. It sometimes makes better sense to give an 'exact' value by leaving π as part of the answer. Comparisons between distances and area may be clearer as a result, and rounding errors no longer apply.

Recall the two formulas for the circumference (perimeter) of a circle, given either the length of the diameter d or the radius r.

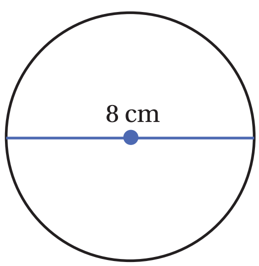
Circle measurement	Area formula
	$C = \pi d$
	$C = 2\pi r$

Worked example

Calculating circumference in terms of pi

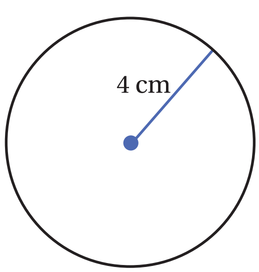
Calculate the circumference of the circles in terms of pi.

(a)



THINKING	WORKING
Recall the formula for circumference using the diameter.	$C = \pi d$
Substitute the length of the diameter into the circumference formula.	The diameter is $d = 8$ cm. $C = \pi \times 8$
Simplify, treating π as an algebraic factor, and writing it after the number factors.	$C = 8\pi$
Write the answer.	The circumference is 8π cm.

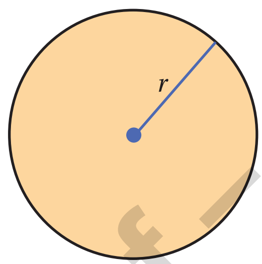
(b)



THINKING	WORKING
Recall the formula for circumference using the radius.	$C = 2\pi r$
Substitute the length of the radius into the circumference formula.	The radius is $r = 4$ cm. $C = 2\pi \times 4$
Simplify, multiplying the numbers (other than π) together.	$C = 2 \times 4 \times \pi$ $= 8\pi$
Write the answer.	The circumference is 8π cm.

SC 2 I can calculate the area of a circle as a value in terms of pi

Remember the formula for the area of a circle, given the length of the radius r.



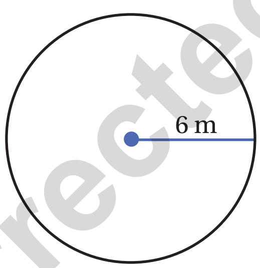
$A = \pi r^2$, with the units for area being square units.

Worked example

Calculating the area of a circle in terms of pi

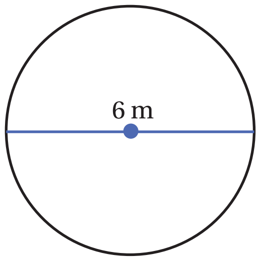
Calculate the area of the circles in terms of pi.

(a)



THINKING	WORKING
Recall the formula for the area of a circle.	$A = \pi r^2$
Determine the length of the radius.	The length of the radius $r = 6$ m.
Substitute the length of the radius into the area formula.	$A = \pi \times 6^2$
Simplify the expression.	$A = \pi \times 6 \times 6$ $= \pi \times 36$ $= 36\pi$
Write the answer.	The area of the circle is 36π m^2.

(b)



THINKING	**WORKING**
Recall the formula for area of a circle.	$A = \pi r^2$
Determine the length of the radius and substitute it into the area formula.	The length of the diameter is $d = 6$ m. $r = \frac{d}{2}$ $= \frac{6}{2}$ $= 3\text{ m}$ Hence, the length of the radius is $r = 3$ m.
Substitute the length of the radius into the area formula.	$A = \pi \times 3^2$
Simplify the expression.	$A = \pi \times 3 \times 3$ $= \pi \times 9$ $= 9\pi$
Write the answer.	The area of the circle is 9π m^2.

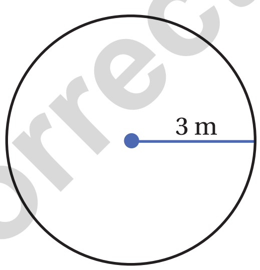
Practice

ANSWERS Page XXX

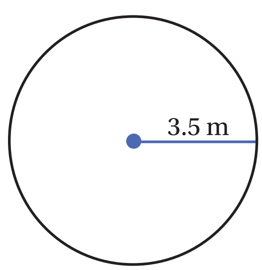
SC 1 I can calculate circumference as a value in terms of pi

1 Calculate the circumference of each circle in terms of pi.

(a)

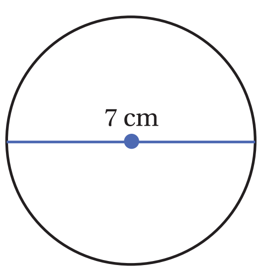


(b)

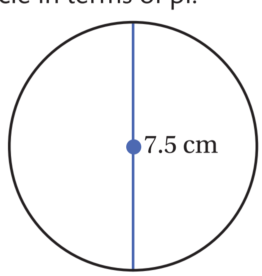


2 Calculate the circumference of each circle in terms of pi.

(a)

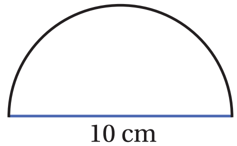


(b)

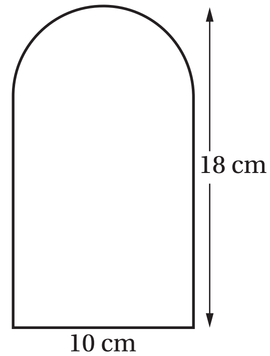


3 Calculate the exact perimeter of each shape that contains a semicircle. Write your answer in terms of pi.

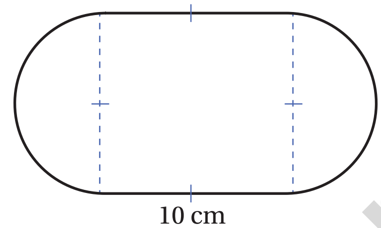
(a)



(b)

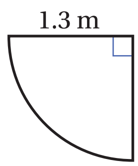


(c)

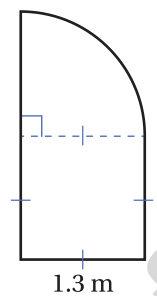


4 Calculate the exact perimeter of each shape that contains a quarter of a circle. Write your answer in terms of pi.

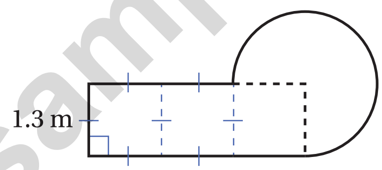
(a)



(b)

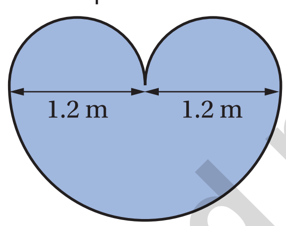


(c)



5 Calculate the perimeter of each shape.

(a)



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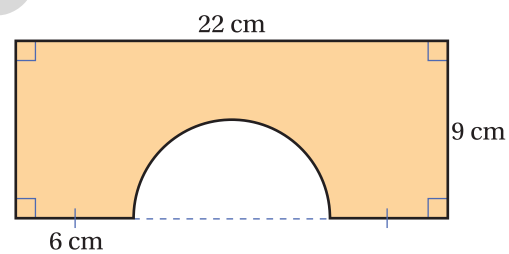
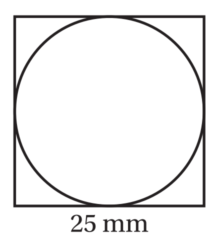
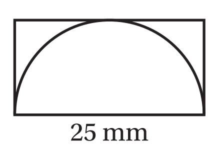


6 Determine the exact ratio of the perimeter of each shape.

(a) The circle to the square



(b) The semicircle to the rectangle



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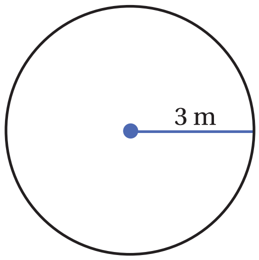
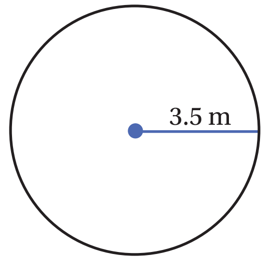
SC 2 I can calculate the area of a circle as a value in terms of pi

1 Calculate the area of each circle in terms of pi.

(a)

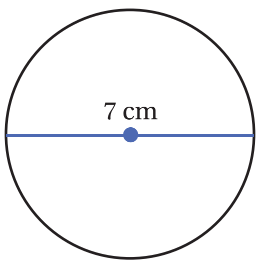


(b)

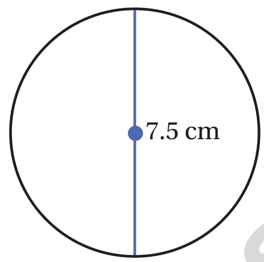


2 Calculate the area of each circle in terms of pi. Determine the length of the radius first.

(a)

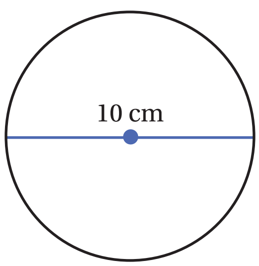


(b)

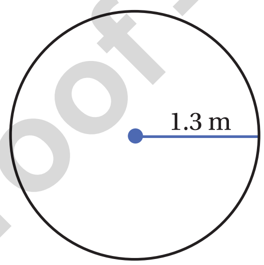


3 Calculate the area of each circle. Write your answer in terms of pi.

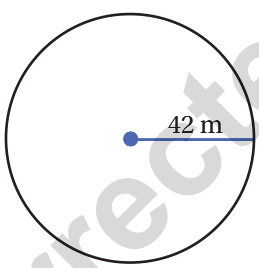
(a)



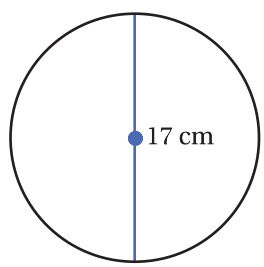
(b)



(c)

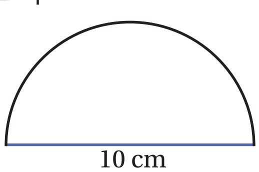


(d)

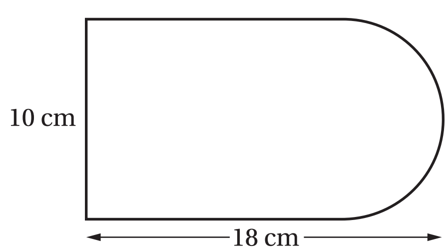


4 Calculate the exact area of each shape that contains a semicircle. Write your answer in terms of pi.

(a)



(b)



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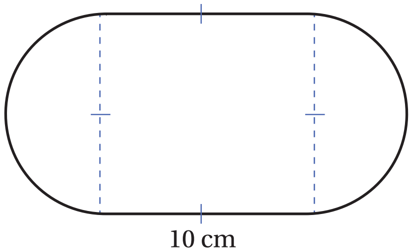
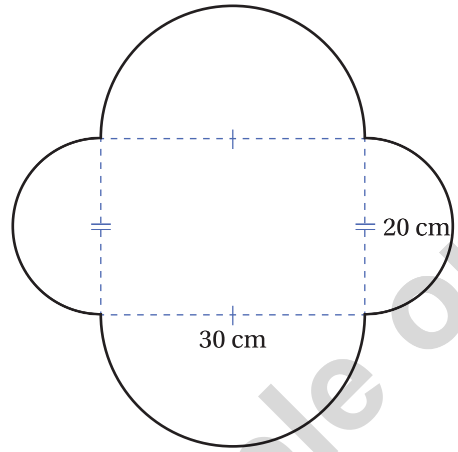
(c)

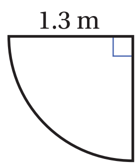


(d)



5 Calculate the exact area of each shape that contains a quarter of a circle. Write your answer in terms of pi.

(a)



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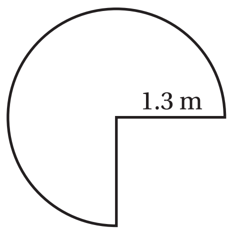

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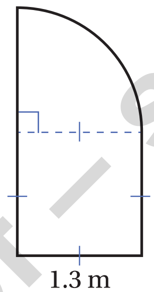
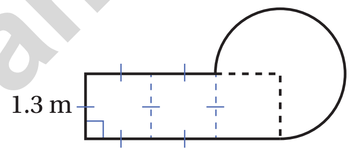
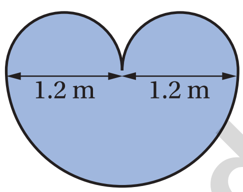


(d)

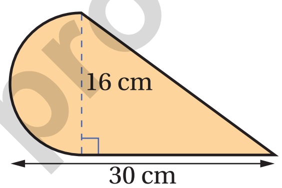


6 Calculate the exact shaded area.

(a)



(b)



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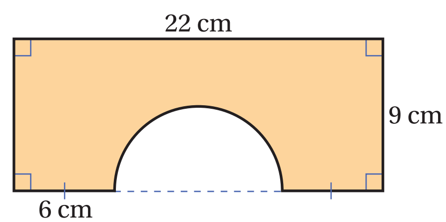
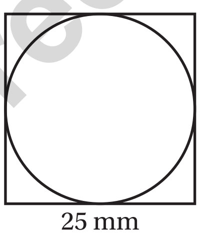
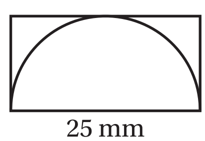


7 Determine the exact ratio of the area of each shape.

(a) The circle to the square



(b) The semicircle to the rectangle



Determine the radius of a circle from the area or circumference

7.2

Learning intention: To be able to determine the radius of a circle from the area or circumference

Success criteria:

SC 1 I can determine the radius of a circle given the circumference.

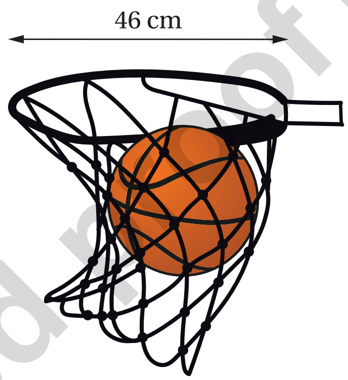
SC 2 I can determine the radius of a circle given the area.

Lesson warm-up

Room for error?

During the half-time entertainment at a professional basketball game, a performer bounced off a trampoline, dunked a basketball, then fell through the ring.

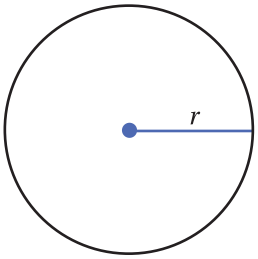
If a person can fit through a basketball ring, how much room for error is there when shooting a goal in basketball? Note that the basketball has a circumference of approximately 74 cm.



SC 1 I can determine the radius of a circle given the circumference

Backtracking can be used to determine the length of the radius r when the circumference C is known.

$$C = 2\pi r$$
$$C = 2 \times \pi \times r$$
$$\frac{C}{2\pi} = \frac{2 \times \pi \times r}{2\pi}$$
$$r = \frac{C}{2\pi}$$



Worked example

Determining radius from the circumference

Determine the length of the radius of a circle, in terms of pi, given the following information.

(a) The circumference is 24π cm.

THINKING	WORKING
Recall the formula for circumference.	$C = 2\pi r$
Identify the circumference.	$C = 24\pi$ cm
Substitute the circumference into the formula.	$24\pi = 2\pi r$
Solve the equation for the radius, leaving pi as part of the answer.	$r = \frac{24\pi}{2\pi}$ $= \frac{24}{2}$ $= 12$
Write the answer.	The radius of the circle is 12 cm.

(b) The circumference is 40 cm.

THINKING	WORKING
Recall the formula for circumference.	$C = 2\pi r$
Identify the circumference.	$C = 40$ cm
Substitute the circumference into the formula.	$40 = 2\pi r$
Solve the equation for the radius, leaving pi as part of the answer.	$r = \frac{40}{2\pi}$ $= \frac{20}{\pi}$
Write the answer.	The radius of the circle is $\frac{20}{\pi}$ cm.

SC 2 I can determine the radius of a circle given the area

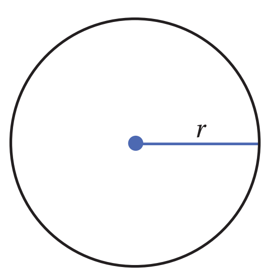
Backtracking can be used to determine the length of the radius r when the area A is known.

$$A = \pi r^2$$

$$\frac{A}{\pi} = \frac{\pi \times r^2}{\pi}$$

$$r^2 = \frac{A}{\pi}$$

$$\therefore r = \sqrt{\frac{A}{\pi}}$$



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Worked example

Determining radius from area

Determine the length of the radius of a circle, in terms of pi, given the following area.

(a) The area of the circle is 16π cm^2.

THINKING	WORKING
Recall the formula for the area of a circle.	$A = \pi r^2$
Identify the area of the circle.	$A = 16\pi$ cm^2
Substitute the area into the formula.	$16\pi = \pi r^2$
Solve the equation for the variable r. Given that r represents a length, $r > 0$, so the negative root can be ignored.	$\frac{16\pi}{\pi} = \frac{\pi \times r^2}{\pi}$ $r^2 = 16$ $r = \sqrt{16}$ $r = 4$
Write the answer.	The radius of the circle is 4 cm.

(b) The area of the circle is 85 cm^2.

THINKING	WORKING
Recall the formula for the area of a circle.	$A = \pi r^2$
Identify the area of the circle.	$A = 85$ cm^2
Substitute the area into the formula.	$85 = \pi r^2$
Solve the equation for the variable r. Given that r represents a length, $r > 0$, so the negative root can be ignored.	$\frac{85}{\pi} = \frac{\pi r^2}{\pi}$ $r^2 = \frac{85}{\pi}$ $r = \sqrt{\frac{85}{\pi}}$ $r = 5.20157\ldots$
Write the answer.	The exact radius of the circle is $\sqrt{\frac{85}{\pi}}$ cm.

7

Practice

ANSWERS Page XXX

SC 1 I can determine the radius of a circle given the circumference

1 Determine the radius for each circle, given the circumference.

(a) 10π mm **(b)** 15π mm **(c)** 20π mm **(d)** 25π mm

2 Determine the radius for each circle, given the circumference. Write your answer in terms of pi.

(a) 10 mm **(b)** 15 mm **(c)** 20 mm **(d)** 25 mm

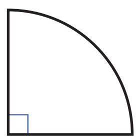
3 Describe the relationship between the radius and the diameter.

4 Determine the exact diameter and radius for each circle, given the circumference.

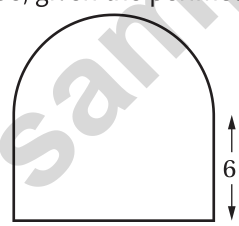
(a) 140 mm **(b)** 18 cm **(c)** 1.35 m **(d)** 26.8 cm

5 Determine the exact radius of the partial circle in each shape, given the perimeter.

(a) $P = 55$ cm



(b) $P = 40$ cm



SC 2 I can determine the radius of a circle given the area

1 Determine the radius for each circle, given the area.

(a) 4π mm^2 **(b)** 9π mm^2 **(c)** 16π mm^2 **(d)** 25π mm^2

2 Determine the radius for each circle, given the area. Write your answer in terms of pi.

(a) 10 mm^2 **(b)** 15 mm^2 **(c)** 20 mm^2 **(d)** 25 mm^2

3 Describe the relationship between the radius and the diameter.

4 Determine the exact radius and diameter for each circle, given the area.

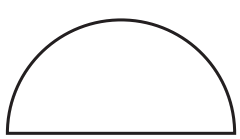
(a) 49π mm^2 **(b)** 81π cm^2 **(c)** 10π mm^2 **(d)** 20 m^2 **(e)** 26.8 cm^2

5 Determine the exact radius for each circle, then the approximate radius correct to 2 decimal places, using the given information of circumference C or area A.

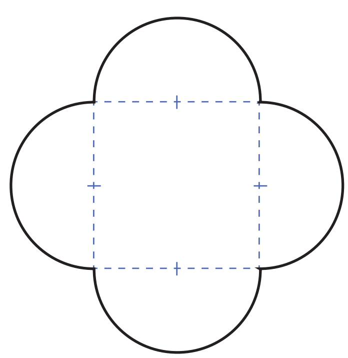
(a) $C = 45$ cm **(b)** $A = 350$ cm^2 **(c)** $C = 40$ m **(d)** $A = 62$ m^2

6 Determine the exact radius of the partial circle in each shape, given the area.

(a) $A = 50$ cm^2



(b) $A = 30$ m^2



Determine the surface area of cylinders

7.3

Learning intention: To be able to determine the surface area of cylinders

Success criteria:

SC 1 I can relate the net and the surface area of a cylinder.

SC 2 I can determine the surface area of a cylinder

Lesson warm-up

Can you describe the net and surface area of a cylinder?

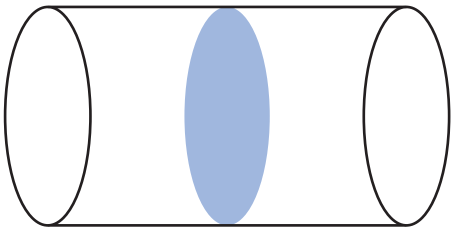
The net of a solid can be imagined as unfolding the 3D solid into its 2D shapes.

Draw the net of a cylinder.

Describe each of the dimensions of the 2D shapes that make up the net.

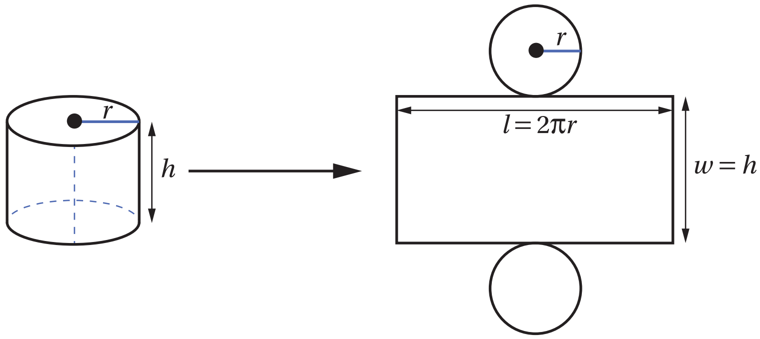
SC 1 I can relate the net and the surface area of a cylinder

Like right prisms, cylinders have a uniform cross-section: a circle.



Cylinders have two faces that are identical circles and a curved surface that, when imagined to be cut at right angles to the base and flattened out, becomes a rectangle.

- The length of the rectangle is the same as the circumference of the circle.
- The width of the rectangle is the same as the height of the cylinder.



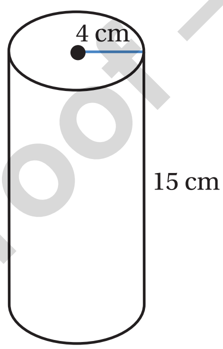
The 'net' of a cylinder is not a true net since the circles theoretically just touch the rolled-out rectangle at a single point, but it is still usual to draw the shapes as though they are joined.

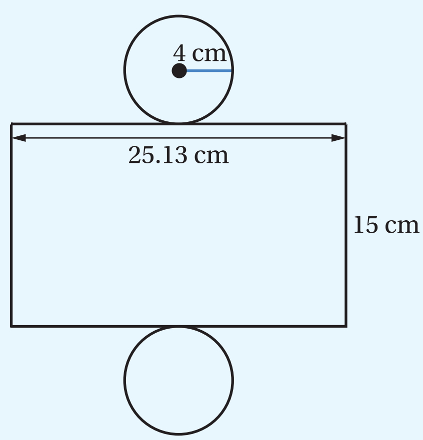
The circles may be placed anywhere along the curved-edge side of the rectangle, but are usually placed opposite each other.

Worked example

Drawing nets of cylinders

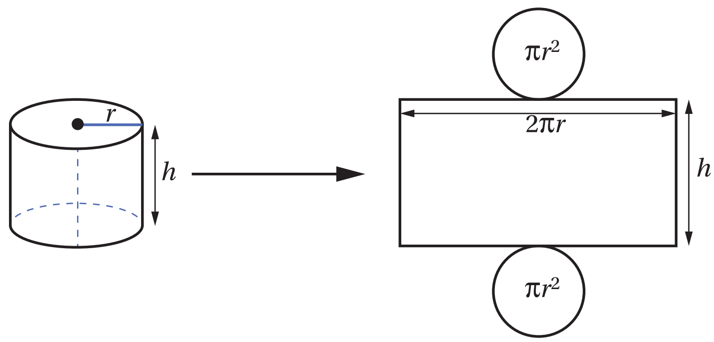
Draw a net to represent the cylinder below.



THINKING	WORKING
Determine the circumference of an end circle, correct to 2 decimal places.	$C = 2\pi r$ where $r = 4$ cm $C = 2\pi \times 4$ $= 8\pi$ ≈ 25.13 cm
Draw the net by placing two circles, the same as the ends of the cylinder, along opposite sides of a rectangle. The length of the rectangle should match the circumference of the circles. The width of the rectangle should match the height of the cylinder.	

SC 2 I can determine the surface area of a cylinder

The net of a cylinder is made up of two circular faces and a curved rectangular surface. Each circle has an area of πr^2. The dimensions of the rectangle are the circumference $2\pi r$ and the height of the cylinder h.



Hence, the surface area of a cylinder has the formula:

$$S = 2 \times (\pi r^2) + (2\pi r \times h)$$
$$= 2\pi r^2 + 2\pi rh$$

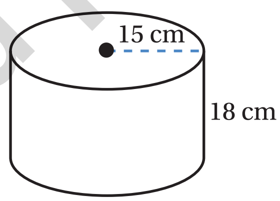
where r is the radius of the circular ends and h is the height of the cylinder.

This matches the general formula for surface area of a prism:
S = (area of base) × 2 + (perimeter of base) × h

Worked example

Determine the surface area of a cylinder

Determine the surface area of the cylinder, correct to 2 decimal places.



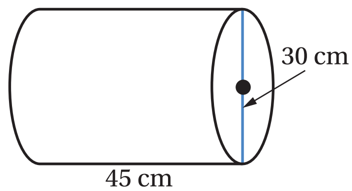
THINKING	WORKING
Write the formula for the surface area of a cylinder.	$S = 2\pi r^2 + 2\pi rh$
Substitute values for the working and calculate in terms of pi.	$S = 2 \times \pi \times (15)^2 + 2 \times \pi \times 15 \times 18$ $= 450\pi + 450\pi$ $= 990\pi$ $= 3110.176 \ldots$
Write the answer, rounding appropriately.	The surface area of the cylinder is 3110.18 cm^2, correct to 2 decimal places.

Practice

ANSWERS Page XXX

SC 1 I can relate the net and the surface area of a cylinder

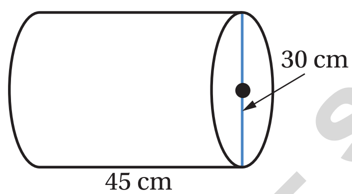
1 Consider the cylinder shown.



(a) Draw the net and label the radius and the height.

(b) Determine the exact dimensions of the rectangle in the net.

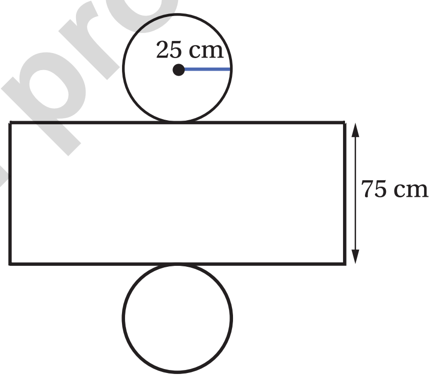
2 Consider the cylinder shown.



(a) Draw the net and label the radius and the height.

(b) Determine the exact dimensions of the rectangle in the net.

3 From the net of the cylinder, draw and label the dimensions of the cylinder.



4 A rectangle, 60 cm by 20 cm, is wrapped around the curved surface of a cylinder, with the longer sides wrapping around the circular ends.

(a) State the height of the cylinder.

(b) Determine the exact radius of the circular base.

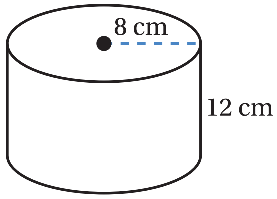
5 A square of side length 80 mm is wrapped around the curved surface of a cylinder.

(a) State the height of the cylinder.

(b) Determine the exact diameter of the circular base.

SC 2 I can determine the surface area of a cylinder

1 Determine the exact surface area of a cylinder of height 8 cm and radius of 12 cm.



2 For a cylinder of height 26.1 cm and radius 9.6 cm, determine the following.

(a) The exact area of a circular end.

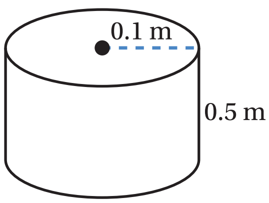
(b) The exact circumference of a circular end.

(c) The exact curved surface area.

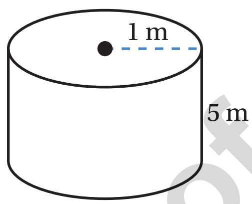
(d) The exact surface area of the cylinder.

3 Determine the exact surface area of each cylinder.

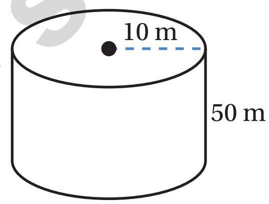
(a)



(b)

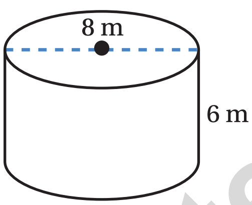


(c)

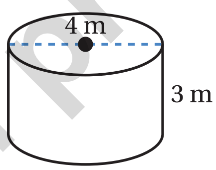


4 Determine the exact surface area of each cylinder.

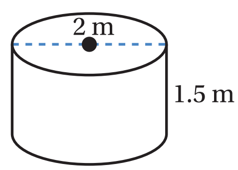
(a)



(b)



(c)



5 The area of a circular end of a cylinder is 1156π cm^2 and the curved surface area is 3944π cm^2. Determine the following.

(a) The length of the radius of the cylinder.

(b) The height of the cylinder.

6 Icing can be used to decorate cakes. The cake shown has a diameter of 25 cm and a depth of 10 cm.

(a) Describe the difference between the surface area of the cake and the surface area of the cake that is to be iced.

(b) Determine the surface area of the cake to be iced, correct to 2 decimal places.

7

7.4 Solve problems involving the surface area of cylinders

Learning intention: To be able to solve problems involving the surface area of cylinders

Success criteria:

SC 1 I can solve a variety of problems involving the nets and surface areas of cylinders.

Lesson warm-up

Painting curved surfaces

'The mural shown at Sheep Hills (below) represents the passing on of knowledge and local Indigenous history from Elders to the next generation within the community; as well as depicting elements of the local dreaming and the passing of time. The artist, Adnate, spent three weeks with the Barenji Gadjin community to conceive and complete the mural.'

In Victoria, the Silo Art Trail began at a small rural town called Brim. A small community project to paint the cylindrical grain silos resulted in international media attention and an influx of visitors to the tiny town.

The silos are 30 m high and each of the six silos has a diameter of approximately 6 m.

Determine the size of the murals.

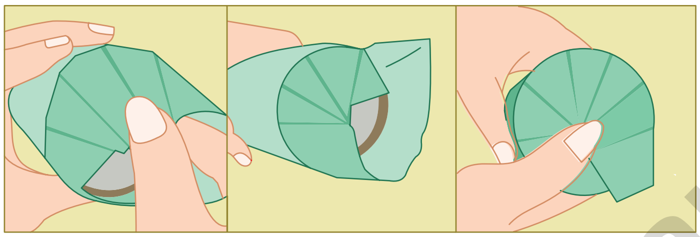
7

SC 1	I can solve a variety of problems involving the nets and surface areas of cylinders

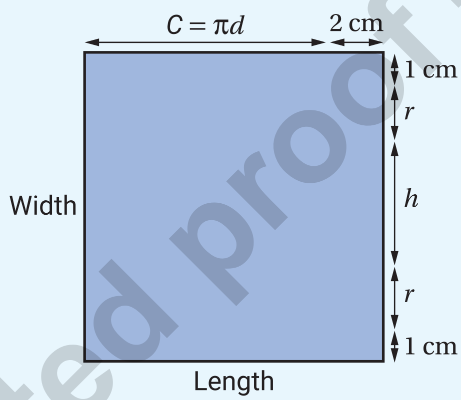
Worked example

Solving problems involving surface area of cylinders

A cylindrical gift of height 25 cm and diameter 11 cm is to be wrapped with a rectangular piece of paper. There needs to be a 2 cm overlap of the paper wrapped around the middle of the cylinder. The paper will be folded to cover the circular ends, so each end needs an additional radius length plus a 1 cm overlap. This will allow the paper at the ends to be folded over, as in the pictures below.



Determine the smallest dimensions possible for the wrapping paper, rounded up to the nearest centimetre.

THINKING	WORKING
Draw a diagram of the rectangular paper, labelling all side lengths.	
Determine the length of the curved surface (rectangle).	The length is the circumference of the circle, plus the overlap. $\pi d + 2 = \pi \times 11 + 2$ $= 36.5...$ The length of the rectangle must be at least 37 cm, rounded up to the nearest whole number.

Determine the width of the curved surface (rectangle).	One radius length plus a 1 cm overlap will be added at both the top and the bottom of the height. This extra length will be used to fold over the top and bottom of the cylinder. $r = \frac{11}{2} = 5.5$ cm The width of the rectangle will equal: $h + (r + 1) + (r + 1)$ $= 25 + (5.5 + 1) + (5.5 + 1)$ $= 38$ The width of the rectangle must be at least 38 cm.
Write the answer.	The wrapping paper must be at least 37 cm by 38 cm.

Practice

ANSWERS Page XXX

SC 1 I can solve a variety of problems involving the nets and surface areas of cylinders

1 Determine the height of a cylinder that has a radius of 80 cm and a surface area of 5 m^2. Give your answer in centimetres, to the nearest millimetre.

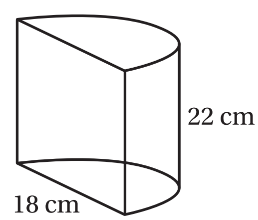
2 Determine the dimensions of the cardboard rectangle required to cut the curved and circular ends for a cylinder of height 10 cm and radius 6 cm. Choose the option that ensures the rectangle has the smallest possible area. Write your answer correct to the nearest millimetre.

3 A cylindrical container has no lid.

(a) Write a formula for the external surface area of the container.

(b) Determine the surface area, correct to 2 decimal places, given that the cylinder is 30 cm wide and 30 cm high.

4 A semi-cylindrical container with no lid has a diameter of 18 cm and a height of 22 cm. Determine the outer surface area of the container, in terms of pi.



5 Cans of baked beans are 7 cm high and 6.5 cm in diameter. The paper labels for the cans wrap around the curved surface, with a 1 cm overlap where they are glued. Determine the number of labels that will fit onto a 1.5 m by 1 m rectangular sheet of paper.

6 Determine the surface area of a quarter cylinder of height and radius 16 cm, in terms of pi.

7

Volume and capacity of cylinders

7.5

Learning intention: To be able to determine the volume and capacity of cylinders

Success criteria:

SC 1 I can apply the cylinder volume formula.

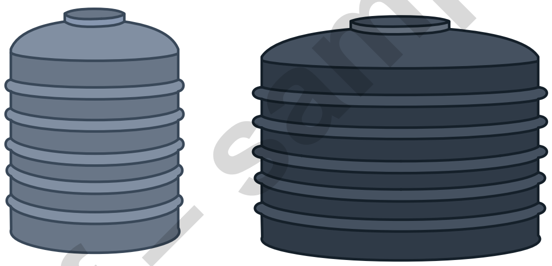
SC 2 I can solve a variety of problems involving the volumes and capacities of cylinders.

Lesson warm-up

Water tanks for sale

Cylindrical water tanks sold through a hardware shop are priced as shown.

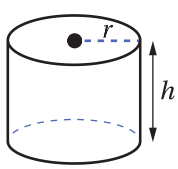
The larger tank has a capacity of 5000 L and is sold for $1040. The smaller tank has a capacity of 2000 L and costs $837.



The smaller water tank holds less than half the amount of water, but costs 80% of the price of the larger tank. Explain why this is reasonable or unreasonable.

SC 1 I can apply the cylinder volume formula

The formula for the volume of any prism holds for shapes with constant cross-sections, even for bases that have curves.



V = Area of cross-section × height

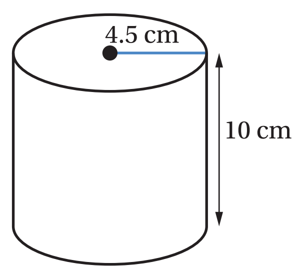
In the case of a cylinder, the cross-section is a circle, with area πr^2.

The formula for the volume of a cylinder is: $V = \pi r^2 h$

Worked example

Calculating the volume of a cylinder

Determine the volume of the cylinder, correct to the nearest whole number.



THINKING	WORKING
Recall the formula for the volume of a cylinder.	$V = \pi r^2 h$
Identify the radius and height of the cylinder.	$r = 4.5$ cm, $h = 10$ cm
Substitute the lengths of the radius and height into the formula and calculate.	$V = \pi \times 4.5^2 \times 10$ $= 636.1\ldots$
Write the answer, rounded as directed, with appropriate units.	The volume is 636 cm^3 to the nearest whole number.

SC 2 I can solve a variety of problems involving the volumes and capacities of cylinders

Volume and capacity equivalences:

1 cm^3 = 1 mL

1000 cm^3 = 1 L

1 m^3 = 1 kL

Also, 1000 mL = 1 L and 1000 L = 1 kL

Worked example

Determining the capacity of a cylinder

Determine the capacity of an approximately cylindrical jar of juice, to the nearest millilitre, given that its diameter is 8 cm and its height is 18 cm.

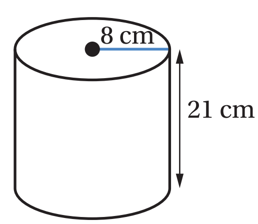
THINKING	WORKING
Recall the formula for the volume of a cylinder.	$V = \pi r^2 h$
Determine the length of the radius and the height.	d = 8 cm, so r = 4 cm h = 18 cm
Substitute into the volume formula and calculate.	$V = \pi \times 4^2 \times 18$ $= 904.7...$
Round the volume to the nearest cubic centimetre.	The volume of space in the can is about 905 cm^3.
Recall the volume capacity equivalence.	1 cm^3 = 1 mL
Write the answer.	The capacity of the can is 905 mL.

Practice

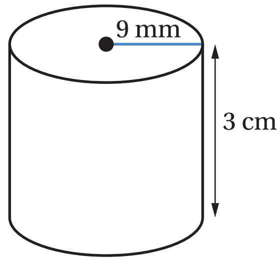
ANSWERS Page XXX

SC 1 I can apply the cylinder volume formula

1 A cylinder has a height of 8 cm and a diameter of 21 cm. Determine the volume of the cylinder in cubic centimetres, correct to 2 decimal places.



2 A cylinder has a radius of 9 mm and a height of 3 cm. Convert the radius to centimetres, then determine the volume of the cylinder in cubic centimetres, correct to 2 decimal places.



3 A cylinder just fits inside a cubic box of internal edge length 15 cm. Determine the volume of the cylinder to the nearest whole number.

4 Six cylindrical cans of diameter of 8 cm and height 16 cm are packed into a box in 2 × 3 formation, with no room to spare. Determine the following.

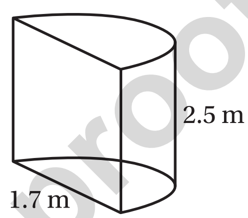
(a) The internal dimensions of the box.

(b) The volume of the box.

(c) The total volume of the six cans, to the nearest cubic centimetre.

(d) The percentage of the interior of the box that is empty space, correct to 1 decimal place.

5 Determine the volume of the half cylinder, correct to 2 decimal places.



SC 2 I can solve a variety of problems involving the volumes and capacities of cylinders

1 A semi-cylindrical water trough for a horse is 2.5 m long and 1.8 m wide (both measured internally). Determine the number of kilolitres of water needed to fill the trough, correct to 2 decimal places.

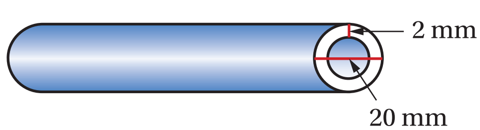
2 Cylinder 1 has a height of 12 cm and radius of 10 cm. Other cylinders have the same volume as Cylinder 1. Determine the following correct to 2 decimal places.

(a) The height of Cylinder 2, given that its radius is 2 cm less than the radius of Cylinder 1

(b) The radius of Cylinder 3, given that its height is 2 cm less than the height of Cylinder 1

3 Ginger beer is sold in small cans of 200 mL. Given that the diameter of the cans is 5 cm, determine their height, to the nearest millimetre.

4 A copper pipe has a diameter of 20 mm and is 2 mm thick. Determine the following.



(a) The amount of copper in a 2 m length of the pipe, to the nearest cubic centimetre

(b) The number of millilitres of water held in the 2 m length of pipe, to the nearest whole number

7.6 Understand the relationship between the volume and dimensions of cylinders

Learning intention: To understand the relationship between the volume and dimensions of cylinders

Success criteria:

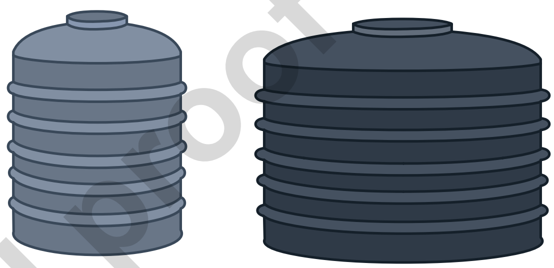
SC 1 I can use values in terms of pi to demonstrate the effect of change in linear dimensions on volume.

Lesson warm-up

What size?

A cylindrical tank has a volume of 80 m^2. What could its dimensions be?

What are reasonable values for each dimension (radius, height)?



SC 1 I can use values in terms of pi to demonstrate the effect of change in linear dimensions on volume

The formula for the volume of a cylinder, $V = \pi r^2 h$, can be used to show that increasing the height by a factor produces the same factor increase in the volume; however, because the radius value is squared, increasing the radius (or diameter) by a factor produces a square of the factor increase in the volume.

Worked example

Demonstrating the effect of an increase in the height of a cylinder on its volume

A cylinder has a height of 30 cm and a radius of 12 cm.

(a) Calculate the volume in terms of pi.

THINKING	WORKING
Recall the formula for the volume of a cylinder.	$V = \pi r^2 h$, where r = 12 cm, h = 30 cm
Substitute the length of the radius and height into the formula and calculate in terms of pi.	$V = \pi \times 12^2 \times 30$ $= 4320\pi$ cm^2

(b) Determine the new height, given that it is increased by 20%.

THINKING	WORKING
Determine the scale factor.	100% + 20% = 120% 120% = 1.2
Multiply the original height by the scale factor.	New height: 30 cm × 1.2 = 36 cm

(c) Calculate the new volume in terms of pi.

THINKING	WORKING
Substitute the new height into the volume formula and calculate the volume in terms of pi.	New volume, using h = 36 cm: $V = \pi \times 12^2 \times 36$ $= 5184\pi$ cm^2

(d) Determine the percentage increase in volume and reflect on the answer.

THINKING	WORKING
Write the new volume as a percentage of the old volume.	New volume compared to old: $\frac{5184\pi}{4320\pi} \times 100\% = 120\%$
Subtract 100% to determine the percentage increase and compare with the percentage increase in height.	120% – 100% = 20% The 20% increase in height produces the same percentage increase in volume.

7

Worked example

Demonstrating the effect of an increase in the radius of a cylinder on its volume

A cylinder has a height of 30 cm and a radius of 12 cm.

(a) Calculate the volume in terms of pi.

THINKING	WORKING
Recall the volume for a cylinder.	$V = \pi r^2 h$, where r = 12 cm, h = 30 cm
Substitute the length of the radius and height into the formula and calculate in terms of pi.	$V = \pi \times 12^2 \times 30$ $= 4320\pi$ cm^3

(b) Increase the radius by 20%.

THINKING	WORKING
Determine the scale factor.	100% + 20% = 120%, 120% = 1.2
Multiply the original height by the scale factor.	New height: 12 cm × 1.2 = 14.4 cm

(c) Calculate the new volume in terms of pi.

THINKING	WORKING
Substitute the new height into the volume formula and calculate the volume in terms of pi.	New volume, using r = 14.4 cm: $V = \pi \times 14.4^2 \times 30$ $= 6220.8\pi$ cm^3

(d) Determine the percentage increase in volume and reflect on the answer.

THINKING	WORKING
Write the new volume as a percentage of the old volume.	New volume compared to old: $\frac{6220.8\pi}{4320\pi} \times 100\% = 144\%$
Subtract 100% to determine the percentage increase and compare with the percentage increase in radius.	144% – 100% = 44% The 20% increase in radius produces a 44% increase in volume.

7

(e) Determine the ratio of the new volume to the old volume.

THINKING	WORKING
State the ratio of the new radius to the old radius.	100% + 20% = 120%, 120% = 1.2 The new to old ratio of radii is 1.2.
Determine the ratio of the new volume to the old volume.	In the formula for volume $V = \pi r^2 h$, the radius is squared. If the radius is increased by 1.2, then the volume will be increased by $1.2^2 = 1.44$.

Practice

ANSWERS Page XXX

SC 1 I can use values in terms of pi to demonstrate the effect of change in linear dimensions on volume

1 A cylinder has a height of 3.2 m and a radius of 1.4 m.

- **(a)** Calculate the volume in terms of pi.
- **(b)** Calculate the new volume, in terms of pi, when the height is doubled.
- **(c)** Compare the new volume to the original volume using ratios.

2 A cylinder has a height of 50 cm and a radius of 10 cm.

- **(a)** Calculate the volume in terms of pi.
- **(b)** Calculate the new volume, in terms of pi, when the radius is doubled.
- **(c)** Compare the new volume to the original volume using ratios.

3 A cylinder has a height of 58 mm and a diameter of 90 mm.

- **(a)** Calculate the volume in terms of pi.
- **(b)** Calculate the new volume, in terms of pi, when the height is doubled.
- **(c)** Compare the new volume to the original volume using ratios.

4 A cylinder has a height and diameter of 1 m.

- **(a)** Calculate the volume, in cubic metres, in terms of pi.
- **(b)** Calculate the new volume, in cubic metres, in terms of pi, when the diameter is doubled.
- **(c)** Compare the new volume to the original volume using ratios.

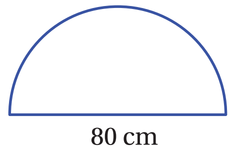
5 Determine the effect on the volume for each of the following changes.

- **(a)** The height is increased by a factor of 10.
- **(b)** The radius is increased by a factor of 10.
- **(c)** The diameter is increased by a factor of 6.
- **(d)** The height is increased by 40%.
- **(e)** The radius is increased by 40%.

TOPIC REVIEW

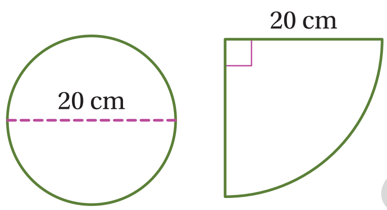
Multiple choice

1 The perimeter of the semicircle in centimetres is:



A 80π **B** $20\pi + 40$ **C** $80\pi + 80$ **D** $40\pi + 80$

2 The difference between the perimeters of the circle and quarter circle, in centimetres, is:



A $40 - 10\pi$ **B** $10\pi - 20$ **C** $20\pi - 40$ **D** $40\pi - 40$

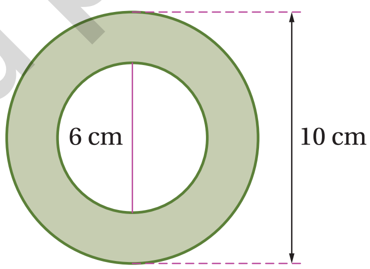
3 The exact area of a circle with a diameter of 25 m is:

A $\frac{625\pi^2}{4}$ m^2 **B** $\frac{625\pi}{4}$ m^2 **C** $625\pi^2$ m^2 **D** $\frac{625\pi}{2}$ m^2

4 The exact area of a circle with a radius of 75 mm is:

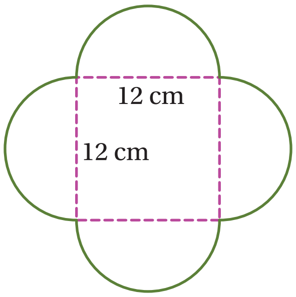
A 75π mm^2 **B** 150π mm^2 **C** 5625π mm^2 **D** $22\,500\pi$ mm^2

5 The shaded area of this shape, in square centimetres, is:



A 64π **B** 16π **C** 8π **D** 4π

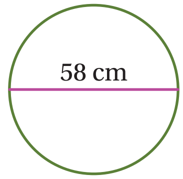
6 The area of this shape, in square centimetres, is:



A 24π **B** 72π **C** $48 + 24\pi$ **D** $144 + 72\pi$

7

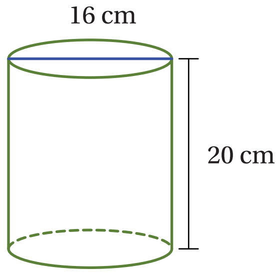
7 The exact circumference of this circle is:



A 58π cm **B** 29π cm **C** 3364π cm **D** 841π cm

Use the following information to answer Questions 8–10.

A net is to be drawn, consisting of two circles and a rectangle, to represent the cylinder below.



8 The area of each circle will be:

A 256π cm^2 **B** 64π cm^2 **C** 32π cm^2 **D** 16π cm^2

9 The shorter side of the rectangle will be:

A 8 cm **B** 16 cm **C** 20 cm **D** 40 cm

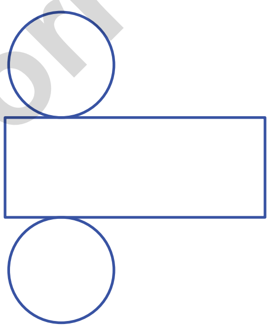
10 The longer side of the rectangle will be:

A 256π cm **B** 64π cm **C** 16π cm **D** 32π cm

11 A cylindrical can full of water has a diameter of 30 cm and a height of 20 cm. The number of smaller cylinders of diameter 10 cm and height 5 cm that can be filled from the larger cylinder is:

A 12 **B** 48 **C** 144 **D** 36

12 The simplest nets of cylinders involve rectangles, but other shapes are possible. The net that could *not* form a cylinder is:

A


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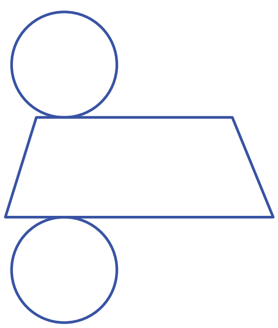
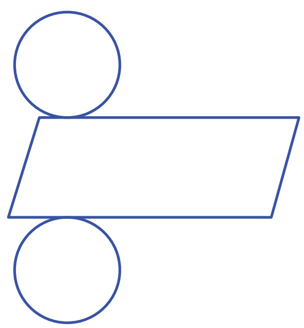
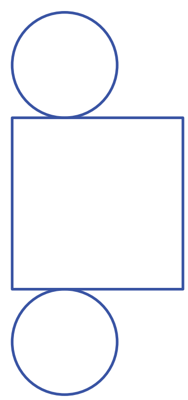


C


D


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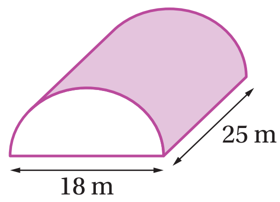
Use the following information to answer Questions 13–14.

Consider the semi-cylinder below.



13 The volume, in cubic metres, of the semi-cylinder is:

A 1012.5π **B** 4050π **C** 2025π **D** 225π

14 The surface area, in square metres, of the semi-cylinder is:

A $265.5\pi + 450$ **B** $387\pi + 450$ **C** $531\pi + 450$ **D** $306\pi + 450$

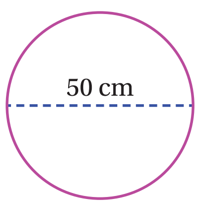
15 The radius of a cone, 20 cm high, with a volume of 40 000 cm^3 is closest to:

A 1910 cm **B** 25 cm **C** 44 cm **D** 637 cm

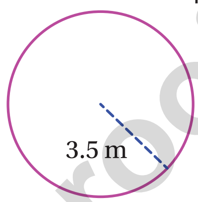
Short answer

1 Calculate the circumference of each circle in terms of pi.

(a)

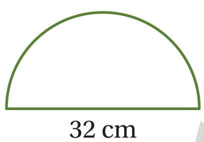


(b)

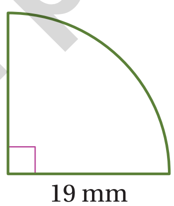


2 Determine the perimeter of each shape in terms of pi.

(a)

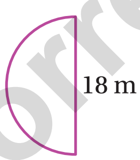


(b)

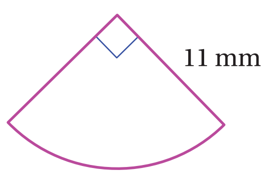


3 Determine the area of each shape in terms of pi.

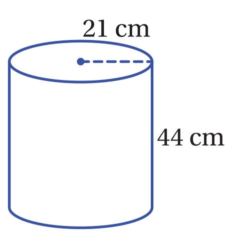
(a)



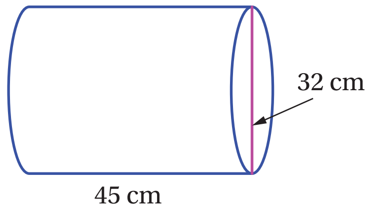
(b)



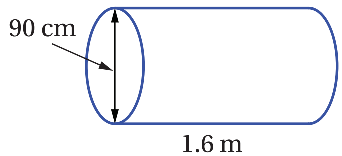
4 Determine the surface area and volume of the cylinder, correct to the nearest whole number each time.



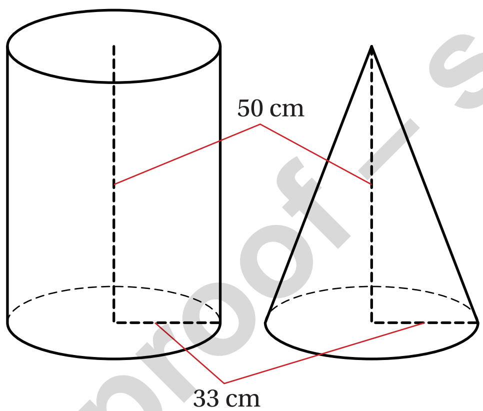
5 Determine the surface area of the cylinder in terms of pi.



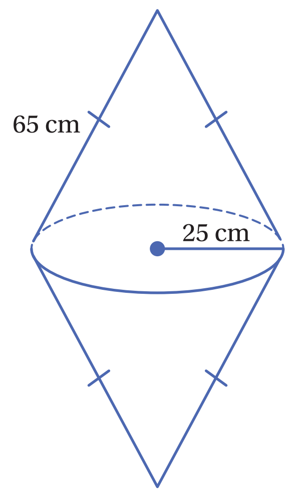
6 Determine the volume of the cylinder, in cubic metres, in terms of pi.



7 Calculate the volume of the cylinder in terms of pi, and hence determine the volume of the cone.



8 A double-cone sculpture is made of identical cones.



(a) Use Pythagoras' theorem to determine the height of each cone.

(b) Determine the exact volume of the sculpture.

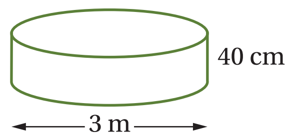
(c) If a cylinder has the same radius and volume as the sculpture, determine its height.

(d) If a cylinder has the same height and volume as the sculpture, determine its exact radius.

9 Determine the capacity of a jar of pickles, to the nearest millilitre, that is 8 cm wide and 12 cm high, internally.

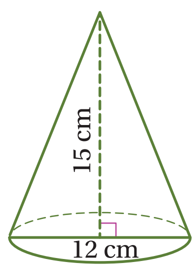
10 A cylinder is to be made from an A4 sheet of coloured cardboard 210 mm by 297 mm. If the height and diameter of the cylinder are both 9 cm, what area of coloured cardboard will be wasted, to the nearest square centimetre?

11 Determine the number of metric cups, 250 mL each, it takes to fill the water tank below.

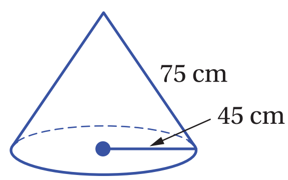


12 Determine the volume of each cone, correct to the nearest whole number.

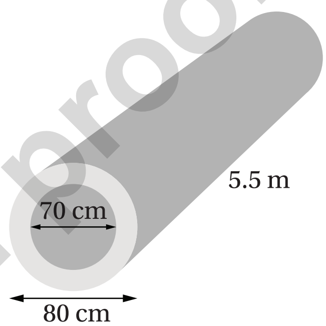
(a)



(b)



13 Determine the volume of material in the pipe, in cubic metres, correct to 2 decimal places.



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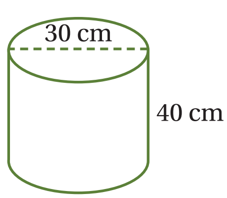
Extended response

1 Consider the cylinder below.



(a) Determine the volume in terms of pi.

(b) Determine the volume of a cone with the same diameter and height.

(c) Determine the volume of a square-based prism with the same width and height.

(d) Write a simple ratio of the three volumes, in the order calculated.

2 A celebration cake is to be made using three square-based pans of base lengths 50 cm, 40 cm and 30 cm, respectively. The depth of each tier is to be 15 cm.

(a) Calculate the total volume of the un-iced cake.

(b) Determine the height, to the nearest centimetre, of a single-tier round cake made from the same amount of cake mix in a cake tin of diameter 40 cm.

(c) If both cakes are to be iced on the visible surfaces only, determine the area to be iced for each cake, rounding to the nearest hundred square centimetres, where necessary.

3 Grain silos like the one below can be up to 90 m high, with diameters as much as 27 m.

(a) If the cylindrical part of the silo is 30 m high and 10 m wide, determine the volume of grain held in this section, in cubic metres, correct to 2 decimal places.

(b) If the conical parts of the silo have heights of 1 m and 1.5 m, respectively, determine the total volume of grain held in the silo, rounding as before.

Trucks with trays in the shape of rectangular prisms are to take the grain to various markets.

(c) Determine the volume of grain a truck can carry for each load if the tray dimensions are 2 m by 4 m by 3 m.

(d) Determine the number of loads needed to empty the silo.

Pearson Secondary Teaching Hub – Teaching program
Australian Curriculum v9.0
Year level 9

Pearson Secondary Teaching Hub mathematics lessons provide a systematic approach to deliver content in manageable chunks of content, defined by and written specifically to success criteria to ensure learning is relevant and purposeful.

Curriculum coverage

Teaching Hub Year level 9 topics	Strand	AC v9	Content description
Real numbers	Number	AC9M9N01	recognise that the real number system includes the rational numbers and the irrational numbers, and solve problems involving real numbers using digital tools
Exponents	Algebra	AC9M9A01	apply the exponent laws to numerical expressions with integer exponents and extend to variables
Algebra (binomials)	Algebra	AC9M9A02	simplify algebraic expressions, expand binomial products and factorise monic quadratic expressions
Linear relationships and graphs	Algebra	AC9M9A03; AC9M9A05; AC9M9A06	find the gradient of a line segment, the midpoint of the line interval and the distance between 2 distinct points on the Cartesian plane use mathematical modelling to solve applied problems involving change including financial contexts; formulate problems, choosing to use either linear or quadratic functions; interpret solutions in terms of the situation; evaluate the model and report methods and findings experiment with the effects of the variation of parameters on graphs of related functions, using digital tools, making connections between graphical and algebraic representations, and generalising emerging patterns
Quadratic relationships and graphs	Algebra	AC9M9M04; AC9M9M05; AC9M9A06	identify and graph quadratic functions, solve quadratic equations graphically and numerically, and solve monic quadratic equations with integer roots algebraically, using graphing software and digital tools as appropriate use mathematical modelling to solve applied problems involving change including financial contexts; formulate problems, choosing to use either linear or quadratic functions; interpret solutions in terms of the situation; evaluate the model and report methods and findings experiment with the effects of the variation of parameters on graphs of related functions, using digital tools, making connections between graphical and algebraic representations, and generalising emerging patterns
Area and volume	Measurement	AC9M9M01	solve problems involving the volume and surface area of right prisms and cylinders using appropriate units
Circles and cylinders	Measurement	AC9M9M01; AC9M7M03	solve problems involving the volume and surface area of right prisms and cylinders using appropriate units solve spatial problems, applying angle properties, scale, similarity, Pythagoras' theorem and trigonometry in right-angled triangles
Measurement and scientific notation	Measurement	AC9M9M02	solve problems involving very small and very large measurements, time scales and intervals expressed in scientific notation
Percentage error in measurement	Measurement	AC9M9M04	calculate and interpret absolute, relative and percentage errors in measurements, recognising that all measurements are estimates

Pythagoras and geometry	Measurement	AC9M9M03	solve spatial problems, applying angle properties, scale, similarity, Pythagoras' theorem and trigonometry in right-angled triangles
Modelling situations with measurement and rates	Measurement	AC9M9M05	use mathematical modelling to solve practical problems involving direct proportion, rates, ratio and scale, including financial contexts; formulate the problems and interpret solutions in terms of the situation; evaluate the model and report methods and findings
Trigonometry	Measurement Space	AC9M9M03 AC9M9SP01	solve spatial problems, applying angle properties, scale, similarity, Pythagoras' theorem and trigonometry in right-angled triangles recognise the constancy of the sine, cosine and tangent ratios for a given angle in right-angled triangles using properties of similarity
Ratios and proportion in space	Measurement Space	AC9M9M03 AC9M9M05 AC9M9SP02	solve spatial problems, applying angle properties, scale, similarity, Pythagoras' theorem and trigonometry in right-angled triangles use mathematical modelling to solve practical problems involving direct proportion, rates, ratio and scale, including financial contexts; formulate the problems and interpret solutions in terms of the situation; evaluate the model and report methods and findings apply the enlargement transformation to shapes and objects using dynamic geometry software as appropriate; identify and explain aspects that remain the same and those that change
Analysing and interpreting statistics	Statistics	AC9M9ST01 AC9M9ST02	analyse reports of surveys in digital media and elsewhere for information on how data was obtained to estimate population means and medians analyse how different sampling methods can affect the results of surveys and how choice of representation can be used to support a particular point of view
Displaying and comparing statistical data	Statistics	AC9M9ST03 AC9M9ST04	represent the distribution of multiple data sets for numerical variables using comparative representations; compare data distributions with consideration of centre, spread and shape, and the effect of outliers on these measures choose appropriate forms of display or visualisation for a given type of data; justify selections and interpret displays for a given context
[Activity – coming soon]	Statistics	AC9M9ST05	plan and conduct statistical investigations involving the collection and analysis of different kinds of data; report findings and discuss the strength of evidence to support any conclusions
Probability (compound events, relative frequencies)	Probability	AC9M9P01 AC9M9P02	list all outcomes for compound events both with and without replacement, using lists, tree diagrams, tables or arrays; assign probabilities to outcomes calculate relative frequencies from given or collected data to estimate probabilities of events involving "and", inclusive "or" and exclusive "or"
[Activity – coming soon]	Probability	AC9M9P03	design and conduct repeated chance experiments and simulations, using digital tools to compare probabilities of simple events to related compound events, and describe results

Source: Australian Curriculum, Assessment and Reporting Authority (ACARA)

Year planner

Term	Pearson Secondary Teaching Hub topics
Term 1	Real numbers Exponents Algebra (binomials) Linear relationships and graphs
Term 2	Quadratic relationships and graphs Area and volume Circles and cylinders Measurement and scientific notation
Term 3	Percentage error in measurement Pythagoras and geometry Modelling situations with measurement and rates Trigonometry
Term 4	Ratios and proportion in space Analysing and interpreting statistics Displaying and comparing statistical data Probability (compound events, relative frequencies)

Features and support

Phase: Activate prior knowledge

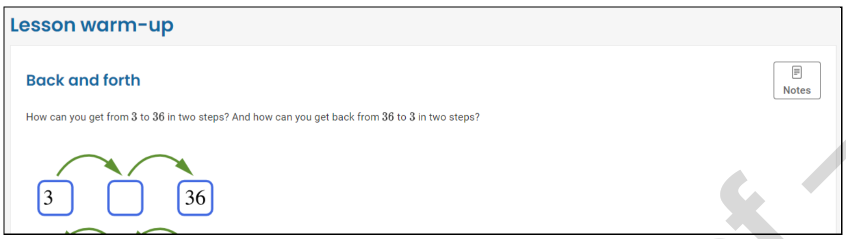
Pearson Diagnostic

These quizzes are mapped to each topic and are designed to diagnose misconceptions and levels of understanding. Based on the results of these quizzes, each student receives personalised targeted activities to overcome misconceptions and upskill to ensure they are working at level for longer.

Lesson warm-up

Every lesson begins with a lesson warm-up. This activity is designed to engage students in the lesson content and activate prior knowledge.

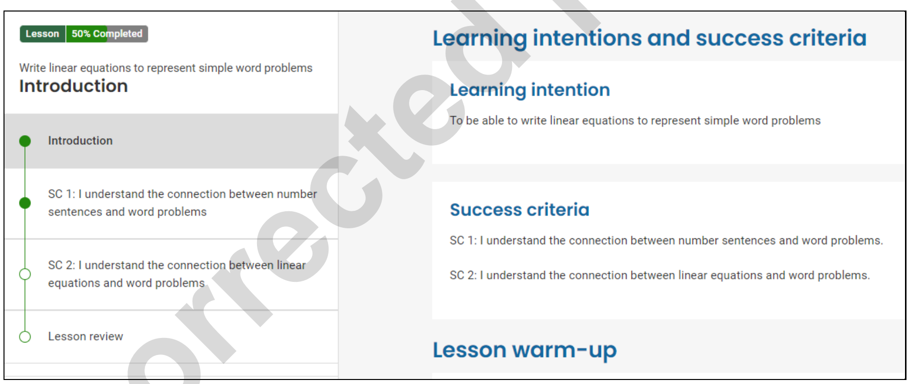
Every lesson warm-up comes complete with Teaching Notes (teacher view only), where teachers are supported with a suggested timeframe, any materials required, enabling and extending prompts and sample solutions.



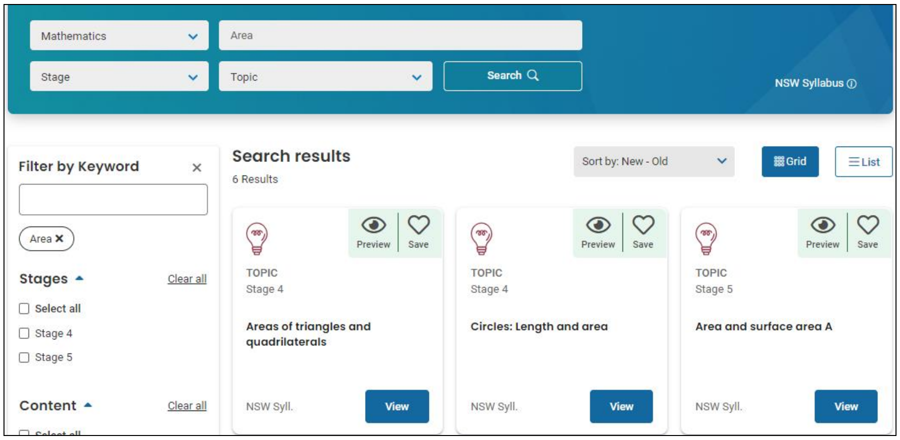
Phase: Setting Learning Goals

The resources in Pearson Secondary Teaching Hub have been specifically created to support teachers and students.

The topics comprise lessons, the purpose of each lesson is defined by a learning intention and success criteria.



The hub gives access to Years 7 – 10 (Australian and Victorian curricula) and Stages 4 and 5 (NSW syllabus) content to ensure all students can access content at a suitable entry point and can be extended.

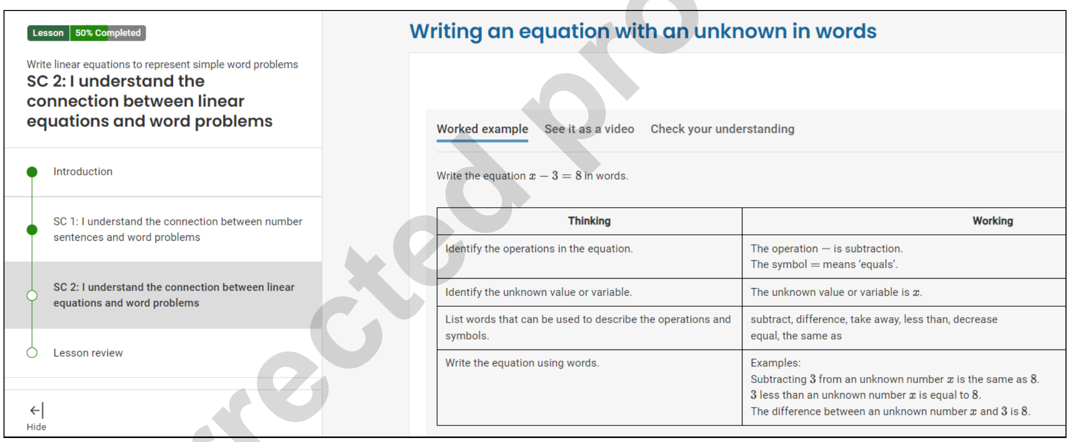


Phase: Presentation (I do)

The demonstration phase of learning is supported with worked examples in the digital platform that are also presented as a video demonstration.

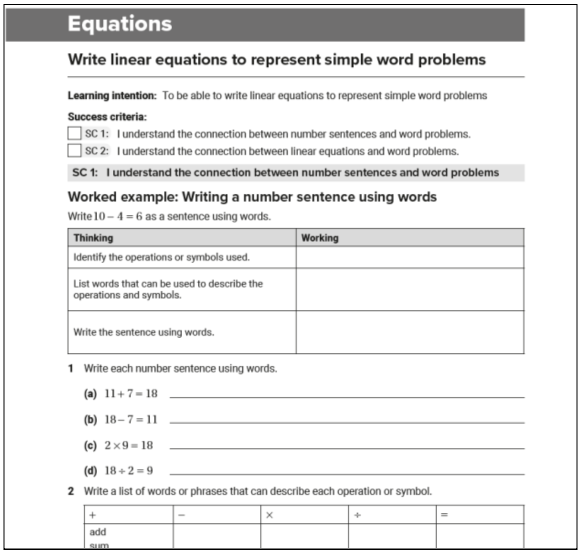
Success criteria have at least one worked example which is further supported with:

- a video walkthrough 'See it as a video'
- a try yourself example in the Student Companion
- 1-3 autocorrecting 'Check your understanding' questions to assess student readiness to progress from guided practice to independent practice.



Phase: Guided Practice (We do)

Each of the digital lessons, contains approximately 1-2 corresponding pages in the Student Companion providing a place for guided practice. The 'try yourself' format of the worked example gives students the opportunity to practice the required skill or skills with the support of their teacher.



Equations

Write linear equations to represent simple word problems

Learning intention: To be able to write linear equations to represent simple word problems

Success criteria:

☐ SC 1: I understand the connection between number sentences and word problems.

☐ SC 2: I understand the connection between linear equations and word problems.

SC 1: I understand the connection between number sentences and word problems

Worked example: Writing a number sentence using words

Write $10 - 4 = 6$ as a sentence using words.

Thinking	Working
Identify the operations or symbols used.	
List words that can be used to describe the operations and symbols.	
Write the sentence using words.	

1 Write each number sentence using words.

(a) $11 + 7 = 18$ ________

(b) $18 - 7 = 11$ ________

(c) $2 \times 9 = 18$ ________

(d) $18 \div 2 = 9$ ________

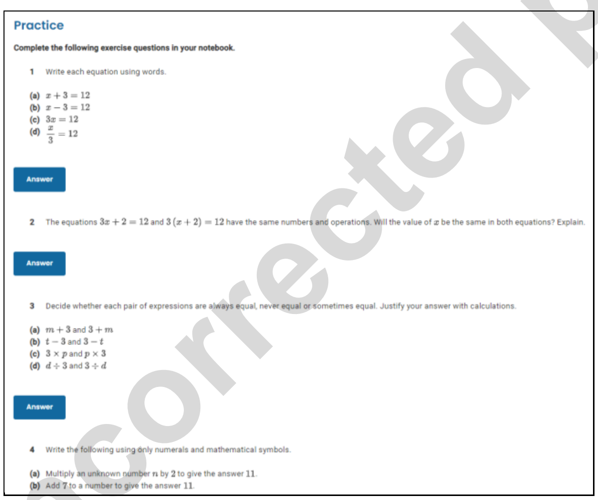
2 Write a list of words or phrases that can describe each operation or symbol.

+	−	×	÷	=
add sum				

Phase: Independent Practice (You do)

Independent practice is supported in the digital lesson.

Each success criteria contains a 'Practice' section with approximately 4–6 exercise questions, available in both the Student Book and in Hub.



Practice

Complete the following exercise questions in your notebook.

1 Write each equation using words.

(a) $x + 3 = 12$
(b) $x - 3 = 12$
(c) $3x = 12$
(d) $\frac{x}{3} = 12$

Answer

2 The equations $3x + 2 = 12$ and $3(x + 2) = 12$ have the same numbers and operations. Will the value of x be the same in both equations? Explain.

Answer

3 Decide whether each pair of expressions are always equal, never equal or sometimes equal. Justify your answer with calculations.

(a) $m + 3$ and $3 + m$
(b) $t - 3$ and $3 - t$
(c) $3 \times p$ and $p \times 3$
(d) $d \div 3$ and $3 \div d$

Answer

4 Write the following using only numerals and mathematical symbols.

(a) Multiply an unknown number n by 2 to give the answer 11.
(b) Add 7 to a number to give the answer 11.

COMING SOON
The teaching program will supply sample student navigation to support differentiation with a layered curriculum.

Foundation	Standard	Extension

Sample scope and sequence

TERM 1

TERM 1: Weeks 1–2

TOPIC 1: REAL NUMBERS

Content descriptions:

AC9M9N01 recognise that the real number system includes the rational numbers and the irrational numbers, and solve problems involving real numbers using digital tools

Source: Australian Curriculum, Assessment and Reporting Authority (ACARA)

Pearson Diagnostic quizzes

☐ N/A

Lesson name	Learning intention and success criteria	Differentiating independent practice	Annotations, other resources, teacher sign off
Identify and define irrational numbers	**Learning intention:** To be able to identify and define irrational numbers **Success criteria:** SC 1: I can define a rational number and determine whether a number is rational or irrational. SC 2: I can use a number line to indicate the solution interval for inequalities.		
Apply irrational numbers	**Learning intention:** To be able to apply irrational numbers **Success criteria:** SC 1: I can write approximate values for irrational numbers. SC 2: I can apply irrational numbers in the solution of problems.		
Plot and locate irrational numbers on a number line by estimation and by construction	**Learning intention:** To be able to plot and locate irrational numbers on a number line by estimation and by construction **Success criteria:** SC 1: I can estimate the location of irrational numbers on a number line. SC 2: I can use construction techniques to accurately locate irrational numbers on a number line.		

TERM 1: Weeks 3–5

TOPIC 2: EXPONENTS

Content descriptions:

AC9M9A01 apply the exponent laws to numerical expressions with integer exponents and extend to variables

Source: Australian Curriculum, Assessment and Reporting Authority (ACARA)

Pearson Diagnostic quizzes

- ☐ Prime, composite and square numbers
- ☐ Factors and multiples

Lesson name	Learning intention and success criteria	Differentiating independent practice	Annotations, other resources, teacher sign off
Establish and apply the exponent law for multiplication	**Learning intention:** To be able to establish and apply the exponent law for multiplication **Success criteria:** SC 1: I can write the expanded form of a multiplication and multiply numbers using exponent notation. SC 2: I can multiply variables using exponent notation.		
Establish and apply the exponent law for division	**Learning intention:** To establish and apply the exponent law for division **Success criteria:** SC 1: I can write the expanded form of a division and divide powers of numbers using exponent notation. SC 2: I can divide powers of variables using exponent notation.		
Establish and apply the exponent law for raising a power to a power	**Learning intention:** To establish and apply the exponent law for raising a power to a power **Success criteria:** SC 1: I can write the expanded form for powers of numbers raised to a power. SC 2: I can raise a power to a power using a variable base		
Establish and apply the exponent law for raising to the power of 0	**Learning intention:** To establish and apply the exponent law for raising to the power of 0 **Success criteria:** SC 1: I can demonstrate that any natural		

		number raised to the power of 0 is equal to 1. SC 2: I can solve problems raising variables to the power of zero.			
	Apply exponent laws to numerical expressions with negative integer exponents	**Learning intention:** To be able to apply exponent laws to numerical expressions with negative integer exponents **Success criteria:** SC 1: I can write any natural number raised to a power with a negative integer exponent as a power with a positive exponent. SC 2: I can solve problems raising variables to a power with a negative integer exponent.			
	Apply exponent laws to simplify numerical expressions	**Learning intention:** To be able to apply exponent laws to simplify numerical expressions **Success criteria:** SC 1: I can represent decimals and fractions in expanded form using negative exponents where necessary. SC 2: I can simplify and evaluate numerical expressions involving positive and negative exponents.			
	Choose and apply efficient strategies to exponent laws of numerical expressions	**Learning intention:** To be able to choose and apply efficient strategies to exponent laws of numerical expressions **Success criteria:** SC 1: I can connect the calculation of numerical expressions involving exponents to the exponent laws. SC 2: I can apply the exponent laws to simplify expressions involving products, quotients and powers of constants.			
	Apply exponent laws to simplify algebraic expressions	**Learning intention:** To be able to apply exponent laws to simplify algebraic expressions **Success criteria:** SC 1: I can verify the exponent laws as applied to variables. SC 2: I can simplify algebraic expressions using exponent laws. SC 3: I can simplify expressions that use exponent form and involve two or more variables.			

TERM 1: Weeks 6–7

TOPIC 3: ALGEBRA

Content descriptions:

AC9M9A02 simplify algebraic expressions, expand binomial products and factorise monic quadratic expressions

Source: Australian Curriculum, Assessment and Reporting Authority (ACARA)

Pearson Diagnostic quizzes

- ☐ Values for letters
- ☐ Letters for numbers or objects
- ☐ Writing expressions involving multiplication, addition and subtraction
- ☐ Formulating algebraic expressions
- ☐ Writing expressions using area rules
- ☐ Expanding brackets using an area model

Lesson name	Learning intention and success criteria	Differentiating independent practice	Annotations, other resources, teacher sign off
Understand and use the distributive law	**Learning intention:** To understand and use the distributive law **Success criteria:** SC 1: I can describe and illustrate the distributive law using the area model. SC 2: I can apply the distributive law to calculate a range of numerical expressions. SC 3: I can apply the distributive law to multiply out the brackets of algebraic expressions.		
Recognise, expand and factorise special binomial products	**Learning intention:** To be able to recognise, expand and factorise special binomial products **Success criteria:** SC 1: I can expand the sum or difference of perfect squares. SC 2: I can expand the difference of two squares. SC 3: I can factorise perfect squares or the difference of two squares.		
Understand algebraic factorisation	**Learning intention:** To understand algebraic factorisation **Success criteria:** SC 1: I can factorise algebraic expressions containing both numerical and algebraic common factors. SC 2: I can factorise algebraic expressions in which the common		

		factor contains brackets			
	Factorise simple quadratics	**Learning intention:** To Factorise simple quadratics **Success criteria:** SC 1: I can factorise simple quadratics.			

TERM 1: Weeks 8–10

TOPIC 4: LINEAR RELATIONSHIPS AND GRAPHS

Content descriptions:

AC9M9A03 find the gradient of a line segment, the midpoint of the line interval and the distance between 2 distinct points on the Cartesian plane

AC9M9A05 use mathematical modelling to solve applied problems involving change including financial contexts; formulate problems, choosing to use either linear or quadratic functions; interpret solutions in terms of the situation; evaluate the model and report methods and findings

AC9M9A06 experiment with the effects of the variation of parameters on graphs of related functions, using digital tools, making connections between graphical and algebraic representations, and generalising emerging patterns

Source: Australian Curriculum, Assessment and Reporting Authority (ACARA)

Pearson Diagnostic quizzes

- ☐ Solving linear equations
- ☐ Writing linear equations
- ☐ Plotting coordinates
- ☐ Representing linear functions
- ☐ Interpreting gradients of graphs
- ☐ Reading scales
- ☐ Grid references and coordinates

Lesson name	Learning intention and success criteria	Differentiating independent practice	Annotations, other resources, teacher sign off
Determine the gradient of straight-line graphs	**Learning intention:** To be able to determine the gradient of straight-line graphs **Success criteria:** SC 1: I understand the basic ideas related to gradient. SC 2: I can determine the gradient of a straight line and link its connection to the variable m in the straight line y = mx + b.		
Sketch and analyse linear graphs	**Learning intention:** To be able to sketch and analyse linear graphs **Success criteria:** SC 1: I can sketch a linear graph by determining the coordinates of two points. SC 2: I can sketch a linear graph by determining the x- and y-intercepts. SC 3: I can sketch a linear graph written in any form including general form and y = mx + b form.		
Determine the equation of a	**Learning intention:** To be able to determine the equation of a straight line		

	straight line	**Success criteria:** SC 1: I can identify the y-intercept graphically and calculate it using the gradient and a coordinate. SC 2: I can use the gradient and y-intercept to determine the equation for a straight line.			
	Model practical contexts with linear equations	**Learning intention:** To be able to model practical contexts with linear equations **Success criteria:** SC 1: I can solve linear equations. SC 2: I can represent practical contexts using linear models.			
	Determine the distance between points and the coordinates of the midpoint	**Learning intention:** To be able to determine the distance between points and the coordinates of the midpoint **Success criteria:** SC 1: I can find the distance between two points for a linear equation. SC 2: I can determine the midpoint of a line segment between two coordinates. SC 3: I can determine an unknown coordinate of a line segment, using the midpoint and a coordinate.			
	Transform linear graphs	**Learning intention:** To be able to transform linear graphs **Success criteria:** SC 1: I can interpret and analyse dilation and reflection as related to the equation of a straight line. SC 2: I can interpret and analyse translation as related to the equation of a straight line. SC 3: I can interpret and analyse combined transformations on a straight line.			
	Interpolate and extrapolate expressions	**Learning intention:** To be able to interpolate and extrapolate **Success criteria:** SC 1: I can interpolate and extrapolate to predict values.			

TERM 2

TERM 2: Weeks 1–3

TOPIC 5: QUADRATIC RELATIONSHIPS AND GRAPHS

Content descriptions:

AC9M9M04 identify and graph quadratic functions, solve quadratic equations graphically and numerically, and solve monic quadratic equations with integer roots algebraically, using graphing software and digital tools as appropriate

AC9M9A05 use mathematical modelling to solve applied problems involving change including financial contexts; formulate problems, choosing to use either linear or quadratic functions; interpret solutions in terms of the situation; evaluate the model and report methods and findings

AC9M9A06 experiment with the effects of the variation of parameters on graphs of related functions, using digital tools, making connections between graphical and algebraic representations, and generalising emerging patterns

Source: Australian Curriculum, Assessment and Reporting Authority (ACARA)

Pearson Diagnostic quizzes

- ☐ Writing expressions using area rules
- ☐ Expanding brackets using an area model
- ☐ Plotting coordinates

Lesson name	Learning intention and success criteria	Differentiating independent practice	Annotations, other resources, teacher sign off
Understand solutions to simple quadratic equations	**Learning intention:** To understand solutions to simple quadratic equations **Success criteria:** SC 1: I can recognise and use square numbers to solve simple quadratic equations. SC 2: I understand that a quadratic equation can have zero, one or two solutions.		
Solve monic quadratic equations using the Null Factor Law	**Learning intention:** To be able to solve monic quadratic equations using the Null Factor Law **Success criteria:** SC 1: I can use the Null Factor Law to solve simple quadratic equations. SC 2: I can factorise quadratic expressions using perfect squares and solve equations using the Null Factor Law. SC 3: I can factorise quadratic expressions using the difference of two squares and solve equations using the Null Factor Law. SC 4: I can factorise monic quadratic expressions and solve equations		

		using the Null Factor Law..			
	Identify and plot the key features of quadratic graphs	**Learning intention:** To be able to identify and plot the key features of quadratic graphs **Success criteria:** SC 1: I can generate a table of value of values from a quadratic equation and plot the points. SC 2: I can identify and plot key features of quadratic graphs.			
	Determine transformation s of parabolas	**Learning intention:** To be able to determine transformations of parabolas **Success criteria:** SC 1: I can analyse and interpret both horizontal and vertical translations. SC 2: I can analyse and interpret dilations and determine reflections in the x-axis. SC 3: I can analyse and interpret combined transformations.			
	Solve quadratic equations graphically	**Learning intention:** To be able to solve quadratic equations graphically **Success criteria:** SC 1: I can determine the number of solutions to a quadratic equation (zero, one or two). SC 2: I can approximate solutions to quadratic equations from a graph.			
	Model and solve practical problems with quadratic equations	**Learning intention:** To be able to model and solve practical problems with quadratic equations **Success criteria:** SC 1: I can use tables and graphs to represent practical applications of simple quadratic functions and interpret the results. SC 2: I can determine the reasonableness of a solution. SC 3: I can use digital tools to represent practical applications of simple quadratic functions and interpret the results.			

TERM 2: Weeks 4–5

TOPIC 6: SURFACE AREA AND VOLUME

Content descriptions:

AC9M9M01 solve problems involving the volume and surface area of right prisms and cylinders using appropriate units

Source: Australian Curriculum, Assessment and Reporting Authority (ACARA)

Pearson Diagnostic quizzes

- ☐ Volume using litres
- ☐ Volume using cubic measures
- ☐ Labelling base and height of a triangle
- ☐ Visualising solids and nets of solids
- ☐ Visualising 3D from 2D

Lesson name	Learning intention and success criteria	Differentiating independent practice	Annotations, other resources, teacher sign off
Determine the volume of right prisms	**Learning intention:** To be able to determine the volume of right prisms **Success criteria:** SC 1: I can determine the volume of right prisms.		
Solve problems involving the volumes and capacities of right prisms and right pyramids	**Learning intention:** To be able to solve problems involving the volumes and capacities of right prisms and right pyramids **Success criteria:** SC 1: I can explain the relationships between the volumes of right prisms and pyramids. SC 2: I can solve a variety of problems involving the volume and capacity of prisms and pyramids.		
Solve problems involving the surface areas and nets of right prisms	**Learning intention:** To be able to solve problems involving the surface areas and nets of right prisms **Success criteria:** SC 1: I can relate the net and the surface area of a right prism. SC 2: I can understand and apply formulas to calculate the surface area of right prisms. SC 3: I can solve a variety of problems involving the nets and surface areas of right prisms.		

TERM 2: Weeks 6–8

TOPIC 7: CIRCLES AND CYLINDERS

Content descriptions:

AC9M9M01 solve problems involving the volume and surface area of right prisms and cylinders using appropriate units

AC9M7M03 solve spatial problems, applying angle properties, scale, similarity, Pythagoras' theorem and trigonometry in right-angled triangles

Source: Australian Curriculum, Assessment and Reporting Authority (ACARA)

Pearson Diagnostic quizzes

- ☐ Volume using litres
- ☐ Volume using cubic measures
- ☐ Visualising solids and nets of solids
- ☐ Visualising 3D from 2D

Lesson name	Learning intention and success criteria	Differentiating independent practice	Annotations, other resources, teacher sign off
Calculate circumference and area in terms of pi	**Learning intention:** To be able to calculate circumference and area in terms of pi **Success criteria:** SC 1: I can calculate circumference as a value in terms of pi. SC 2: I can calculate the area of a circle as a value in terms of pi.		
Determine the radius of a circle from the area or circumference	**Learning intention:** To be able to determine the radius of a circle from the area or circumference **Success criteria:** SC 1: I can determine the radius of a circle given the circumference SC 2: I can determine the radius of a circle given the area		
Determine the surface area of cylinders	**Learning intention:** To be able to determine the surface area of cylinders **Success criteria:** SC 1: I can relate the net and the surface area of a cylinder SC 2: I can determine the surface area of a cylinder		
Solve problems	**Learning intention:** To be able to solve problems involving the surface		

	involving the surface area of cylinders	area of cylinders **Success criteria:** SC 1: I can solve a variety of problems involving the nets and surface areas of cylinders			
	Determine the volume and capacity of cylinders	**Learning intention:** To be able to determine the volume and capacity of cylinders **Success criteria:** SC 1: I can apply the cylinder volume formula SC 2: I can solve a variety of problems involving the volumes and capacities of cylinders			
	Understand the relationship between the volume and dimensions of cylinders	**Learning intention:** To understand the relationship between the volume and dimensions of cylinders **Success criteria:** SC 1: I can use values in terms of pi to demonstrate the effect of change in linear dimensions on volume.			

TERM 2: Weeks 9–10

TOPIC 8: MEASUREMENT AND SCIENTIFIC NOTATION

Content descriptions:

AC9M9M02 solve problems involving very small and very large measurements, time scales and intervals expressed in scientific notation

Source: Australian Curriculum, Assessment and Reporting Authority (ACARA)

Pearson Diagnostic quizzes

☐ Reading scales

☐ Mass

Lesson name	Learning intention and success criteria	Differentiating independent practice	Annotations, other resources, teacher sign off
Identify and describe very small and very large measurements	**Learning intention:** To be able to identify and describe very small and very large measurements **Success criteria:** SC 1: I can identify and describe common prefixes used in measurement. SC 2: I can recall the meaning of prefixes for very small or very large measurement units.		
Express numbers in scientific notation and decimal form	**Learning intention:** To be able to express numbers in scientific notation and decimal form **Success criteria:** SC 1: I can represent very small and very large numbers using scientific notation. SC 2: I can convert numbers written using scientific notation into decimal form.		
Order and perform calculations using numbers in scientific notation	**Learning intention:** To be able to order and perform calculations using numbers in scientific notation **Success criteria:** SC 1: I can order numbers written in scientific notation using practical contexts. SC 2: I can perform calculations involving numbers written using scientific notation.		
Estimate and round	**Learning intention:** To be able to		

	numbers to a specified degree of accuracy	estimate and round numbers to a specified degree of accuracy **Success criteria:** SC 1: I can use the language of estimation and round numbers to a specified number of significant figures. SC 2: I can compare the effect that truncating or rounding of values during calculations can have on the accuracy of the results.			

TERM 3

TERM 3: Weeks 1–2

TOPIC 9: PERCENTAGE ERROR IN MEASUREMENT

Content descriptions:

AC9M9M04 calculate and interpret absolute, relative and percentage errors in measurements, recognising that all measurements are estimates

Source: Australian Curriculum, Assessment and Reporting Authority (ACARA)

Pearson Diagnostic quizzes

- ☐ Percentage estimation
- ☐ Percentage strategies
- ☐ Percentage problem types
- ☐ Percentage change

Lesson name	Learning intention and success criteria	Differentiating independent practice	Annotations, other resources, teacher sign off
Determine the precision and absolute error of measurements	**Learning intention:** To be able to determine the precision and absolute error of measurements **Success criteria:** SC 1: I can use the precision of measuring tools to calculate the absolute error for measurements.		
Estimate the degree of accuracy	**Learning intention:** To be able to estimate the degree of accuracy **Success criteria:** SC 1: I can use absolute error to estimate degrees of accuracy by identifying the upper and lower bounds.		
Determine the percentage error in measurements and calculations	**Learning intention:** To be able to determine the percentage error in measurements and calculations **Success criteria:** SC 1: I can calculate the relative and percentage error in measurements. SC 2: I can calculate the relative and percentage error between measured and actual values in context.		

TERM 3: Weeks 3–4

TOPIC 10: PYTHAGORAS AND GEOMETRY

Content descriptions:

AC9M9M03 solve spatial problems, applying angle properties, scale, similarity, Pythagoras' theorem and trigonometry in right-angled triangles

Source: Australian Curriculum, Assessment and Reporting Authority (ACARA)

Pearson Diagnostic quizzes

- ☐ Labelling base and height of a triangle
- ☐ Readiness to learn about Pythagoras theorem

Lesson name	Learning intention and success criteria	Differentiating independent practice	Annotations, other resources, teacher sign off
Apply Pythagoras' theorem to solve problems	**Learning intention:** To be able to apply Pythagoras' theorem to solve problems **Success criteria:** SC 1: I can apply Pythagoras' theorem to surveying problems. SC 2: I can apply Pythagoras' theorem to problems in a design context.		
Calculate the distance between two points on a Cartesian plane	**Learning intention:** To be able to calculate the distance between two points on a Cartesian plane **Success criteria:** SC 1: I can calculate the vertical and horizontal distances between two points plotted on Cartesian axes. SC 2: I can calculate the distance between any pair of points given in coordinate form. SC 3: I can apply distance calculations on a Cartesian plane to embedded similar triangles.		
Understand when right-angled triangles are similar	**Learning intention:** To understand when right-angled triangles are similar **Success criteria:** SC 1: I can identify pairs of similar right-angled triangles. SC 2: I can calculate an unknown side given enough information using similar triangle properties. SC 3: I can use the scale factor between two similar right-angled triangles to calculate the area of one triangle from the area of the other.		

	Use the triangle inequality theorem	**Learning intention:** To be able to use the triangle inequality theorem **Success criteria:** SC 1: I can apply the triangle inequality theorem to practical situations involving right-angled triangles. SC 2: I can extend the theorem to acute- and obtuse-angled triangles.			

TERM 3: Week 5

TOPIC 11: MODELLING SITUATIONS WITH MEASUREMENT AND RATES

Content descriptions:

AC9M9M05 use mathematical modelling to solve practical problems involving direct proportion, rates, ratio and scale, including financial contexts; formulate the problems and interpret solutions in terms of the situation; evaluate the model and report methods and findings

Source: Australian Curriculum, Assessment and Reporting Authority (ACARA)

Pearson Diagnostic quizzes

☐ Comparing ratios

☐ Calculating with proportions

Lesson name	Learning intention and success criteria	Differentiating independent practice	Annotations, other resources, teacher sign off
Model direct proportion	**Learning intention:** To be able to model direct proportion **Success criteria:** SC 1: I can model direct proportion with formulas. SC 2: I can model direct proportion with graphs.		
Use formulas that model rates	**Learning intention:** To be able to use formulas that model rates **Success criteria:** SC 1: I can use formulas involving direct proportion and rates in science contexts.		

TERM 3: Weeks 6–7

TOPIC 12: TRIGONOMETRY

Content descriptions:

AC9M9M03 solve spatial problems, applying angle properties, scale, similarity, Pythagoras' theorem and trigonometry in right-angled triangles

AC9M9SP01 recognise the constancy of the sine, cosine and tangent ratios for a given angle in right-angled triangles using properties of similarity

Source: Australian Curriculum, Assessment and Reporting Authority (ACARA)

Pearson Diagnostic quizzes

☐ Labelling sides for trigonometry

☐ Understanding angle

Lesson name	Learning intention and success criteria	Differentiating independent practice	Annotations, other resources, teacher sign off
Understand right-angled triangle trigonometry	**Learning intention:** To understand right-angled triangle trigonometry **Success criteria:** SC 1: I can correctly identify the hypotenuse, adjacent and opposite sides in a right-angled triangle. SC 2: I can calculate sine and cosine ratios. SC 3: I can calculate tangent ratios.		
Use trigonometry to solve an unknown side length in a right-angled triangle	**Learning intention:** To be able to use trigonometry to solve an unknown side length in a right-angled triangle **Success criteria:** SC 1: I can identify the ratio needed to solve an unknown side length in a right-angled triangle. SC 2: I can solve the unknown side in a right-angled triangle given one side and an angle. SC 3: I can solve problems using trigonometry involving unknown side lengths in a right-angled triangle.		
Use trigonometry to solve an unknown angle in a right-angled triangle	**Learning intention:** To be able to use trigonometry to solve an unknown angle in a right-angled triangle **Success criteria:** SC 1: I can identify the ratio needed to solve an unknown angle in a right-		

		angled triangle. SC 2: I can solve an unknown angle in a right-angled triangle given two of the sides. SC 3: I can solve problems using trigonometry involving unknown angles in a right-angled triangle.			
	Define a right-angled triangle	**Learning intention:** To be able to define a right-angled triangle **Success criteria:** SC 1: I can recognise the minimal information required to define a right-angled triangle and write a strategy to determine any missing values. SC 2: I can solve the missing side lengths and angle sizes in right-angled triangles.			

TERM 4

TERM 4: Week 1–2

TOPIC 13: RATIOS AND PROPORTION IN SPACE

Content descriptions:

AC9M9SP02 apply the enlargement transformation to shapes and objects using dynamic geometry software as appropriate; identify and explain aspects that remain the same and those that change

AC9M9M03 solve spatial problems, applying angle properties, scale, similarity, Pythagoras' theorem and trigonometry in right-angled triangles

AC9M9M05 use mathematical modelling to solve practical problems involving direct proportion, rates, ratio and scale, including financial contexts; formulate the problems and interpret solutions in terms of the situation; evaluate the model and report methods and findings

Source: Australian Curriculum, Assessment and Reporting Authority (ACARA)

Pearson Diagnostic quizzes

- ☐ Comparing ratios
- ☐ Congruence and similarity
- ☐ Calculating with proportions
- ☐ Visualising 3D from 2D
- ☐ Understanding angle

Lesson name	Learning intention and success criteria	Differentiating independent practice		Annotations, other resources, teacher sign off
Understand the effect of the enlargement transformation	**Learning intention:** To understand the effect of the enlargement transformation **Success criteria:** SC 1: I can apply the enlargement transformation to shapes and objects. SC 2: I can identify aspects of similar shapes that are the same and those that change SC 3: I can identify aspects of similar objects that are the same and those that change.	(blue)		
		(green)		
		(orange)		
Calculate the area of a shape or the volume of an object using a scale factor	**Learning intention:** To be able to calculate the area of a shape or the volume of an object using a scale factor **Success criteria:** SC 1: I can calculate the area of a triangle from a similar triangle. SC 2: I can use scale factor to calculate the area of any shape from a similar shape. SC 3: I can solve problems involving length, area and volume of similar	(blue)		
		(green)		
		(orange)		

		shapes and objects.			
	Use images and proportion to estimate lengths	**Learning intention:** To be able to use images and proportion to estimate lengths **Success criteria:** SC 1: I can estimate heights from images of objects that are side-by-side. SC 2: I can estimate heights from images of objects that are in the foreground and the background.			
	Ascertain compliance involving horizontal and vertical distances	**Learning intention:** To be able to ascertain compliance involving horizontal and vertical distances **Success criteria:** SC 1: I can calculate ratios of horizontal and vertical distances to check compliance.			

TERM 4: Weeks 3–4

TOPIC 14: ANALYSING AND INTERPRETING STATISTICS

Content descriptions:

AC9M9ST01 analyse reports of surveys in digital media and elsewhere for information on how data was obtained to estimate population means and medians

AC9M9ST02 analyse how different sampling methods can affect the results of surveys and how choice of representation can be used to support a particular point of view

Source: Australian Curriculum, Assessment and Reporting Authority (ACARA)

Pearson Diagnostic quizzes

- ☐ Interpreting pictographs
- ☐ Interpreting bar graphs
- ☐ Interpreting line graphs
- ☐ Choosing appropriate graphs
- ☐ Arithmetic average (mean)
- ☐ Understanding mean, median and mode

Lesson name	Learning intention and success criteria	Differentiating independent practice	Annotations, other resources, teacher sign off
Analyse statistical reports in digital media	**Learning intention:** To be able to analyse statistical reports in digital media **Success criteria:** SC 1: I can identify the processes by which statistics have been estimated. SC 2: I can analyse reports published in the media.		
Question the view presented in media reports	**Learning intention:** To be able to question the view presented in media reports **Success criteria:** SC 1: I can identify how particular visual displays can affect the perception of results. SC 2: I can identify potential bias in media statistical reports.		

TERM 4: Weeks 4–5

TOPIC 15: DISPLAYING AND COMPARING STATISTICAL DATA

Content descriptions:

AC9M9ST03 represent the distribution of multiple data sets for numerical variables using comparative representations; compare data distributions with consideration of centre, spread and shape, and the effect of outliers on these measures

AC9M9ST04 choose appropriate forms of display or visualisation for a given type of data; justify selections and interpret displays for a given context

Source: Australian Curriculum, Assessment and Reporting Authority (ACARA)

Pearson Diagnostic quizzes

- ☐ Interpreting pictographs
- ☐ Interpreting bar graphs
- ☐ Interpreting line graphs
- ☐ Choosing appropriate graphs
- ☐ Arithmetic average (mean)
- ☐ Understanding mean, median and mode

Lesson name	Learning intention and success criteria	Differentiating independent practice	Annotations, other resources, teacher sign off
Represent data using statistical displays	**Learning intention:** To be able to represent data using statistical displays **Success criteria:** SC 1: I can describe the underlying shape of a distribution. SC 2: I can draw and interpret comparative stem-and-leaf plots. SC 3: I can draw and interpret comparative bar charts and histograms.		
Justify the selection of particular data displays	**Learning intention:** To be able to justify the selection of particular data displays **Success criteria:** SC 1: I can use mean, median and range to interpret and compare data sets. SC 2: I can distinguish between the type of display relevant for categorical data and numerical data. SC 3: I can interpret data displays such as infographics.		

TERM 4: Weeks 6–7

TOPIC 17: PROBABILITY (COMPOUND EVENTS, RELATIVE FREQUENCIES)

Content descriptions:

AC9M9P01 list all outcomes for compound events both with and without replacement, using lists, tree diagrams, tables or arrays; assign probabilities to outcomes

AC9M9P02 calculate relative frequencies from given or collected data to estimate probabilities of events involving “and”, inclusive “or” and exclusive “or”

Source: Australian Curriculum, Assessment and Reporting Authority (ACARA)

Pearson Diagnostic quizzes

☐ Probability (simple outcome spaces)

☐ Long run probability

Lesson name	Learning intention and success criteria	Differentiating independent practice	Annotations, other resources, teacher sign off
Use tables and tree diagrams to represent two- and three-step chance events	**Learning intention:** To be able to use tables and tree diagrams to represent two- and three-step chance events **Success criteria:** SC 1: I can create tables to represent the outcomes of a two-step chance event with replacement. SC 2: I can use a tree diagram to represent the outcomes of a two- and three-step chance event with replacement. SC 3: I can use a tree diagram to represent the outcomes of a two- and three-step chance event without replacement.		
Calculate the probability of compound events	**Learning intention:** To be able calculate the probability of compound events **Success criteria:** SC 1: I can use Venn diagrams to calculate the probability of “and”, inclusive “or”, and exclusive “or” events. SC 2: I can use two-way tables to calculate the probability of “and”, inclusive “or”, and exclusive “or” events. SC 3: I can calculate the probability of “and”, “or” events.		

	Estimate the probability of events	**Learning intention:** To be able to estimate the probability of events			
		Success criteria: SC 1: I can use the relative frequency of events from large statistical samples or long run experiments to estimate the probability of events.			
		SC 2: I can use Venn diagrams or two-way tables to estimate frequencies of events involving 'and', 'or' questions.			
	Design and conduct experiments and simulations	**Learning intention:** To be able to design and conduct experiments and simulations **Success criteria:**			
		SC 1: I can conduct experiments and simulations for single and compound events.			
		SC 2: I can use the results of a probability experiment to predict future events and evaluate the outcomes.			

References