Apex Exam Guide

Essential Mathematics
Year 12 QCE
Queensland Curriculum

2025 Edition

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Apex Exam Guide
Essential Mathematics
Year 12 QCE

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Contents

Notes	From 2020 to 2022 QCAA only released only one sample external assessments to the public. In 2023 there has been a change where QCAA will release all previous year sample assessments (five in total per year).

Unit 3 – Measurement, scales and data

Unit 3 – Topic 1: Measurement

Part A
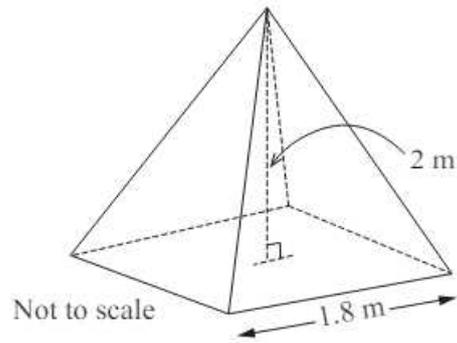
<table>
<tr>
<td>

2023
Phase 1
Part A
Question 1

Measurement

</td>
<td>

A tissue box is shown.

Not to scale · 9 cm · 21 cm · 10.6 cm

a) Round the width of the shaded base to the nearest centimetre. [1 mark]

_____

b) Use the result from Question 1a) to estimate the area of the base in square centimetres. [1 mark]

_____

_____

_____

c) Use the result from Question 1b) to estimate the volume of the tissue box in cubic centimetres. [1 mark]

_____

_____

_____

_____

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2023 **Phase 1** **Part A** **Question 3** **Measurement**	A square-based pyramid is completely filled with coloured gel to use as a decoration. 2 m Not to scale —1.8 m— a) Calculate the volume of the pyramid in cubic metres. [2 marks] _____ _____ _____ _____ b) Use the result from Question 3a) to calculate the capacity of the pyramid in litres. [2 marks] _____ _____ _____ _____ It is known that 1 L of coloured gel has an estimated mass of 1.3 kg. c) Use the result from Question 3b) to estimate the mass, in kilograms, of coloured gel needed to fill the pyramid. [1 mark] _____ _____ _____

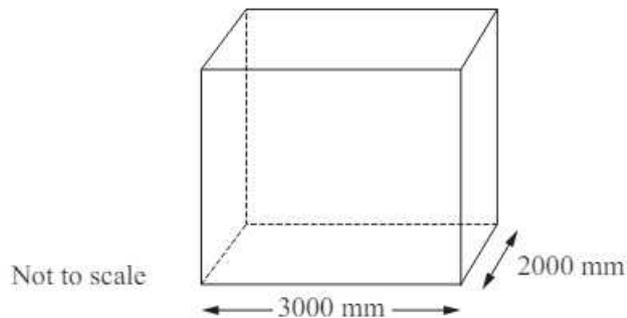|	
2023 Phase 1 Part A Question 5 **Measurement**	A rectangular outdoor eating space is shown. Scale 1:80 a) Calculate the actual length and width of the eating space in centimetres. [3 marks] Length: Width: b) Use the results from Question 5a) to calculate the perimeter of the eating space in metres. [2 marks]
2023 Phase 1 Part A Question 7 **Measurement**	A carpenter is building a cabinet with the base dimensions shown. Not to scale 2000 mm ← 3000 mm → a) Identify the name of the three-dimensional solid. [1 mark] b) How many vertices does the cabinet have? [1 mark]

c) Calculate the base area of the cabinet in square millimetres. [2 marks]

_____

_____

_____

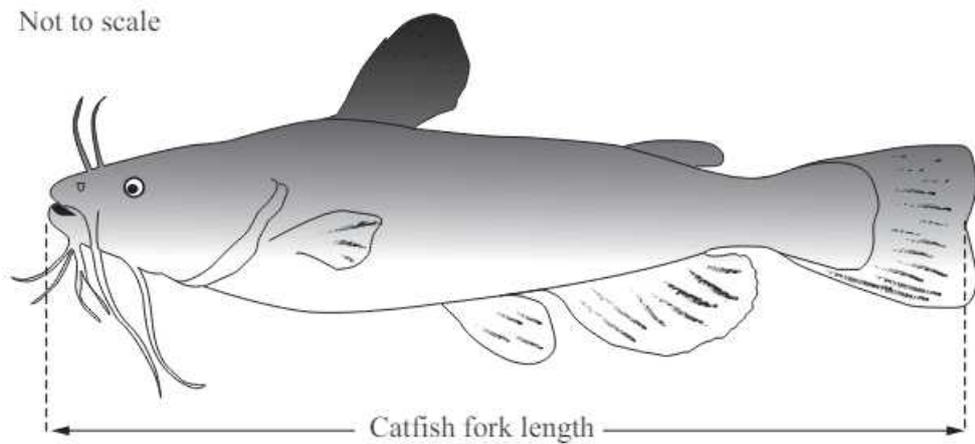d) Convert the result from Question 7c) to square metres. [2 marks]

_____

_____

_____

2023 Phase 1 Part A Question 8	The fork length of a fish is measured from the tip of its snout to the fork of its tail. An average goldfish's fork length is 18 cm. An average catfish's fork length is 13 times that of a goldfish.

Measurement

Not to scale

Catfish fork length

a) Estimate the average catfish fork length in centimetres. [2 marks]

_____

_____

b) Convert the result from Question 8a) to metres. [1 mark]

_____

_____

2023 Phase 1 Part A Question 9 **Measurement**	A student purchased a cylindrical water bottle as shown.

2.5 cm

22 cm

Not to scale

a) Calculate the volume of the water bottle. [2 marks]

_____

_____

_____

b) Use the result from Question 9a) to determine the capacity of the water bottle in millilitres. [1 mark]
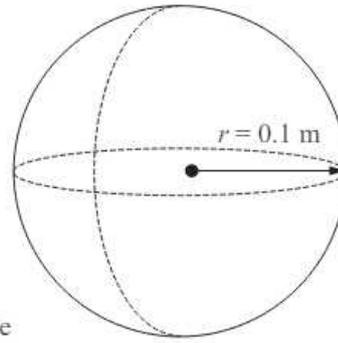
_____

_____

c) Use the result from Question 9b) to calculate the number of times the bottle is filled if the student needs to drink 2500 mL of water. [2 marks]

_____

_____

_____

_____

2023 **Phase 2** **Part A** **Question 2** **Measurement**	A gym owner buys a ball completely filled with gel. $r = 0.1$ m Not to scale a) Calculate the volume of the ball in cubic metres. [2 marks] _____ _____ _____ _____ b) Use the result from Question 2a) to calculate the capacity of the ball in litres. [2 marks] _____ _____ _____ _____ It is known that 1 L of gel has an estimated mass of 1.1 kg. c) Use the result from Question 2b) to estimate the mass, in kilograms, of gel needed to fill the ball. [1 mark] _____ _____

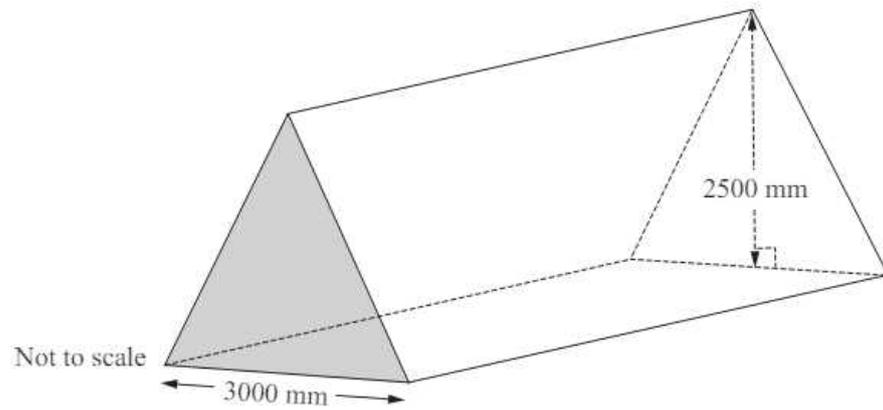|	
2023 Phase 2 Part A Question 3 **Measurement**	A fence has been built around a piece of land, as shown Scale 1 cm : 1500 m a) Calculate the actual length and width of the fence in metres. [3 marks] Length: Width: b) Use the results from Question 3a) to calculate the perimeter of the fence in kilometres. [2 marks]

The roof of a shed is shown.

Not to scale
2500 mm
3000 mm

a) Identify the name of the three-dimensional shape. [1 mark]

_____

_____

b) How many vertices does the roof have? [1 mark]

_____

_____

c) Calculate the area of the shaded face in square millimetres. [2 marks]

_____

_____

_____

d) Convert the result from Question 5c) to square metres. [2 marks]

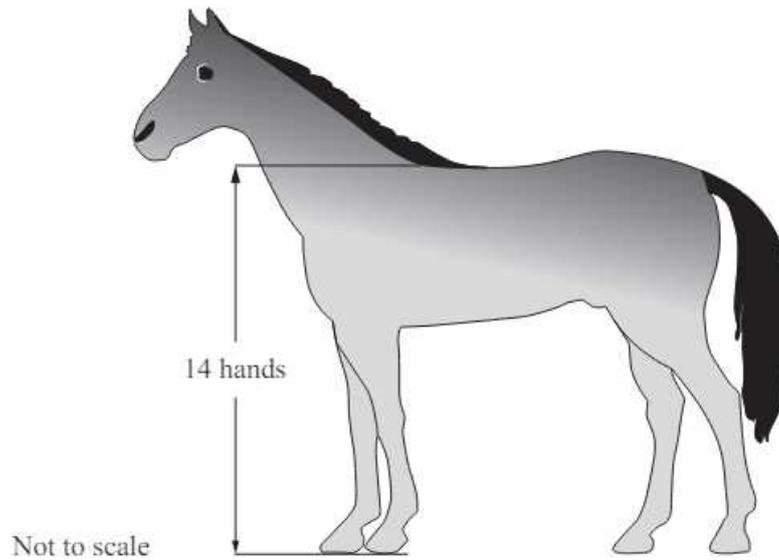_____

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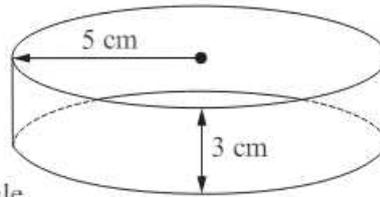|	
2023 **Phase 2** **Part A** **Question 6** **Measurement**	Horse heights are measured from hoof to wither (where the neck meets the back) in units called 'hands'. A hand is approximately 10.2 cm. 14 hands Not to scale a) Estimate the height of the horse shown in centimetres. [2 marks] b) Convert the result from Question 6a) to metres. [1 mark]

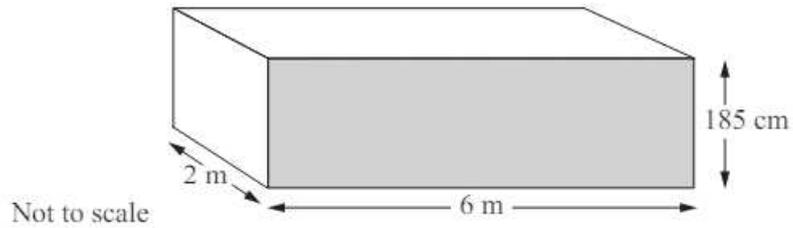|	
2023 **Phase 2** **Part A** **Question 7** **Measurement**	The space within a pie shell is cylindrical, as shown. a) Calculate the volume of the space within the pie shell. [2 marks] _____ _____ _____ The pie shell will be filled with custard. b) Use the result from Question 7a) to determine the amount of custard, in millilitres, required to fill the pie shell. [1 mark] _____ _____ Custard is sold in 900 mL cartons. c) Use the result from Question 7b) to calculate the number of pie shells that could be filled with one carton of custard. [2 marks] _____ _____ _____ _____

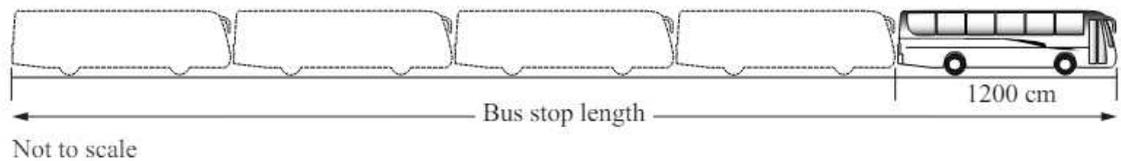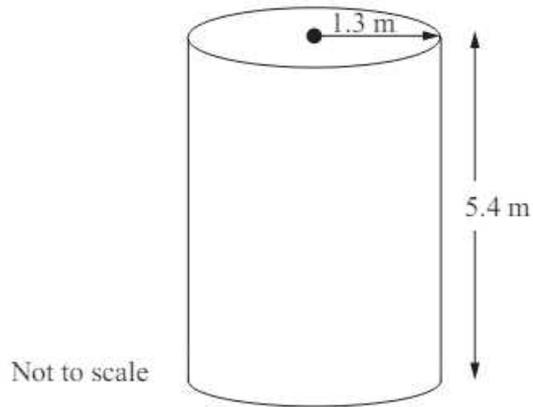|	
2023 **Phase 2** **Part A** **Question 8** **Measurement**	The local council is planning to install a long rectangular hedge in one of its parks, as shown. a) Round the height of the hedge to the nearest whole metre. [1 mark] _____ b) Use the result from Question 8a) to estimate the area of the shaded face in square metres. [1 mark] _____ _____ _____ c) Use the result from Question 8b) to estimate the volume of the hedge in cubic metres. [1 mark] _____ _____ _____ _____
2023 **Phase 3** **Part A** **Question 1** **Measurement**	A school is constructing a bus stop to accommodate five buses, as shown from the side view. a) Estimate the minimum length of the bus stop in centimetres. [2 marks] _____ _____ b) Convert the result from Question 1a) to metres. [1 mark] _____ _____ _____

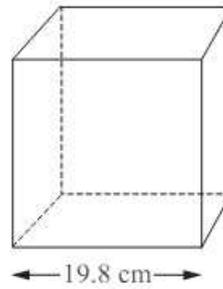|	
2023 **Phase 3** **Part A** **Question 2** **Measurement**	A cylindrical rainwater tank is installed at a property, as shown. 1.3 m 5.4 m Not to scale a) Calculate the volume of the rainwater tank. [2 marks] b) Use the result from Question 2a) to determine the capacity of the rainwater tank in kilolitres. [1 mark] c) Use the result from Question 2b) to calculate the number of tanks needed to collect 250 kL of rainwater. [2 marks]

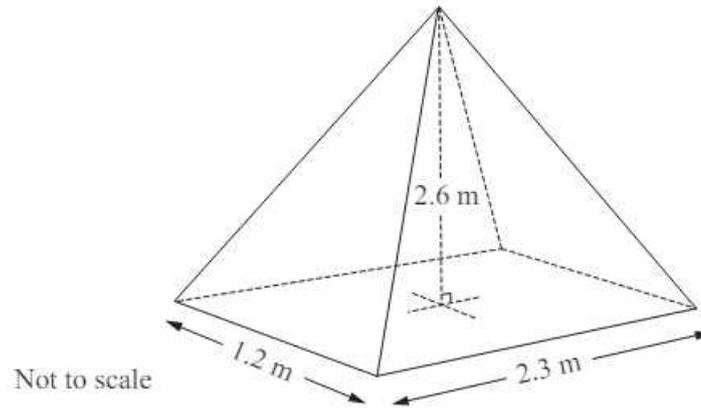|	
2023 **Phase 3** **Part A** **Question 3** **Measurement**	A storage box is in the shape of a cube. Not to scale ←—19.8 cm—→ a) Round the side length of the storage box to the nearest centimetre. [1 mark] _____ b) Use the result from Question 3a) to estimate the area of one face of the storage box in square centimetres. [1 mark] _____ _____ _____ c) Use the result from Question 3b) to estimate the volume of the storage box in cubic centimetres. [1 mark] _____ _____ _____ _____

2023 **Phase 3** **Part A** **Question 5** **Measurement**	A glass pyramid is filled with coloured liquid as a prop for a play. Not to scale a) Calculate the volume of the pyramid in cubic metres. [2 marks] _____ _____ _____ _____ b) Use the result from Question 5a) to calculate the capacity of the pyramid in litres. [2 marks] _____ _____ _____ _____ It is known that 1 L of coloured liquid has an estimated mass of 0.9 kg. c) Use the result from Question 5b) to estimate the mass, in kilograms, of coloured liquid needed to fill the pyramid. [1 mark] _____ _____ _____

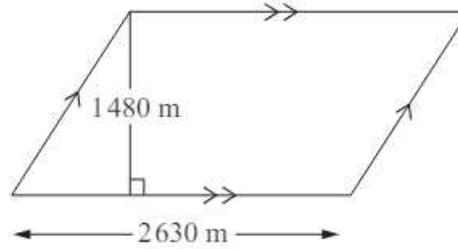|	
2023 Phase 3 Part A Question 7 **Measurement**	A school built the rectangular volleyball court shown. Scale 1:200 a) Calculate the actual length and width of the volleyball court in centimetres. [3 marks] Length: Width: b) Use the results from Question 7a) to calculate the perimeter of the volleyball court in metres. [2 marks]

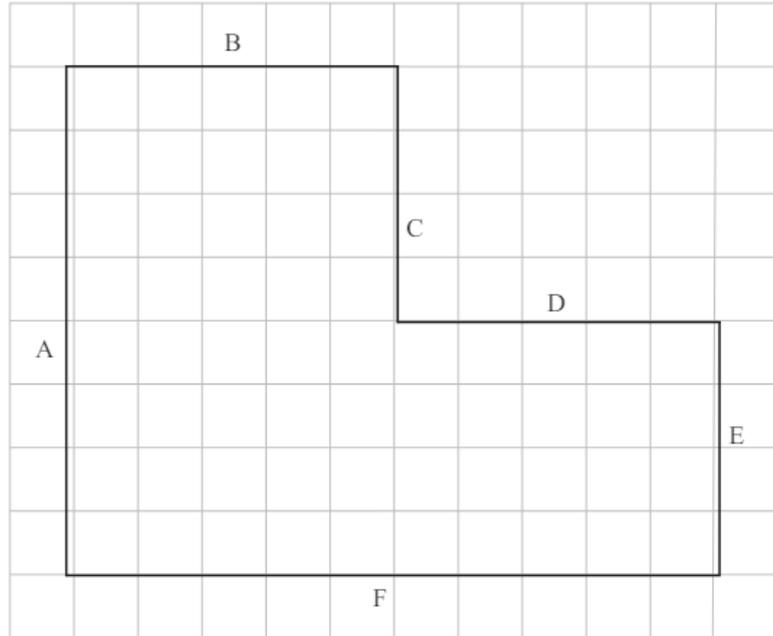|	
2023 **Phase 3** **Part A** **Question 9** **Measurement**	A farmer is planting crops in the paddock shown. Not to scale 1480 m 2630 m a) Identify the name of the two-dimensional shape. [1 mark] ___ ___ b) How many vertices does the paddock have? [1 mark] ___ ___ c) Calculate the area of the paddock in square metres. [2 marks] ___ ___ ___ d) Convert the result from Question 9c) to hectares. [2 marks] ___ ___

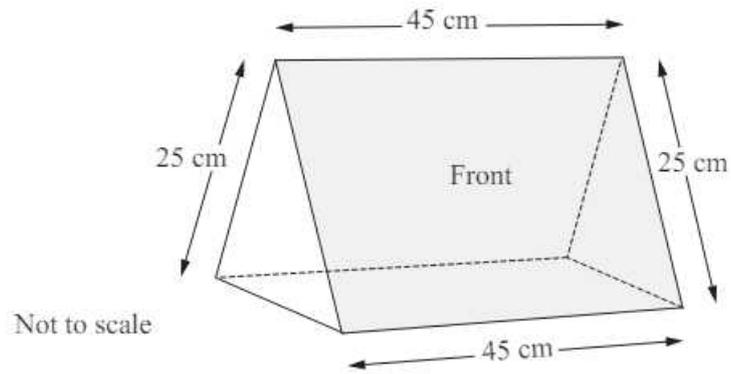|	
2023 Phase 4 Part A Question 1 **Measurement**	The top view of a theatre is drawn on a grid as shown. Scale 1 unit : 100 cm a) Estimate the actual length of side F in centimetres. [2 marks] _____ _____ The area of the theatre is approximately 620 000 cm^2 . b) Convert the area into the most appropriate unit of measure. [1 mark] _____ _____

A baker is creating a cake in the shape shown.

a) Identify the name of the three-dimensional shape. [1 mark]

_____

_____

b) How many vertices does the cake have? [1 mark]

_____

An edible photograph will be placed on the front face of the cake.

c) Identify the shape of the front face. [1 mark]

_____

_____

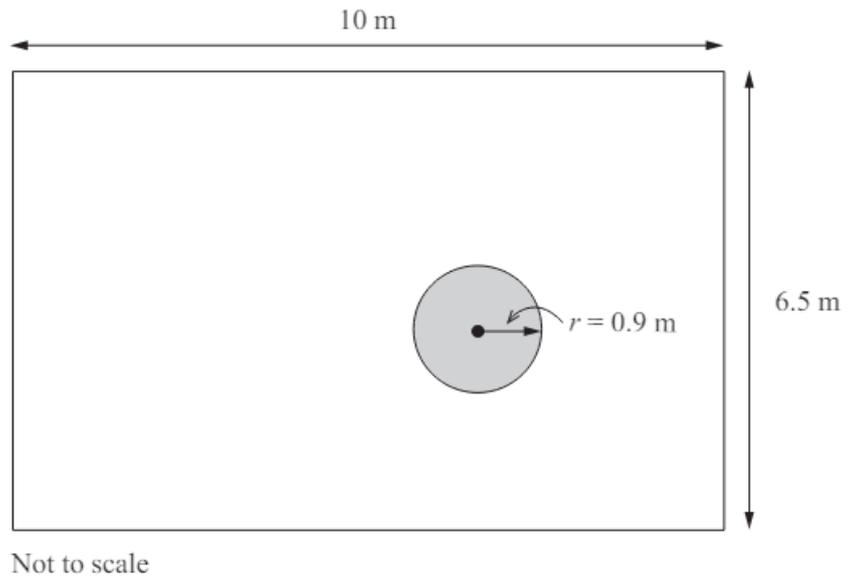d) Calculate the area of the front face in square centimetres. [2 marks]

_____

_____

_____

_____

2023 **Phase 4** **Part A** **Question 3** **Measurement**	A worker blocked off a rectangular section of road with a barrier to inspect the condition of a sinkhole, as shown in the top view. 10 m $r = 0.9$ m 6.5 m Not to scale a) Calculate the perimeter of the blocked off section in metres. [2 marks] b) Use leading-digit approximation to estimate the area of the sinkhole in square metres. [2 marks]
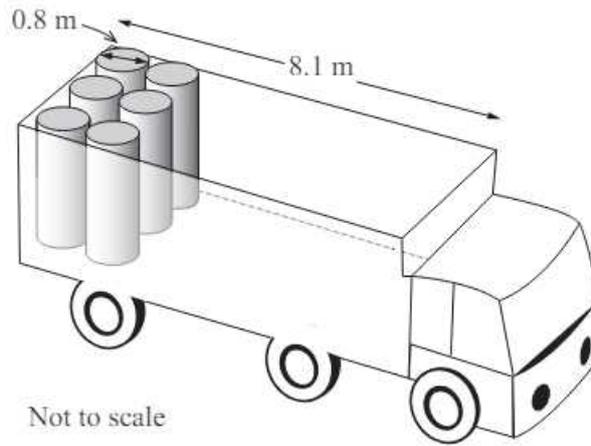
|	
2023 **Phase 4** **Part A** **Question 6** **Measurement**	A truck carries a chemical in cylindrical barrels, as shown. 0.8 m 8.1 m Not to scale a) Estimate the maximum number of barrels that would fit inside the truck. [2 marks] _____ _____ _____ _____ b) If each barrel has a capacity of 600 L, estimate the maximum capacity of the truck in litres. [1 mark] _____ _____ After a delivery, the truck has 40% of the barrels left. c) Use the result from Question 6b) to determine the amount of chemical left on the truck in litres. [1 mark] _____ _____ _____

2023 Phase 4 Part A Question 7 Measurement	A plastic paperweight is in the shape of a square-based pyramid, as shown.

Not to scale

7 cm

h

8 cm

4 cm
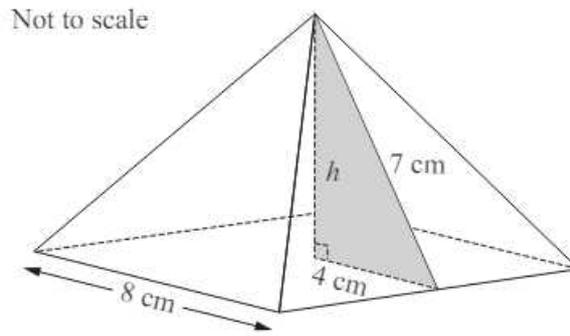
a) Use Pythagoras' theorem to calculate the height, h, of the paperweight in centimetres. [2 marks]

b) Use the result from Question 7a) to calculate the volume of the paperweight in cubic centimetres. [2 marks]

c) To make the plastic paperweight, a liquid is poured into a mould. Use the result from Question 7b) to determine the capacity of the paperweight mould in litres. [1 mark]

d) Use the result from Question 7c) to determine the number of plastic paperweights that can be made from 10 L of liquid. [1 mark]

2023 **Phase 4** **Part A** **Question 8** **Measurement**	A person is moving containers completely filled with glue. The largest container has a torn label and now only shows the volume. **Volume** 0.004125 m^3 a) Convert the volume to cubic centimetres. [1 mark] _____ _____ b) Use the result from Question 8a) and leading-digit approximation to estimate the number of times the largest container can be filled using a smaller container, which has a volume of 1150 cm^3 . [1 mark] _____ _____ c) Use the result from Question 8b) and leading-digit approximation to estimate the mass of the largest container in kilograms, given the smaller container weighs 7.8 kg. [1 mark] _____ _____

Scientists collected data on lizard lengths, in centimetres, as shown.

| 12 | 13 | 14 | 15 | 16 | 17 | 19 | 21 | 22 | 24 | 27 | 27 | 29 | 30 | 32 | 33 | 53 |

a) Determine the modal lizard length. [1 mark]

b) Complete the five-number summary for the lizard lengths by writing an appropriate value in each empty cell of the table. [2 marks]

Minimum	Lower quartile (Q_1)	Median	Upper quartile (Q_3)	Maximum
	15.5		29.5	

c) Construct a box plot to represent the data. [2 marks]

Draw your box plot here.

2023 **Phase 5** **Part A** **Question 1** **Measurement**	A stage has been designed in the shape of an equilateral triangle. There is a rectangular section inside the stage, as shown. 13.5 m 10.2 m Not to scale ←1.5 m→ a) Calculate the perimeter of the entire triangular stage in metres. [2 marks] _____ _____ _____ b) Use leading-digit approximation to estimate the area of the rectangular section in square metres. [2 marks] _____ _____ _____ _____

2023 **Phase 5** **Part A** **Question 4** **Measurement**	A truck transports gas cylinders in cages, as shown.
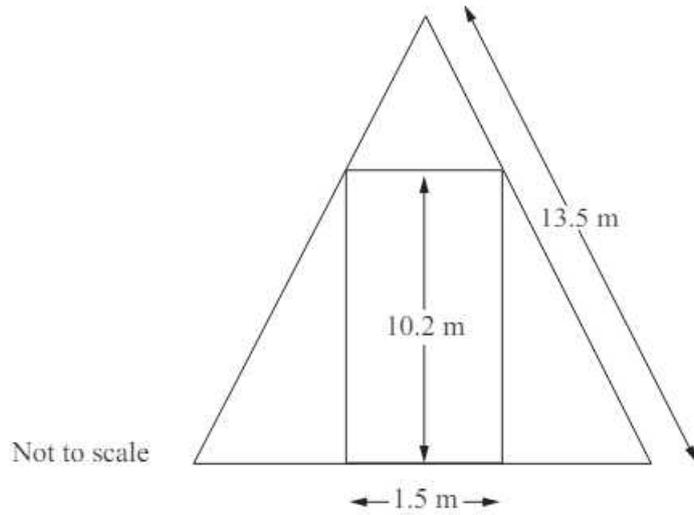
a) Estimate the maximum number of gas cylinders that would fit inside the truck. [2 marks]

_____

_____

_____

_____

b) If each gas cylinder contains 200 L, estimate the maximum capacity the truck can transport in litres. [1 mark]

_____

_____

After a delivery, the truck has 25% of the gas cylinders left.

c) Use the result from Question 4b) to determine the amount of gas left on the truck in litres. [1 mark]

_____

_____

2023 **Phase 5** **Part A** **Question 7** **Measurement**	Liquid soap is stored in a bottle with a volume of 177 000 mm^3. a) Convert the volume of the bottle to cubic centimetres. [1 mark] b) Use the result from Question 7a) and leading-digit approximation to estimate the number of times people can wash their hands using all the soap from the bottle, given that on average people use 3.7 cm3 of soap per hand wash. [1 mark] c) Use the result from Question 7b) and leading-digit approximation to estimate the total mass of the soap, excluding the bottle, if each hand wash uses 3 g of soap. [1 mark]

2023 **Phase 5** **Part A** **Question 8** **Measurement**	The owner of a gym wants to work out the size of a trampoline. The floor of the gym is covered in square mats, with each square mat occupying an area of 10 000 cm^2, as shown. Trampoline a) Convert the area of one square mat into the most appropriate unit of measure. [2 marks] b) Use the result from Question 8a) to estimate the width of the trampoline in metres. [1 mark]

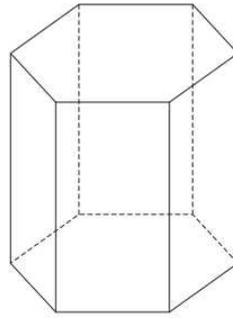|	
2023 **Phase 5** **Part A** **Question 9** **Measurement**	A camper sets up their tent as shown. a) Identify the name of the three-dimensional shape. [1 mark] _____ _____ b) How many edges does the tent have? [1 mark] _____ _____ c) Identify the shape of the side face. [1 mark] _____ _____ d) Calculate the area of the side face in square metres. [2 marks] _____ _____

2022 **Part A** **Question 1** **Measurement**	Jewellery is displayed in an enclosed cabinet in the shape of a hexagonal-based prism, as shown. Not to scale a) How many vertices does the cabinet have? [1 mark] _____ b) How many faces does the cabinet have? [1 mark] _____

2022 **Part A** **Question 3** **Measurement**	A scientist is filling cylindrical containers with creek water to test its quality. The diagram shows the dimensions of each container.

2.4 cm

8.5 cm
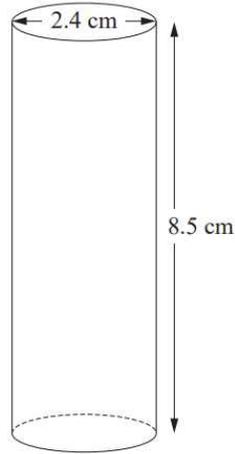
Not to scale

a) Determine the radius of the container in centimetres (cm). [1 mark]

_____

b) Use the result from Question 3a) to calculate the volume of the container, rounded to the nearest cubic centimetre (cm^3). [3 marks]

_____

_____

_____

c) Use the result from Question 3b) to determine the number of millilitres (mL) of creek water in 12 full containers.
[2 marks]

_____

_____

2022 Part A Question 4 Measurement	A fenced enclosure is in the shape of a semicircle with a radius of 6 metres (m), as shown.

A fenced enclosure is in the shape of a semicircle with a radius of 6 metres (m), as shown.

← 6 m →

Not to scale

a) Calculate the arc length of the fenced enclosure in metres (m). [2 marks]

_____

_____

_____

_____

_____

b) Use the result from Question 4a) to calculate the perimeter of the fenced enclosure in metres (m). [2 marks]

_____

_____

_____

_____

Birrani is laying tubing for a garden watering system. He uses his foot length to estimate the length of three pieces of tubing. Birrani's foot length is approximately 30 centimetres (cm).

Piece of tubing	Number of foot lengths
1	8
2	6
3	6

a) Determine the estimated length of piece 1 in centimetres (cm). [1 mark]

b) Determine the estimated length of piece 2 in centimetres (cm). [1 mark]

c) Determine the estimated total length for all three pieces of tubing in centimetres (cm). [1 mark]
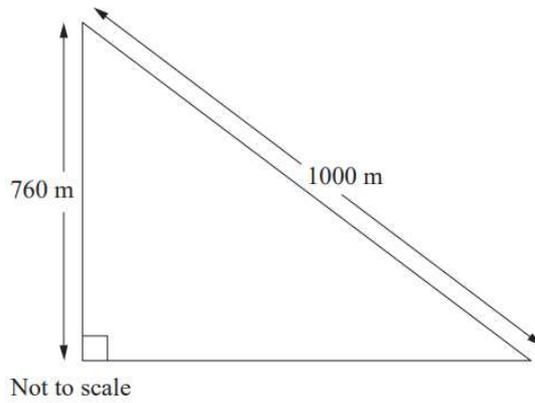
2022 Part A Question 8 **Measurement**	A running track in the shape of a right-angled triangle will be used for a charity event. a) Use Pythagoras' theorem to calculate the third length of the running track in metres (m). [2 marks] The area enclosed by the running track will be the viewing area for spectators. b) Use the result from Question 8a) to calculate the viewing area in hectares (ha). [3 marks] It is predicted that 45 000 spectators will attend the event. No more than 2000 spectators per hectare will be allowed in the viewing area. c) Use the result from Question 8b) to explain whether 45 000 spectators will be allowed in the viewing area. [2 marks]

2021 **Part A** **Question 1** **Measurement**	One apple contains approximately 9 milligrams (mg) of magnesium. The recommended daily allowance (RDA) of magnesium for teenagers is 240 milligrams (mg). Approximately what percentage of the RDA of magnesium for teenagers is contains in one apple? [2 marks]

2021 **Part A** **Question 3** **Measurement**	A tent in the shape of a rectangular-based pyramid is supported by four poles that meet at the top point of the tent, as shown. a) State the mathematical name given to the top point of the tent. [1 mark] The length of each pole is 325 centimetres (cm). b) Determine the total length of the four poles supporting the tent in metres (m). [2 marks] c) Calculate the volume of the tent in cubic metres (m³) [2 marks]

2021 **Part A** **Question 6** **Measurement**	A flag in the shape of a rectangle is designed with a triangular emblem as shown. 1.1 m 1.8 m 1.6 m 2.4 m Not to scale a) Calculate the area of the flag in square metres (m²). [1 mark] b) Calculate the area of the triangle emblem is square metres (m²) [1 mark] The flag designed estimates that the triangular emblem covers one quarter of the flag area. c) Use the results from Question 6a) and 6b) to evaluate the reasonableness of the flag designer's estimate. [3 marks]
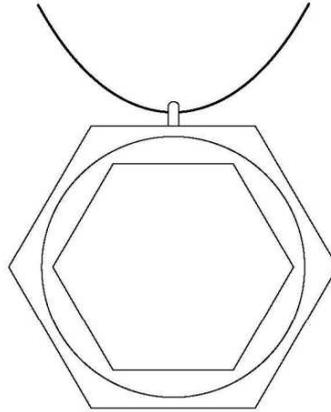
2021 Part A Question 9 **Measurement**	A jeweller designed a pendant consisting of a circle between two regular hexagons as shown. The side length of the inner hexagon is 28 millimetres (mm). The side length of the outer hexagon is 36 millimetres (mm). Not to scale a) Calculate the perimeter of the inner hexagon and the perimeter of the outer hexagon in millimetres (mm). [2 marks] b) Use the result from Question 9a) to estimate the circumference of the circle in millimetres (mm). [1 mark]

2020 Part A Question 1 Measurement	A milk container has the three-dimensional shape shown.

Not drawn to scale

a) How many edges does this milk container have? [1 mark]

_____

b) How many faces does this milk container have? [1 mark]

_____

2020 Part A Question 3 Measurement

Chocolates are made by pouring liquid chocolate into a mould in the shape of the square-based pyramid shown.

The mould has a perpendicular height of 1.5 centimetres (cm) and base length of 2.8 centimetres (cm).

a) Calculate the volume of liquid chocolate required to fill one mould in cubic centimetres (cm^3). [2 marks]

_____

_____

b) Use the result from 3a) to determine the capacity of one mould in millilitres (mL). [1 mark]

_____

One litre (L) of liquid chocolate is available. [1 mark]
c) Determine how many millilitres (mL) of liquid chocolate are available. [1 mark]

_____

d) Determine the maximum number of moulds that can be filled using the 1 litre (L) of liquid chocolate available. [2 marks]

_____

_____

_____

_____

2020 **Part A** **Question 4** **Measurement**	A dog takes 60 steps to walk the length of one side of the enclosure shown. Side Not drawn to scale a) Calculate the number of steps the dog takes to walk the perimeter of the enclosure. [1 mark] _____ _____ The dog has an average step length of 85 centimetres (cm). b) Use the result from 4a) to calculate the perimeter of the enclosure in metres (m). [2 marks] _____ _____ _____ _____

2020 Part A Question 6 **Measurement**	Steel beams are used in many building structures.

Not drawn to scale
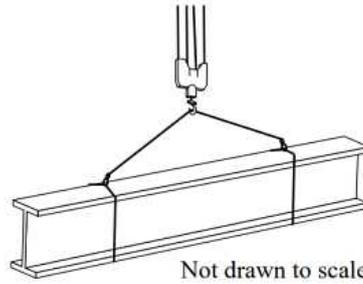
A 1-metre (m) length of steel beam has a mass of 14 kilograms (kg).
a) Calculate the mass of a 9-metre (m) length of steel beam in kilograms (kg). [1 mark]

A truck can carry a maximum mass of 2 tonnes (t).
b) Convert 2 tonnes (t) to kilograms (kg). [1 mark]

c) Use the result from 6a) to determine the maximum number of 9-metre (m) steel beams the truck can carry. [2 marks]
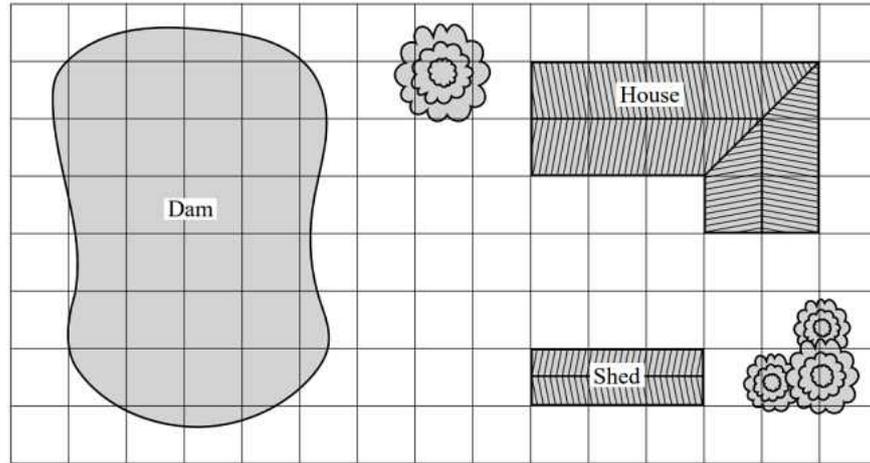
2020 **Part A** **Question 7** **Measurement**	The position of a dam and two buildings on a farm is shown in the diagram. ☐ = 100 m² a) Determine the actual area of the shed in square metres (m²). [1 mark] _____ b) Estimate the actual area of the dam in square metres (m²). [1 mark] _____ _____ c) Determine the actual area of the entire farm in hectares (ha). [2 marks] _____ _____ _____

2023 Phase 1 Part B Question 10 **Measurement**	An hourglass is constructed from two identical enclosed glass cones, as shown. a) Use trigonometry to calculate the slant height, h, of one cone in centimetres. [2 marks] b) Use the result from Question 10a) to calculate the total surface area of the hourglass in square centimetres. [3 marks]

A paper pyramid is made up of four equilateral triangles, as shown.

30°

h

Not to scale

50 cm

a) Use trigonometry to calculate the perpendicular height, h, of one triangular face in centimetres. [2 marks]

_____

_____

_____

_____

b) Use the result from Question 10a) to calculate the total surface area of the pyramid in square centimetres.
[3 marks]

_____

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<table>
<tr><td>

2023
Phase 3
Part B
Question 10

Measurement

</td><td>

A student created a cardboard model of a square-based pyramid as shown.

Not to scale

a) Use trigonometry to calculate the slant height, h, of the triangular face in centimetres. [2 marks]

b) Use the result from Question 10a) to calculate the total surface area of the model in square centimetres. [3 marks]

</td></tr>
</table>

2023 **Phase 4** **Part B** **Question 10** **Measurement**	A model of an observatory is made of two three-dimensional shapes (a cylinder and a hemisphere), as shown. a) Calculate the total outer surface area of metal needed to construct the model of an observatory in square centimetres. [4 marks]

The amount of metal available is 5000 cm^2.

b) Use the result from Question 10a) to evaluate whether there is enough metal to make the model of an observatory. [1 mark]

_____

_____

_____

_____

| 2023 Phase 5 Part B Question 10 Measurement | The school pool shown needs its internal walls and base repainted. |

2.5 m

1.2 m

6 m

25 m

Not to scale

a) Calculate the total surface area of the pool to be repainted in square metres. [4 marks]

_____

_____

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The school has enough paint to cover a maximum surface area of 110 m^2.

b) Use the result from Question 10a) to evaluate whether the school has enough paint to cover the internal walls and base of the pool. [1 mark]

| 2023 Phase 1 Part A Question 1 Measurement | A tissue box is shown. |

a) Round the width of the shaded base to the nearest centimetre. [1 mark]

Sample response	The response
Width = **11** cm	• correctly rounds width **[1 mark]**

b) Use the result from Question 1a) to estimate the area of the base in square centimetres. [1 mark]

Sample response	The response
$A = 21 \times 11$ $= 231$ cm^2	• estimates area of base **[1 mark]**

c) Use the result from Question 1b) to estimate the volume of the tissue box in cubic centimetres. [1 mark]

Sample response	The response
$V = 231 \times 9$ $= 2079$ cm^3	• estimates volume **[1 mark]**

| 2023 Phase 1 Part A Question 3 Measurement | A square-based pyramid is completely filled with coloured gel to use as a decoration. |

Not to scale   2 m   1.8 m
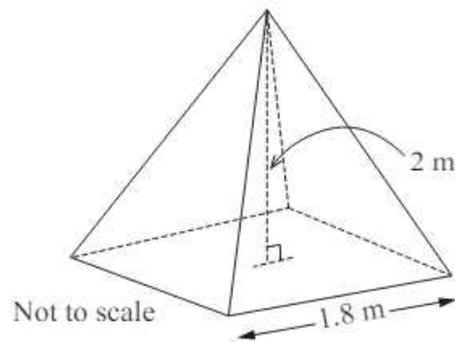
a) Calculate the volume of the pyramid in cubic metres. [2 marks]

Sample response	The response
$V = \frac{1}{3}Ah$ $= \frac{1}{3} \times 1.8^2 \times 2$ $= 2.16 \text{ m}^3$	• correctly selects an appropriate rule **[1 mark]** • calculates volume **[1 mark]**

b) Use the result from Question 3a) to calculate the capacity of the pyramid in litres. [2 marks]

Sample response	The response
$1 \text{ m}^3 = 1 \text{ kL}$ $2.16 \text{ m}^3 = 2.16 \text{ kL}$ $= 2160 \text{ L}$	• uses an appropriate strategy **[1 mark]** • calculates capacity **[1 mark]**

It is known that 1 L of coloured gel has an estimated mass of 1.3 kg.

c) Use the result from Question 3b) to estimate the mass, in kilograms, of coloured gel needed to fill the pyramid. [1 mark]

Sample response	The response
$\text{Mass} = 2160 \times 1.3$ $\text{Mass} = 2808 \text{ kg}$	• determines mass **[1 mark]**

2023 **Phase 1** **Part A** **Question 5** **Measurement**	A rectangular outdoor eating space is shown. Scale 1:80 a) Calculate the actual length and width of the eating space in centimetres. [3 marks]

a) Calculate the actual length and width of the eating space in centimetres. [3 marks]

Sample response	The response
Measured length = 8 cm Measured width = 2 cm Length: 8 × 80 = **640** cm Width: 2 × 80 = **160** cm	• correctly measures length and width **[1 mark]** • calculates length **[1 mark]** • calculates width **[1 mark]**

b) Use the results from Question 5a) to calculate the perimeter of the eating space in metres. [2 marks]

Sample response	The response
Perimeter = $2(L + W)$ = 2 × (6.4 + 1.6) = 16 m	• converts dimensions to metres **[1 mark]** • calculates perimeter **[1 mark]**

| 2023 Phase 1 Part A Question 7 Measurement | A carpenter is building a cabinet with the base dimensions shown. |

Not to scale — 2000 mm — 3000 mm
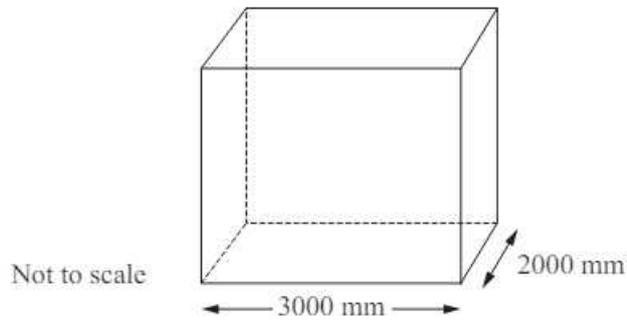
a) Identify the name of the three-dimensional solid. [1 mark]

Sample response	The response
Rectangular-based prism	• correctly identifies solid [1 mark]

b) How many vertices does the cabinet have? [1 mark]

Sample response	The response
8 vertices	• correctly states number of vertices [1 mark]

c) Calculate the base area of the cabinet in square millimetres. [2 marks]

Sample response	The response
$A = L \times W$ $A = 3000 \times 2000$ $= 6\,000\,000 \text{ mm}^2$	• correctly selects an appropriate rule [1 mark] • calculates area [1 mark]

d) Convert the result from Question 7c) to square metres. [2 marks]

Sample response	The response
$A = 6\,000\,000 \div 100^2 \div 10^2$ $= 6 \text{ m}^2$	• uses an appropriate strategy [1 mark] • determines area [1 mark]

2023 Phase 1 Part A Question 8 Measurement	The fork length of a fish is measured from the tip of its snout to the fork of its tail. An average goldfish's fork length is 18 cm. An average catfish's fork length is 13 times that of a goldfish.

Not to scale

Catfish fork length
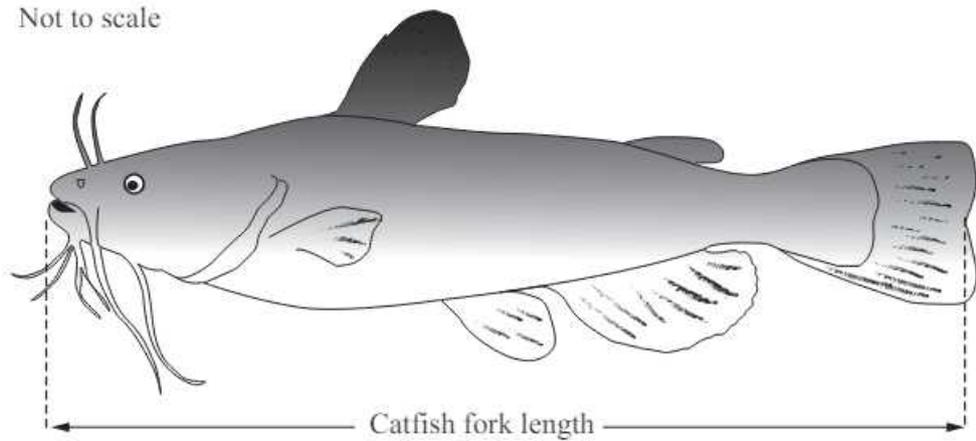
a) Estimate the average catfish fork length in centimetres. [2 marks]

Sample response	The response
Catfish fork length $= 18 \times 13$ $= 234$ cm	• correctly uses an appropriate strategy [1 mark] • estimates fork length [1 mark]

b) Convert the result from Question 8a) to metres. [1 mark]

Sample response	The response
Catfish fork length $= 234 \div 100$ $= 2.34$ m	• converts fork length [1 mark]

A student purchased a cylindrical water bottle as shown.

2.5 cm

22 cm

Not to scale
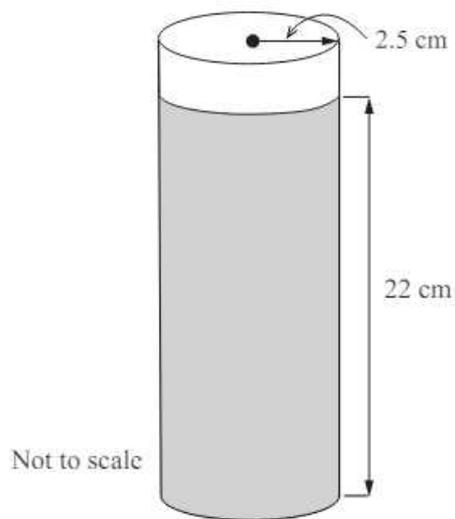
a) Calculate the volume of the water bottle. [2 marks]

Sample response	The response
$V = \pi r^2 h$ $= \pi (2.5)^2 \times 22$ $\approx 431.97 \text{ cm}^3$	• correctly selects an appropriate rule [1 mark] • calculates volume including units [1 mark]

b) Use the result from Question 9a) to determine the capacity of the water bottle in millilitres. [1 mark]

Sample response	The response
Capacity $= 431.97$ mL	• determines capacity [1 mark]

c) Use the result from Question 9b) to calculate the number of times the bottle is filled if the student needs to drink 2500 mL of water. [2 marks]

Sample response	The response
Number of times $= \dfrac{2500}{431.97}$ ≈ 5.79	• uses an appropriate strategy [1 mark] • calculates number of times bottle is filled [1 mark]
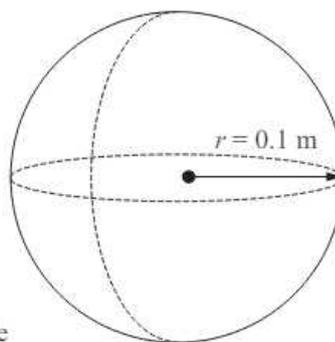
2023 Phase 2 Part A Question 2 Measurement	A gym owner buys a ball completely filled with gel.

$r = 0.1$ m

Not to scale

a) Calculate the volume of the ball in cubic metres. [2 marks]

Sample response	The response
$V = \frac{4}{3} \pi r^3$ $= \frac{4}{3} \times \pi \times 0.1^3$ ≈ 0.00419 m^3	• correctly selects an appropriate rule [1 mark] • calculates volume [1 mark]

b) Use the result from Question 2a) to calculate the capacity of the ball in litres. [2 marks]

Sample response	The response
Capacity = 0.00419×1000 Capacity = 4.19 L	• identifies use of an appropriate strategy [1 mark] • calculates capacity [1 mark]

It is known that 1 L of gel has an estimated mass of 1.1 kg.

c) Use the result from Question 2b) to estimate the mass, in kilograms, of gel needed to fill the ball. [1 mark]

Sample response	The response
Mass = 4.19×1.1 Mass = 4.61 kg	• determines mass [1 mark]

A fence has been built around a piece of land, as shown

Scale 1 cm : 1500 m

a) Calculate the actual length and width of the fence in metres. [3 marks]

Sample response	The response
Measured length = 6 cm Measured width = 5 cm	• correctly measures length and width **[1 mark]**
Length = $6 \times 1500 = 9000$ m Width = $5 \times 1500 = 7500$ m	• calculates length **[1 mark]** • calculates width **[1 mark]**

b) Use the results from Question 3a) to calculate the perimeter of the fence in kilometres. [2 marks]

Sample response	The response
Perimeter = $2(L + W)$ $= 2 \times (9 + 7.5)$ $= 33$ km	• converts dimensions to kilometres **[1 mark]** • calculates perimeter **[1 mark]**

The roof of a shed is shown.
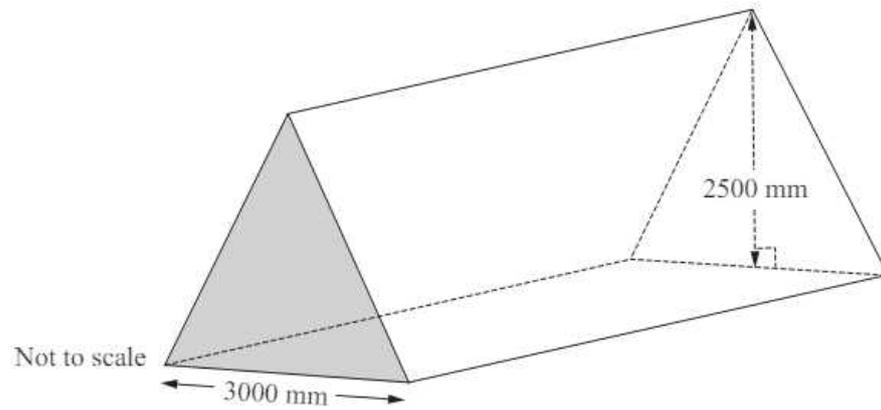
Not to scale
3000 mm
2500 mm

a) Identify the name of the three-dimensional shape. [1 mark]

Sample response	The response
Triangular-based prism	• correctly identifies shape **[1 mark]**

b) How many vertices does the roof have? [1 mark]

Sample response	The response
6 vertices	• correctly states number of vertices **[1 mark]**

c) Calculate the area of the shaded face in square millimetres. [2 marks]

Sample response	The response
$A = \dfrac{1}{2}bh$ $A = \dfrac{1}{2} \times 3000 \times 2500$ $= 3\,750\,000 \text{ mm}^2$	• correctly selects an appropriate rule **[1 mark]** • calculates area **[1 mark]**

d) Convert the result from Question 5c) to square metres. [2 marks]

Sample response	The response
$A = 3\,750\,000 \div 100^2 \div 10^2$ $= 3.75 \text{ m}^2$	• uses an appropriate strategy **[1 mark]** • determines area **[1 mark]**
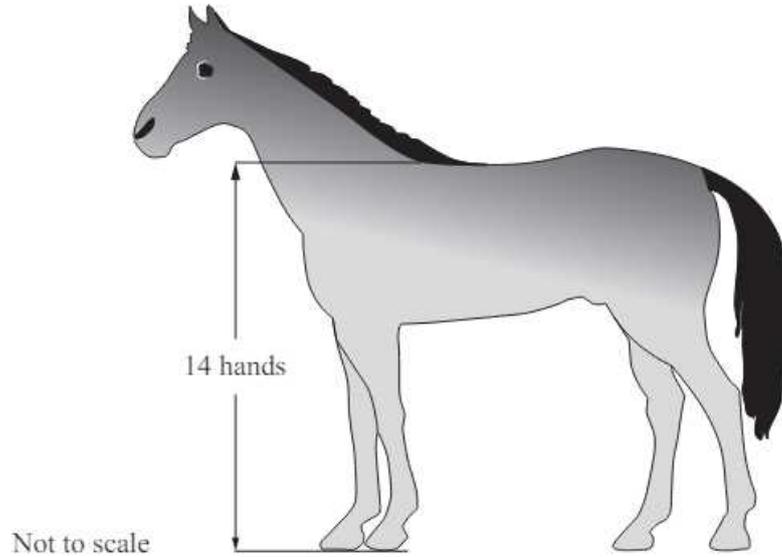
2023 **Phase 2** **Part A** **Question 6** **Measurement**	Horse heights are measured from hoof to wither (where the neck meets the back) in units called 'hands'. A hand is approximately 10.2 cm. 14 hands Not to scale a) Estimate the height of the horse shown in centimetres. [2 marks] | Sample response	The response
Horse height $= 10.2 \times 14$ ≈ 142.8 cm	• correctly uses an appropriate strategy **[1 mark]** • estimates height **[1 mark]** | b) Convert the result from Question 6a) to metres. [1 mark] | Sample response	The response
Horse height $= 142.8 \div 100$ $= 1.428$ m	• converts height **[1 mark]**	

| 2023 Phase 2 Part A Question 7 Measurement | The space within a pie shell is cylindrical, as shown. |

Not to scale
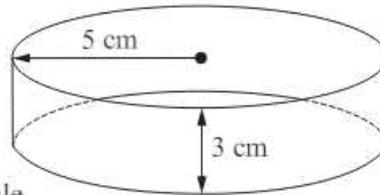
a) Calculate the volume of the space within the pie shell. [2 marks]

Sample response	The response
$V = \pi r^2 h$ $= \pi(5)^2 \times 3$ $\approx 235.62 \text{ cm}^3$	• correctly selects an appropriate rule [1 mark] • calculates volume including units [1 mark]

The pie shell will be filled with custard.

b) Use the result from Question 7a) to determine the amount of custard, in millilitres, required to fill the pie shell. [1 mark]

Sample response	The response
Capacity $= 235.62$ mL	• determines capacity [1 mark]

Custard is sold in 900 mL cartons.

c) Use the result from Question 7b) to calculate the number of pie shells that could be filled with one carton of custard. [2 marks]

Sample response	The response
Number of pie shells $= \dfrac{900}{235.62}$ ≈ 3.82	• uses an appropriate strategy [1 mark] • calculates number of pie shells [1 mark]
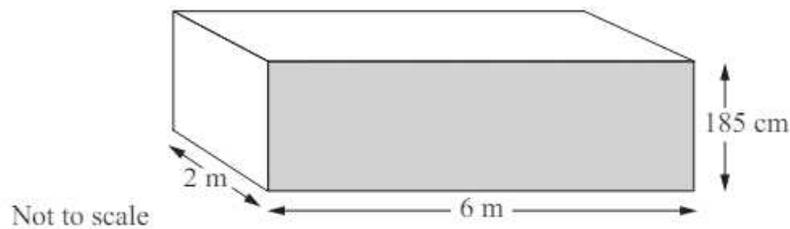
2023 **Phase 2** **Part A** **Question 8** **Measurement**	The local council is planning to install a long rectangular hedge in one of its parks, as shown. 185 cm 2 m Not to scale 6 m a) Round the height of the hedge to the nearest whole metre. [1 mark]

Sample response	The response
Height = **2** m	• uses an appropriate strategy **[1 mark]** • calculates number of pie shells **[1 mark]**

b) Use the result from Question 8a) to estimate the area of the shaded face in square metres. [1 mark]

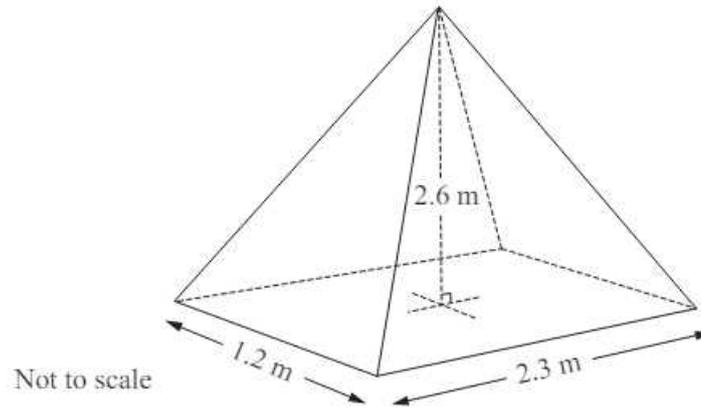| Sample response	The response
$A = 6 \times 2$ $= \mathbf{12}$ m^2	• estimates area of shaded face **[1 mark]**

c) Use the result from Question 8b) to estimate the volume of the hedge in cubic metres. [1 mark]

Sample response	The response
$V = 12 \times 2 = \mathbf{24}$ m^3	• estimates volume **[1 mark]**

2023 **Phase 3** **Part A** **Question 1** **Measurement**	A school is constructing a bus stop to accommodate five buses, as shown from the side view. 1200 cm Bus stop length Not to scale a) Estimate the minimum length of the bus stop in centimetres. [2 marks]
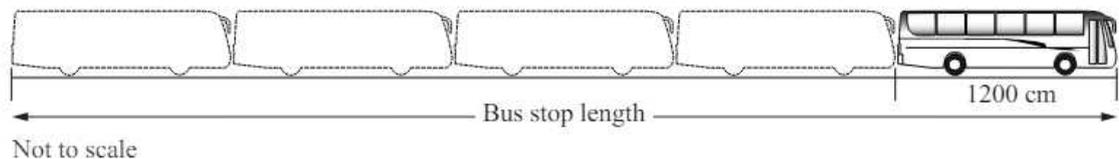
Sample response	The response
Bus length = **1200 × 5** ≈ **6000** cm	• correctly uses an appropriate strategy **[1 mark]** • estimates length **[1 mark]**

b) Convert the result from Question 1a) to metres. [1 mark]

Sample response	The response
Bus length = 6000 ÷ 100 = **60** m	• converts length **[1 mark]**

2023 Phase 3 Part A Question 2 Measurement	A cylindrical rainwater tank is installed at a property, as shown.

Not to scale
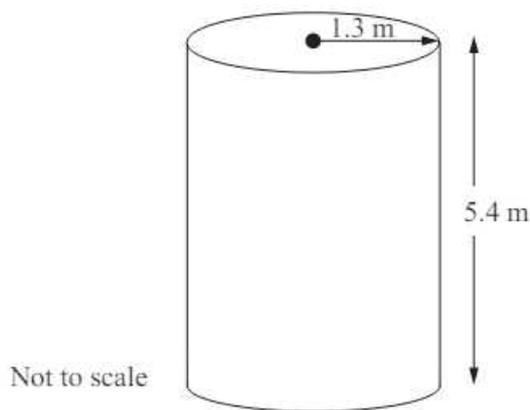
a) Calculate the volume of the rainwater tank. [2 marks]

Sample response	The response
$V = \pi r^2 h$ $= \pi (1.3)^2 \times 5.4$ $\approx 28.67 \text{ m}^3$	• correctly selects an appropriate rule [1 mark] • calculates volume including units [1 mark]

b) Use the result from Question 2a) to determine the capacity of the rainwater tank in kilolitres. [1 mark]

Sample response	The response
$1 \text{ m}^3 = 1 \text{ kL}$ Capacity $= 28.67$ kL	• determines capacity [1 mark]

c) Use the result from Question 2b) to calculate the number of tanks needed to collect 250 kL of rainwater. [2 marks]

Sample response	The response
Number of tanks $= \dfrac{250}{28.67}$ ≈ 8.72	• uses an appropriate strategy [1 mark] • calculates number of rainwater tanks [1 mark]
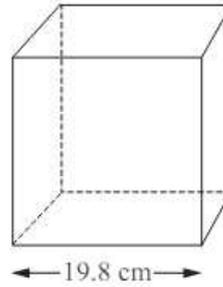
2023 **Phase 3** **Part A** **Question 3** **Measurement**	A storage box is in the shape of a cube. a) Round the side length of the storage box to the nearest centimetre. [1 mark]

a) Round the side length of the storage box to the nearest centimetre. [1 mark]

Sample response	The response
Side length = **20 cm**	• correctly selects an appropriate rule **[1 mark]** • calculates volume including units **[1 mark]**

b) Use the result from Question 3a) to estimate the area of one face of the storage box in square centimetres. [1 mark]

Sample response	The response
$A = 20^2$ $= \textbf{400 } \text{cm}^2$	• estimates area of one face **[1 mark]**

c) Use the result from Question 3b) to estimate the volume of the storage box in cubic centimetres. [1 mark]

Sample response	The response
$V = 400 \times 20$ $= \textbf{8000 } \text{cm}^3$	• estimates volume **[1 mark]**

| 2023
Phase 3
Part A
Question 5

Measurement | A glass pyramid is filled with coloured liquid as a prop for a play.

a) Calculate the volume of the pyramid in cubic metres. [2 marks] |

a) Calculate the volume of the pyramid in cubic metres. [2 marks]

Sample response	The response
$V = \dfrac{1}{3}Ah$ $= \dfrac{1}{3} \times 1.2 \times 2.3 \times 2.6$ $= 2.392 \text{ m}^3$	• correctly selects an appropriate rule [1 mark] • calculates volume [1 mark]

b) Use the result from Question 5a) to calculate the capacity of the pyramid in litres. [2 marks]

Sample response	The response
$1 \text{ m}^3 = 1000 \text{ L}$ Capacity = 2.392 × 1000 Capacity = **2392** L	• identifies use of an appropriate strategy [1 mark] • calculates capacity [1 mark]

It is known that 1 L of coloured liquid has an estimated mass of 0.9 kg.

c) Use the result from Question 5b) to estimate the mass, in kilograms, of coloured liquid needed to fill the pyramid. [1 mark]

Sample response	The response
Mass = 2392 × 0.9 Mass = **2152.8** kg	• determines mass [1 mark]

2023 **Phase 3** **Part A** **Question 7** **Measurement**	A school built the rectangular volleyball court shown. Scale 1:200 a) Calculate the actual length and width of the volleyball court in centimetres. [3 marks]

a) Calculate the actual length and width of the volleyball court in centimetres. [3 marks]

Sample response	The response
Measured length = **9** cm Measured width = **4.5** cm Length: $9 \times 200 = 1800$ cm Width: $4.5 \times 200 = 900$ cm	• correctly measures length and width **[1 mark]** • calculates length **[1 mark]** • calculates width **[1 mark]**

b) Use the results from Question 7a) to calculate the perimeter of the volleyball court in metres. [2 marks]

Sample response	The response
Perimeter $= 2(L + W)$ $= 2 \times (18 + 9)$ $= 54$ m	• converts dimensions to metres **[1 mark]** • calculates perimeter **[1 mark]**

A farmer is planting crops in the paddock shown.

Not to scale

1480 m

2630 m
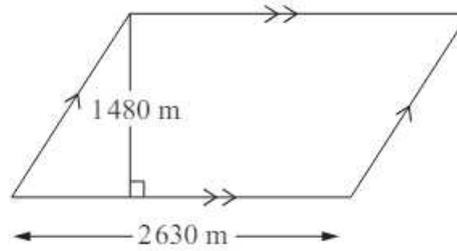
a) Identify the name of the two-dimensional shape. [1 mark]

Sample response	The response
Parallelogram	• correctly identifies shape **[1 mark]**

b) How many vertices does the paddock have? [1 mark]

Sample response	The response
4 vertices	• correctly states number of vertices **[1 mark]**

c) Calculate the area of the paddock in square metres. [2 marks]

Sample response	The response
$A = L \times W$ $A = 1480 \times 2630$ $= 3\,892\,400$ m²	• correctly selects an appropriate rule **[1 mark]** • calculates area **[1 mark]**

d) Convert the result from Question 9c) to hectares. [2 marks]

Sample response	The response
$A = 3\,892\,400 \div 100^2$ $= 389.24$ ha	• uses an appropriate strategy **[1 mark]** • determines area **[1 mark]**

The top view of a theatre is drawn on a grid as shown.
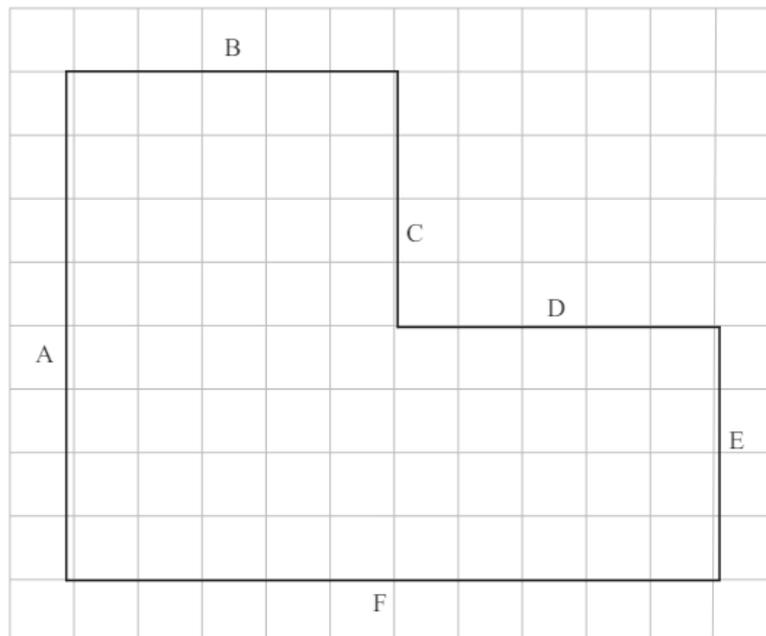
Scale 1 unit : 100 cm

a) Estimate the actual length of side F in centimetres. [2 marks]

Sample response	The response
Length $= \mathbf{10.2} \times 100$ Length $= \mathbf{1020}$ cm	• correctly estimates length of side F **[1 mark]** • determines actual length of side F **[1 mark]**

The area of the theatre is approximately 620 000 cm^2 .
b) Convert the area into the most appropriate unit of measure. [1 mark]

Sample response	The response
$A = 620\,000$ cm^2 $\div 100^2$ $A = \mathbf{62}$ m^2	• correctly converts area to most appropriate unit of measure **[1 mark]**
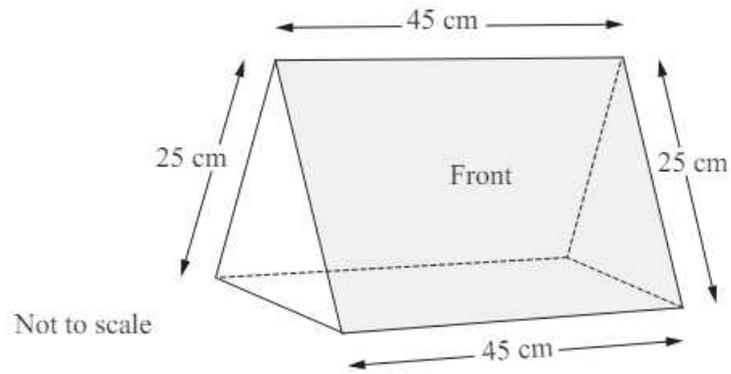
2023 Phase 4 Part A Question 2 **Measurement**	A baker is creating a cake in the shape shown.

a) Identify the name of the three-dimensional shape. [1 mark]

Sample response	The response
Triangular-based prism	• correctly identifies solid [1 mark]

b) How many vertices does the cake have? [1 mark]

Sample response	The response
6 vertices	• correctly states number of vertices [1 mark]

An edible photograph will be placed on the front face of the cake.

c) Identify the shape of the front face. [1 mark]

Sample response	The response
Rectangle	• correctly identifies shape [1 mark]

d) Calculate the area of the front face in square centimetres. [2 marks]

Sample response	The response
$A = L \times W$ $= 45 \times 25$ $= 1125 \text{ cm}^2$	• correctly selects an appropriate rule [1 mark] • calculates area [1 mark]

2023 Phase 4 Part A Question 3 Measurement	A worker blocked off a rectangular section of road with a barrier to inspect the condition of a sinkhole, as shown in the top view.

Not to scale
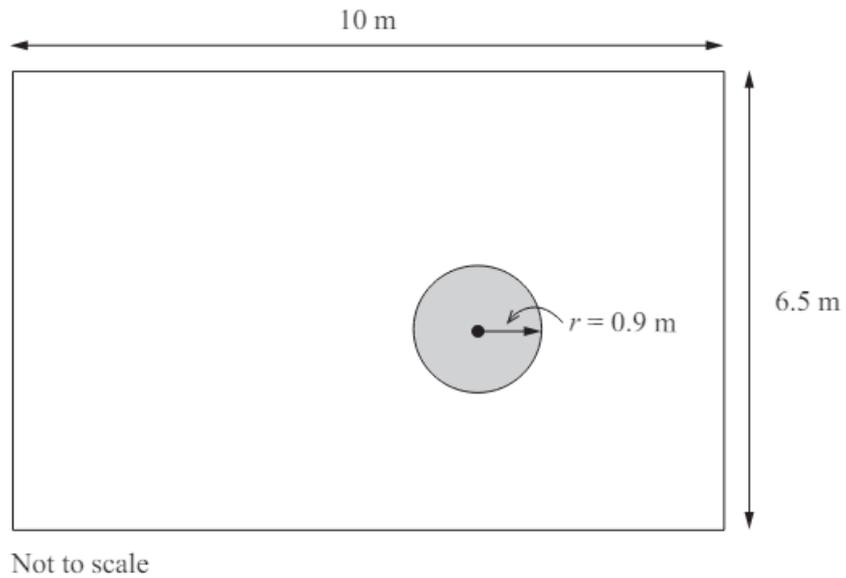
a) Calculate the perimeter of the blocked off section in metres. [2 marks]

Sample response	The response
$P = 2(L + W)$ $= 2 \times (10 + 6.5)$ $= 33$ m	• correctly selects an appropriate rule [1 mark] • calculates perimeter [1 mark]

b) Use leading-digit approximation to estimate the area of the sinkhole in square metres. [2 marks]

Sample response	The response
$A = \pi r^2$ $A = 3 \times 1^2$ $= 3$ m^2	• correctly uses an appropriate strategy [1 mark] • estimates area [1 mark]
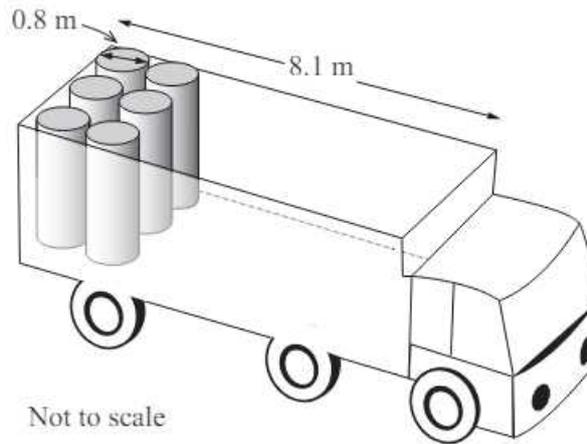
2023 Phase 4 Part A Question 6 Measurement	A truck carries a chemical in cylindrical barrels, as shown.

0.8 m

8.1 m

Not to scale

a) Estimate the maximum number of barrels that would fit inside the truck. [2 marks]

Sample response	The response
Number of barrels = **10** × 3 = **30** barrels	• correctly shows use of an appropriate strategy **[1 mark]** • estimates maximum number of barrels **[1 mark]**

b) If each barrel has a capacity of 600 L, estimate the maximum capacity of the truck in litres. [1 mark]

Sample response	The response
30 × 600 = **18 000** L	• estimates maximum capacity **[1 mark]**

After a delivery, the truck has 40% of the barrels left.

c) Use the result from Question 6b) to determine the amount of chemical left on the truck in litres. [1 mark]

Sample response	The response
0.4 × 18 000 = **7 200** L	

A plastic paperweight is in the shape of a square-based pyramid, as shown.
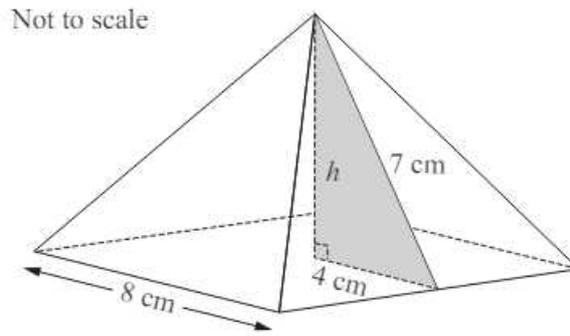
Not to scale

a) Use Pythagoras' theorem to calculate the height, h, of the paperweight in centimetres. [2 marks]

Sample response	The response
$h = \sqrt{(c^2 - a^2)}$ $h = \sqrt{(7^2 - 4^2)}$ $h \approx 5.74456$ cm	• correctly selects an appropriate rule [1 mark] • calculates height [1 mark]

b) Use the result from Question 7a) to calculate the volume of the paperweight in cubic centimetres. [2 marks]

Sample response	The response
$V = \frac{1}{3}Ah$ $V = \frac{1}{3}(8 \times 8) \times 5.74456$ ≈ 122.55 cm³	• selects an appropriate rule [1 mark] • calculates volume [1 mark]

c) To make the plastic paperweight, a liquid is poured into a mould. Use the result from Question 7b) to determine the capacity of the paperweight mould in litres. [1 mark]

Sample response	The response
Capacity = 122.55 mL Capacity ≈ 0.12255 L	• converts capacity to litres [1 mark]

d) Use the result from Question 7c) to determine the number of plastic paperweights that can be made from 10 L of liquid. [1 mark]

Sample response	The response
Number of paperweights = 10 ÷ 0.12255 ≈ 81.6	• determines number of paperweights [1 mark]

2023 Phase 4 Part A Question 8 Measurement	A person is moving containers completely filled with glue. The largest container has a torn label and now only shows the volume.

a) Convert the volume to cubic centimetres. [1 mark]

Sample response	The response
$V = 0.004125 \times 100^3$ $= 4125$ cm^3	• correctly converts volume to cubic centimetres **[1 mark]**

b) Use the result from Question 8a) and leading-digit approximation to estimate the number of times the largest container can be filled using a smaller container, which has a volume of 1150 cm^3 . [1 mark]

Sample response	The response
$4000 \div 1000 = 4$	• estimates number of times **[1 mark]**

c) Use the result from Question 8b) and leading-digit approximation to estimate the mass of the largest container in kilograms, given the smaller container weighs 7.8 kg. [1 mark]

Sample response	The response
$4 \times 8 = 32$ kg	• estimates mass **[1 mark]**

Scientists collected data on lizard lengths, in centimetres, as shown.

| 12 | 13 | 14 | 15 | 16 | 17 | 19 | 21 | 22 | 24 | 27 | 27 | 29 | 30 | 32 | 33 | 53 |

a) Determine the modal lizard length. [1 mark]

Sample response	The response
27 cm	• correctly identifies mode [1 mark]

b) Complete the five-number summary for the lizard lengths by writing an appropriate value in each empty cell of the table. [2 marks]

Sample response					The response
Minimum	Lower quartile (Q₁)	Median	Upper quartile (Q₃)	Maximum	• correctly identifies median [1 mark]
12	15.5	22	29.5	53	• correctly identifies minimum and maximum values [1 mark]

c) Construct a box plot to represent the data. [2 marks]

Sample response	The response
Draw your box plot here. 10 15 20 25 30 35 40 45 50 55 60 65 70	• draws box section [1 mark] • draws whisker sections connecting to box [1 mark]

| 2023 Phase 5 Part A Question 1

Measurement | A stage has been designed in the shape of an equilateral triangle. There is a rectangular section inside the stage, as shown. |

Not to scale

13.5 m

10.2 m

1.5 m

a) Calculate the perimeter of the entire triangular stage in metres. [2 marks]

Sample response	The response
$P = 3 \times 13.5$ $= 40.5 \text{ m}$	• correctly uses an appropriate strategy [1 mark] • calculates perimeter [1 mark]

b) Use leading-digit approximation to estimate the area of the rectangular section in square metres. [2 marks]

Sample response	The response
$A = L \times W$ $= 2 \times 10$ $= 20 \text{ m}^2$	• correctly selects an appropriate rule [1 mark] • estimates area [1 mark]

A truck transports gas cylinders in cages, as shown.
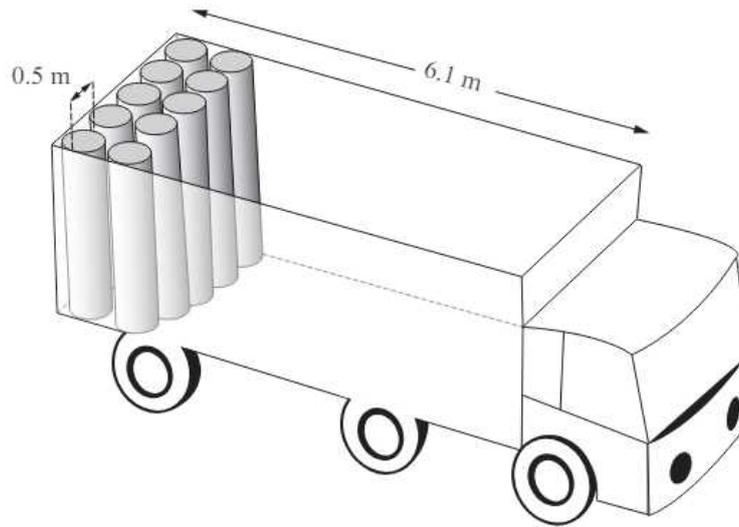
a) Estimate the maximum number of gas cylinders that would fit inside the truck. [2 marks]

Sample response	The response
Number of cylinders = **12** × 5 = **60** cylinders	• correctly shows use of an appropriate strategy **[1 mark]** • estimates maximum number of cylinders **[1 mark]**

b) If each gas cylinder contains 200 L, estimate the maximum capacity the truck can transport in litres. [1 mark]

Sample response	The response
60 × 200 = **12 000** L	• estimates maximum capacity **[1 mark]**

After a delivery, the truck has 25% of the gas cylinders left.

c) Use the result from Question 4b) to determine the amount of gas left on the truck in litres. [1 mark]

Sample response	The response
12 000 × 0.25 = **3000** L	• determines amount of gas **[1 mark]**

2023 **Phase 5** **Part A** **Question 7** **Measurement**	Liquid soap is stored in a bottle with a volume of 177 000 mm³. a) Convert the volume of the bottle to cubic centimetres. [1 mark] _(see table below)_

Sample response	The response
$177\,000 \div 10^3$ $= 177\,\text{cm}^3$	• correctly converts volume to cubic centimetres **[1 mark]**

b) Use the result from Question 7a) and leading-digit approximation to estimate the number of times people can wash their hands using all the soap from the bottle, given that on average people use 3.7 cm3 of soap per hand wash. [1 mark]

Sample response	The response
$200 \div 4 \approx 50$	• estimates number of times **[1 mark]**

c) Use the result from Question 7b) and leading-digit approximation to estimate the total mass of the soap, excluding the bottle, if each hand wash uses 3 g of soap. [1 mark]

Sample response	The response
$50 \times 3 = 150\,\text{g}$	• estimates total mass of soap **[1 mark]**

2023 **Phase 5** **Part A** **Question 8** **Measurement**	The owner of a gym wants to work out the size of a trampoline. The floor of the gym is covered in square mats, with each square mat occupying an area of 10 000 cm², as shown.

a) Convert the area of one square mat into the most appropriate unit of measure. [2 marks]

Sample response	The response
$\text{Area} = 10\,000 \div 100^2$ $= 1\,\text{m}^2$	• correctly shows use of conversion strategy **[1 mark]** • calculates area in appropriate unit of measure **[1 mark]**

b) Use the result from Question 8a) to estimate the width of the trampoline in metres. [1 mark]

Sample response	The response
$\text{Width} \approx 3\,\text{m}$	• estimates width with a tolerance of $\pm 0.2\,\text{m}$ **[1 mark]**

<table>
<tr><td>

2023
Phase 5
Part A
Question 9

Measurement

</td><td>

A camper sets up their tent as shown.

Not to scale

2.7 m

2.1 m   Side   2.1 m

2.5 m   2.7 m

a) Identify the name of the three-dimensional shape. [1 mark]

Sample response	The response
Triangular-based prism	• correctly identifies shape **[1 mark]**

b) How many edges does the tent have? [1 mark]

Sample response	The response
9 edges	• correctly states number of edges **[1 mark]**

c) Identify the shape of the side face. [1 mark]

Sample response	The response
Rectangle	• correctly identifies shape **[1 mark]**

d) Calculate the area of the side face in square metres. [2 marks]

Sample response	The response
$A = L \times W$ $= 2.7 \times 2.1$ $= 5.67 \text{ m}^2$	• correctly selects an appropriate rule **[1 mark]** • calculates area **[1 mark]**

</td></tr>
</table>
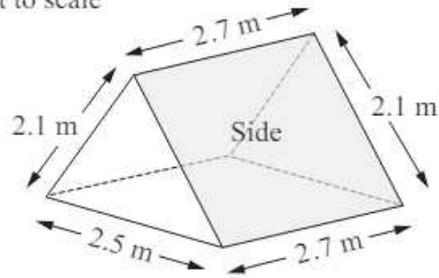
2022 Part A Question 1 Measurement	Jewellery is displayed in an enclosed cabinet in the shape of a hexagonal-based prism, as shown.
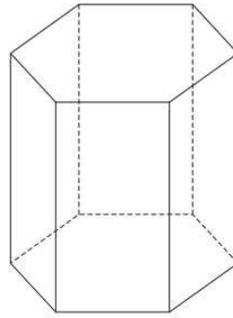
Not to scale

a) How many vertices does the cabinet have? [1 mark]

Sample Response	The response
12	• correctly states the number of vertices [1 mark]

b) How many faces does the cabinet have? [1 mark]

Sample Response	The response
8	• correctly states the number of faces [1 mark]

2022 **Part A** **Question 3** **Measurement**	A scientist is filling cylindrical containers with creek water to test its quality. The diagram shows the dimensions of each container.
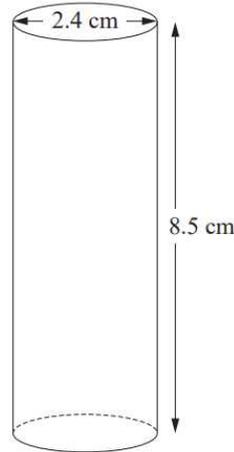
Not to scale

a) Determine the radius of the container in centimetres (cm). [1 mark]

Sample Response	The response
$r = \dfrac{d}{2} = \dfrac{2.4}{2} = 1.2$ cm	• correctly determines the radius [1 mark]

b) Use the result from Question 3a) to calculate the volume of the container, rounded to the nearest cubic centimetre (cm^3). [3 marks]

Sample Response	The response
Volume of container, $V = \pi r^2 h$ $= \pi \times 1.2^2 \times 8.5$	• substitutes into appropriate rule [1 mark]
$= 38.453 \dots$	• calculates volume [1 mark]
≈ 38 cm^3	• rounds to nearest cubic centimetre [1 mark]

c) Use the result from Question 3b) to determine the number of millilitres (mL) of creek water in 12 full containers.
[2 marks]

Sample Response	The response
38 $cm^3 = 38$ mL	• recognises that 1 cm^3 = 1 mL [1 mark]
$12 \times 38 = 456$ mL of creek water	• determines number of millilitres in 12 full containers [1 mark]

2022 **Part A** **Question 4** **Measurement**	A fenced enclosure is in the shape of a semicircle with a radius of 6 metres (m), as shown.
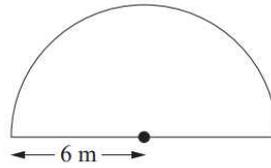
Not to scale

a) Calculate the arc length of the fenced enclosure in metres (m). [2 marks]

Sample Response	The response
Arc length of enclosure, $l = \frac{\theta}{180}\pi r$ $= \frac{180}{180} \times \pi \times r$ $= 1 \times \pi \times 6$ ≈ 18.85 m	• correctly substitutes into appropriate rule [1 mark]
	• calculates arc length [1 mark]

b) Use the result from Question 4a) to calculate the perimeter of the fenced enclosure in metres (m). [2 marks]

Sample Response	The response
Perimeter of enclosure $= 18.85 + 6 + 6$	• identifies use of an appropriate strategy [1 mark]
$= 30.85$ m	• calculates perimeter of enclosure [1 mark]

2022 **Part A** **Question 7** **Measurement**	Birrani is laying tubing for a garden watering system. He uses his foot length to estimate the length of three pieces of tubing. Birrani's foot length is approximately 30 centimetres (cm).

Piece of tubing	Number of foot lengths
1	8
2	6
3	6

a) Determine the estimated length of piece 1 in centimetres (cm). [1 mark]

Sample Response	The response
Estimated length of piece 1 $= 8$ foot lengths $\times 30$ cm/foot length $= 240$ cm	• correctly determines the estimated length of piece 1 [1 mark]

b) Determine the estimated length of piece 2 in centimetres (cm). [1 mark]

Sample Response	The response
Estimated length of piece 2 $= 6$ foot lengths $\times 30$ cm/foot length $= 180$ cm	• correctly determines the estimated length of piece 2 [1 mark]

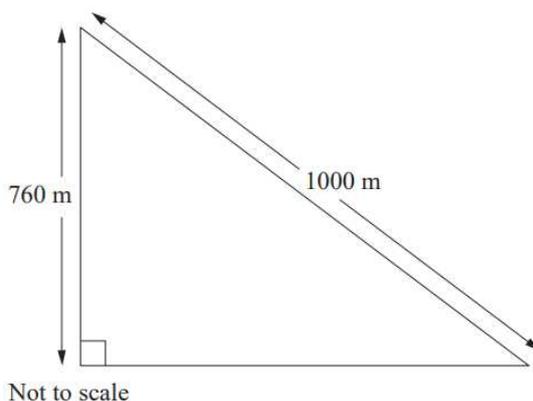c) Determine the estimated total length for all three pieces of tubing in centimetres (cm). [1 mark]

Sample Response	The response
Estimated total length of tubing $= 240 + 180 + 180$ $= 600$ cm	• determines estimated total length [1 mark]

| 2022 Part A Question 8 Measurement | A running track in the shape of a right-angled triangle will be used for a charity event. |

760 m   1000 m

Not to scale

a) Use Pythagoras' theorem to calculate the third length of the running track in metres (m). [2 marks]

Sample Response	The response
Using Pythagoras' theorem $c^2 = a^2 + b^2$ Third length (b) $b^2 = c^2 - a^2$ $b^2 = 1000^2 - 760^2$ $b = \sqrt{1000^2 - 760^2}$	• correctly substitutes into appropriate rule [1 mark]
$b = 650$ m The third length of the track is 650 m.	• calculates third length of track [1 mark]

The area enclosed by the running track will be the viewing area for spectators.
b) Use the result from Question 8a) to calculate the viewing area in hectares (ha). [3 marks]

Sample Response	The response
Area inside triangle, $A = \frac{1}{2}bh$ $= \frac{1}{2} \times 760 \times 650$	• substitutes into appropriate rule [1 mark]
$= 247\ 000$ m^2	• calculates area [1 mark]
$= 24.7$ ha	• converts square metres to hectares [1 mark]

It is predicted that 45 000 spectators will attend the event. No more than 2000 spectators per hectare will be allowed in the viewing area.
c) Use the result from Question 8b) to explain whether 45 000 spectators will be allowed in the viewing area. [2 marks]

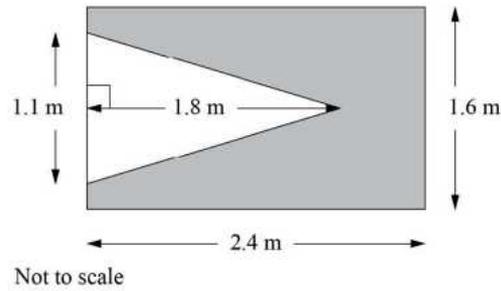| Sample Response	The response
Number of spectators allowed in viewing area $= 24.7 \times 2000$ $= 49\ 400$ people	• determines the maximum number of spectators allowed in viewing area [1 mark]
45 000 < 49 400. The predicted number of spectators will be allowed in the viewing area	• provides a justified decision linked to prior reasoning [1 mark]

2021 Part A Question 1 Measurement	One apple contains approximately 9 milligrams (mg) of magnesium. The recommended daily allowance (RDA) of magnesium for teenagers is 240 milligrams (mg). Approximately what percentage of the RDA of magnesium for teenagers is contains in one apple? [2 marks]

Sample Response	The response
Percentage $\approx \frac{9}{240} \times 100\%$	• correctly compares values [1 mark]
$= 3.75\%$ Approximately 3.75% of the RDA of magnesium for teenagers is contained in one apple.	• determines approximate percentage [1 mark]

2021 Part A Question 3 Measurement	A tent in the shape of a rectangular-based pyramid is supported by four poles that meet at the top point of the tent, as shown.

Pole

1.9 m

2.6 m   4.6 m

Not to scale

a) State the mathematical name given to the top point of the tent. [1 mark]

Sample Response	The response
Apex	• correctly states the apex [1 mark]

The length of each pole is 325 centimetres (cm).
b) Determine the total length of the four poles supporting the tent in metres (m). [2 marks]

Sample Response	The response
325 cm = 3.25 m	• correctly converts centimetres to metres [1 mark]
Total length = 3.25 × 4 = 13 m	• determines total length of poles [1 mark]

c) Calculate the volume of the tent in cubic metres (m³) [2 marks]

Sample Response	The response
Volume of tent, $V = \frac{1}{3} Ah$ $= \frac{1}{3} \times l \times w \times h$ $= \frac{1}{3} \times 4.6 \times 2.6 \times 1.9$	• correctly substitutes into appropriate rule [1 mark]
$\approx 7.57 \text{ m}^3$	• calculates volume of tent [1 mark]

2021 Part A Question 6 Measurement	A flag in the shape of a rectangle is designed with a triangular emblem as shown.

Not to scale

a) Calculate the area of the flag in square metres (m²). [1 mark]

Sample Response	The response
Area of flag, $A = bh$ $= 2.4 \times 1.6$ $= 3.84$ m²	• correctly calculates the flag area [1 mark]

b) Calculate the area of the triangle emblem is square metres (m²) [1 mark]

Sample Response	The response
Area of triangular emblem, $A = \frac{1}{2} bh$ $= \frac{1}{2} \times 1.1 \times 1.8$ $= 0.99$ m²	• correctly calculates the area of triangular emblem [1 mark]

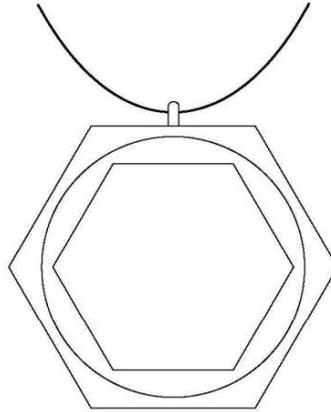The flag designed estimates that the triangular emblem covers one quarter of the flag area.
c) Use the results from Question 6a) and 6b) to evaluate the reasonableness of the flag designer's estimate. [3 marks]

Sample Response	The response
One quarter of flag area = 3.84 ÷ 4 = 0.96	• determines one quarter of flag area [1 mark]
0.96 ≈ 0.99	• compares area of triangular emblem to one quarter of flag area [1 mark]
The designer's estimate of the triangular emblem covering one quarter of the flag area is reasonable because the areas are approximately the same.	• provides a justified statement of reasonableness [1 mark]

2021 **Part A** **Question 9** **Measurement**	A jeweller designed a pendant consisting of a circle between two regular hexagons as shown. The side length of the inner hexagon is 28 millimetres (mm). The side length of the outer hexagon is 36 millimetres (mm). Not to scale a) Calculate the perimeter of the inner hexagon and the perimeter of the outer hexagon in millimetres (mm). [2 marks]

Sample Response	The response
Perimeter of inner hexagon = 28 × 6 = 168 mm Perimeter of outer hexagon = 36 × 6 = 216 mm	• correctly multiplies each side length by 6 [1 mark] • correctly calculates both perimeters [1 mark]

b) Use the result from Question 9a) to estimate the circumference of the circle in millimetres (mm). [1 mark]

Sample Response	The response
The circle's circumference is approximately 190 mm	• estimates circumference in the range of 175–200 mm [1 mark]

2020 **Part A** **Question 1** **Measurement**	A milk container has the three-dimensional shape shown. Not drawn to scale a) How many edges does this milk container have? [1 mark]
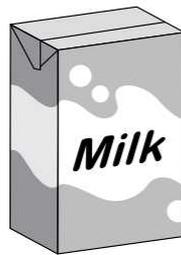
Sample Response	The response
12 edges	• correctly states the number of edges [1 mark]

b) How many faces does this milk container have? [1 mark]

Sample Response	The response
6 faces	• correctly states the number of faces [1 mark]

2020 Part A Question 3 Measurement	Chocolates are made by pouring liquid chocolate into a mould in the shape of the square-based pyramid shown. The mould has a perpendicular height of 1.5 centimetres (cm) and base length of 2.8 centimetres (cm). a) Calculate the volume of liquid chocolate required to fill one mould in cubic centimetres (cm^3). [2 marks]

Sample Response	The response
Volume = $\frac{1}{3} Ah$ $= \frac{2.8 \times 2.8 \times 1.5}{3}$	• correctly substitutes into appropriate rule [1 mark]
$= 3.92 \text{ cm}^3$	• calculates volume in cubic centimetres [1 mark]

b) Use the result from 3a) to determine the capacity of one mould in millilitres (mL). [1 mark]

Sample Response	The response
$3.92 \text{ cm}^3 = 3.92 \text{ mL}$	• converts cubic centimetres to millilitres [1 mark]

One litre (L) of liquid chocolate is available. [1 mark]
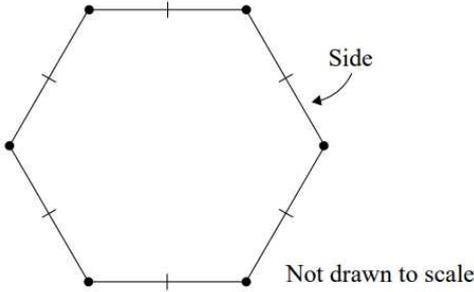c) Determine how many millilitres (mL) of liquid chocolate are available. [1 mark]

Sample Response	The response
1 L = 1000 mL	• converts litres to milllitres [1 mark]

d) Determine the maximum number of moulds that can be filled using the 1 litre (L) of liquid chocolate available. [2 marks]

Sample Response	The response
Maximum number of moulds = 1000 mL ÷ 3.92 mL = 255.102 moulds	• calculates number of moulds that can be filled from 1 L of liquid chocolate [1 mark]
≈ 255 moulds	• rounds down the number of moulds [1 mark]

2020 Part A Question 4 Measurement	A dog takes 60 steps to walk the length of one side of the enclosure shown. a) Calculate the number of steps the dog takes to walk the perimeter of the enclosure. [1 mark]

Sample Response	The response
Number of steps = 60 steps × 6 sides = 360 steps	• correctly calculates the number of steps to walk the perimeter [1 mark]

The dog has an average step length of 85 centimetres (cm).
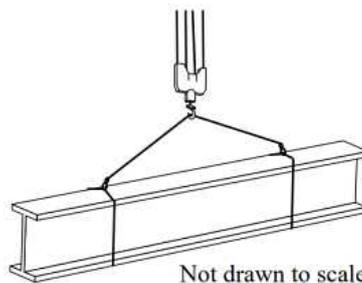b) Use the result from 4a) to calculate the perimeter of the enclosure in metres (m). [2 marks]

Sample Response	The response
Perimeter = 360 steps × 85 cm/step = 30 600 cm	• calculates perimeter in centimetres [1 mark]
= 306 m	• converts centimetres to metres [1 mark]

2020 **Part A** **Question 6** **Measurement**	Steel beams are used in many building structures. Not drawn to scale A 1-metre (m) length of steel beam has a mass of 14 kilograms (kg). a) Calculate the mass of a 9-metre (m) length of steel beam in kilograms (kg). [1 mark]

Sample Response	The response
14 kg/m × 9 m = 126 kg	• correctly calculates the mass of a 9-metre steel beam [1 mark]

A truck can carry a maximum mass of 2 tonnes (t).
b) Convert 2 tonnes (t) to kilograms (kg). [1 mark]

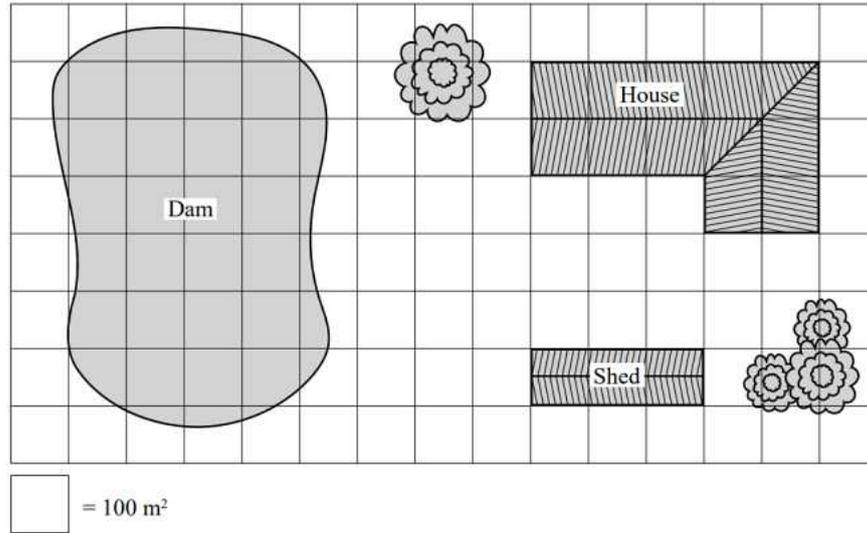| Sample Response	The response
2 t = 2000 kg	• correctly converts tonnes to kilograms [1 mark]

c) Use the result from 6a) to determine the maximum number of 9-metre (m) steel beams the truck can carry. [2 marks]

Sample Response	The response
Number of beams $= \dfrac{2000 \text{ kg}}{126 \text{ kg/beam}}$ = 15.87 beams	• calculates number of 9-metre steel beams the truck can carry [1 mark]
≈ 15 beams	• rounds down number of beams [1 mark]

| 2020 Part A Question 7 Measurement | The position of a dam and two buildings on a farm is shown in the diagram. |

= 100 m²

a) Determine the actual area of the shed in square metres (m²). [1 mark]

Sample Response	The response
300 m²	• correctly determines the actual area of the shed [1 mark]

b) Estimate the actual area of the dam in square metres (m²). [1 mark]

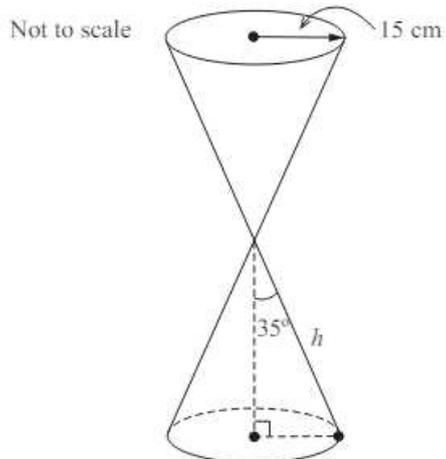| Sample Response	The response
The area of the dam is approximately 27 grid squares, which is 2700 m²	• correctly estimates area of the dam in the range of 2600 to 2800 m2 [1 mark]

c) Determine the actual area of the entire farm in hectares (ha). [2 marks]

Sample Response	The response
Grid that covers entire area of farm is 8 × 15 = 120 grid squares = 12 000 m²	• correctly determines area of the entire farm [1 mark]
12 000 m² ÷ 100² = 1.2 ha	• converts square metres to hectares [1 mark]

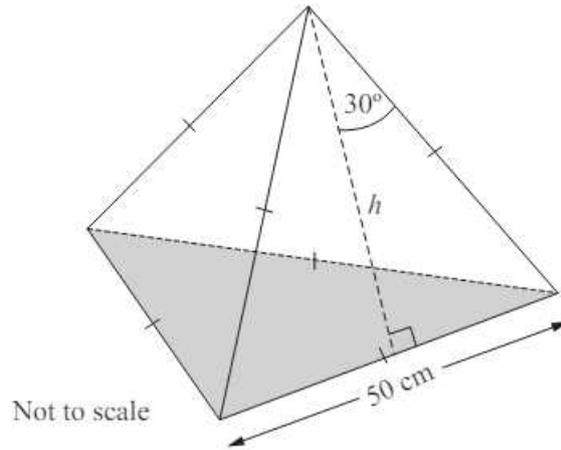|	
2023 **Phase 1** **Part B** **Question 10** **Measurement**	An hourglass is constructed from two identical enclosed glass cones, as shown. a) Use trigonometry to calculate the slant height, h, of one cone in centimetres. [2 marks]

a) Use trigonometry to calculate the slant height, h, of one cone in centimetres. [2 marks]

Sample response	The response
$\sin\theta = \dfrac{opp}{hyp}$ $\sin 35° = \dfrac{15}{h}$ $h = 15 \div \sin 35°$ $\therefore h \approx 26.15$ cm	• correctly selects an appropriate trigonometric ratio **[1 mark]** • calculates slant height **[1 mark]**

b) Use the result from Question 10a) to calculate the total surface area of the hourglass in square centimetres. [3 marks]

Sample response	The response
Surface area of one cone: $SA = \pi r^2 + \pi r s$ $SA = \pi(15)^2 + \pi(15)(26.15)$ $SA \approx 1939.23$ cm² Total surface area for two cones: $TSA = 1939.23 \times 2$ $TSA \approx 3878.46$ cm²	• selects an appropriate rule **[1 mark]** • calculates surface area of one cone **[1 mark]** • calculates total surface area of hourglass **[1 mark]**

2023 Phase 2 Part B Question 10 Measurement	A paper pyramid is made up of four equilateral triangles, as shown.

Not to scale

50 cm

a) Use trigonometry to calculate the perpendicular height, h, of one triangular face in centimetres. [2 marks]

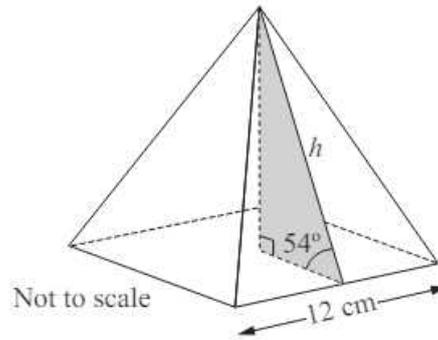| Sample response	The response
$\tan \theta = \dfrac{opp}{adj}$ $\tan 30° = \dfrac{25}{h}$ $h = \dfrac{25}{\tan 30°}$ $h \approx 43.3$ cm	• correctly selects an appropriate trigonometric ratio **[1 mark]** • calculates perpendicular height **[1 mark]**

b) Use the result from Question 10a) to calculate the total surface area of the pyramid in square centimetres. [3 marks]

Sample response	The response
$A = \dfrac{1}{2}bh$ $A = \dfrac{50 \times 43.3}{2}$ $A \approx 1082.53$ cm^2 $TSA \approx 1082.53 \times 4$ $TSA \approx 4330.13$ cm^2	• selects an appropriate rule **[1 mark]** • calculates surface area of one face **[1 mark]** • calculates total surface area of pyramid **[1 mark]**

2023 **Phase 3** **Part B** **Question 10** **Measurement**	A student created a cardboard model of a square-based pyramid as shown.

Not to scale

a) Use trigonometry to calculate the slant height, h, of the triangular face in centimetres. [2 marks]

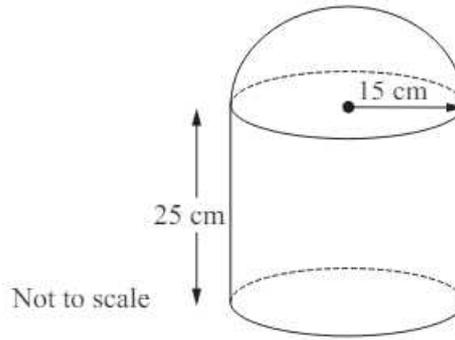| Sample response	The response
$\cos \theta = \dfrac{adj}{hyp}$ $\cos 54° = \dfrac{6}{h}$ $h = \dfrac{6}{\cos 54°}$ $h \approx 10.2$ cm	• correctly selects an appropriate trigonometric ratio [1 mark] • calculates slant height [1 mark]

b) Use the result from Question 10a) to calculate the total surface area of the model in square centimetres. [3 marks]

Sample response	The response
$A = \dfrac{b \times h}{2}$ Total surface area of four triangular faces: $TSA = \dfrac{12 \times 10.2}{2} \times 4$ $= 244.987$ cm^2 Area of square base: $A = 12^2$ $A = 144$ cm^2 Total surface area: $TSA = 144 + 244.8$ $TSA = 388.987$ cm^2	• selects an appropriate rule [1 mark] • calculates total surface area of triangular faces [1 mark] • calculates total surface area [1 mark]

2023 **Phase 4** **Part B** **Question 10** **Measurement**	A model of an observatory is made of two three-dimensional shapes (a cylinder and a hemisphere), as shown. a) Calculate the total outer surface area of metal needed to construct the model of an observatory in square centimetres. [4 marks]

Sample response	The response
Surface area of hemispherical section: $S = \frac{1}{2} \times 4\pi r^2$ $= 2\pi r^2$ $= 2\pi (15)^2$ ≈ 1413.72 cm² Surface area of base section: $S = 2\pi rh + \pi r^2$ $S = 2\pi (15)(25) + \pi (15)^2$ ≈ 3063.0528 cm² Total surface area of metal TSA = 1413.72 + 3063.0528 ≈ 4476.77 cm²	• correctly calculates surface area of hemispherical section **[1 mark]** • correctly selects an appropriate rule **[1 mark]** • calculates surface area of cylindrical section **[1 mark]** • calculates total surface area of metal **[1 mark]**

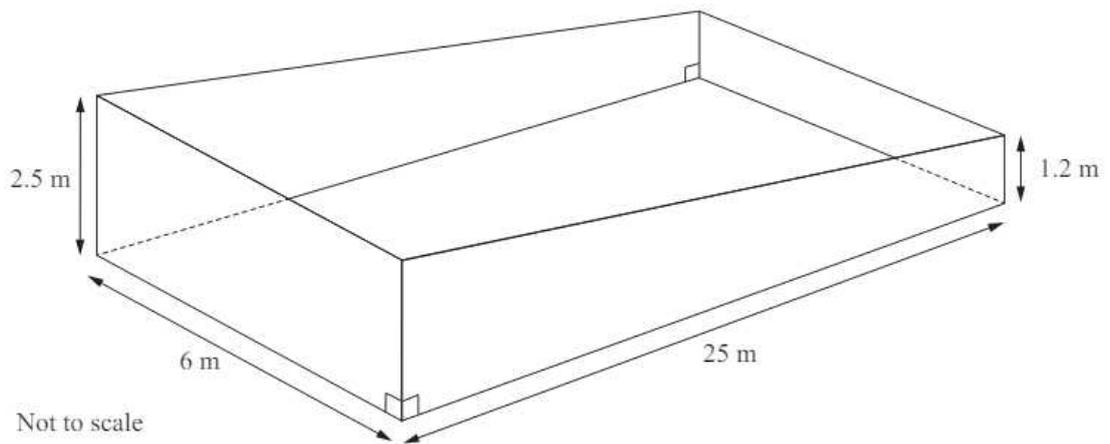The amount of metal available is 5000 cm².

b) Use the result from Question 10a) to evaluate whether there is enough metal to make the model of an observatory. [1 mark]

Sample response	The response
There will be enough metal to construct the artwork since 4476.77 cm² < 5000 cm².	• provides a justified statement of reasonableness **[1 mark]**

The school pool shown needs its internal walls and base repainted.

Not to scale

a) Calculate the total surface area of the pool to be repainted in square metres. [4 marks]

Sample response	The response
Surface area of side rectangular walls S = Area of shallow-end side + Area of deep-end side $= 1.2 \times 6 + 2.5 \times 6$ $= \mathbf{22.2 \ m^2}$ Area of rectangular base $A = 25 \times 6$ $= \mathbf{150 \ m^2}$ Surface area of parallelogrammatic walls $S = \dfrac{(a+b)}{2} \times h \times 2$ $= \dfrac{(2.5 + 1.2)}{2} \times 25 \times 2$ $= \mathbf{92.5 \ m^2}$ Total surface area of pool to be painted $TSA = 22.2 + 150 + 92.5$ $= \mathbf{264.7 \ m^2}$	• correctly calculates surface area of side rectangular walls **[1 mark]** • correctly calculates base area **[1 mark]** • correctly calculates surface area of parallelogrammatic walls **[1 mark]** • calculates total surface area of pool **[1 mark]**

The school has enough paint to cover a maximum surface area of 110 m^2.

b) Use the result from Question 10a) to evaluate whether the school has enough paint to cover the internal walls and base of the pool. [1 mark]

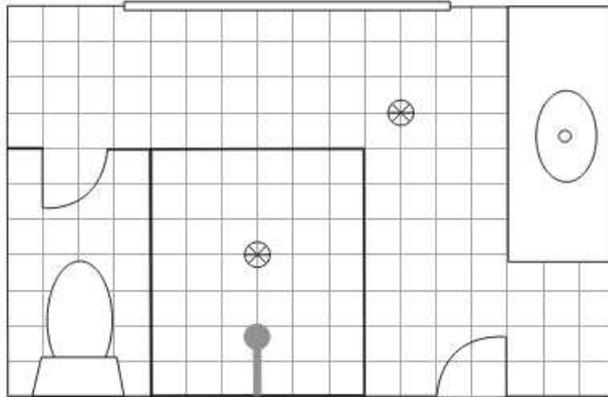| Sample response	The response
The school **will not have enough paint** to cover the internal walls and base of the pool since 110 m^2 < 264.7 m^2.	• provides a justified statement of reasonableness **[1 mark]**

Unit 3 – Topic 2: Scales, plans and models

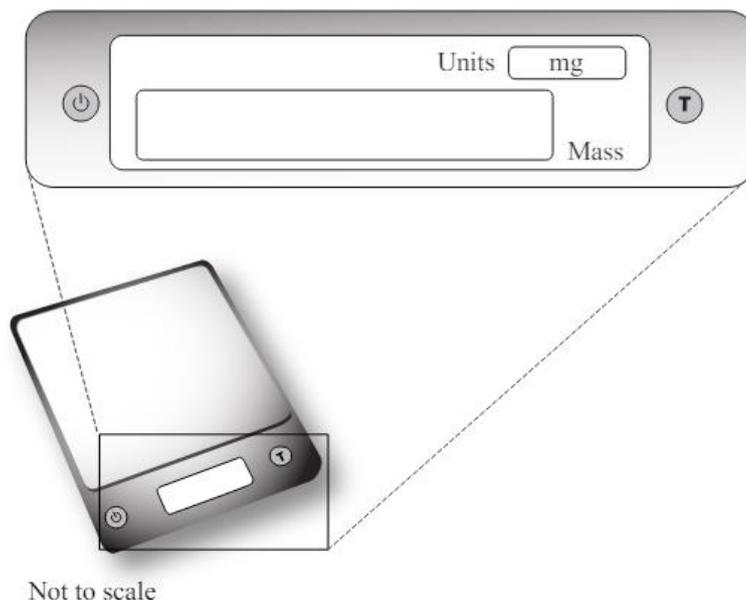|	
2023 Phase 4 Part A Question 5 **Scales, plans and models**	The building plan for a bathroom renovation is shown. a) How many drains are there? [1 mark] _____ b) The plan will be labelled with a scale 10 mm : 50 cm. Interpret what this scale means. [1 mark] _____ _____ _____ The dimensions of the shower on the plan are 35 mm × 30 mm. c) Calculate the actual area of the shower in square metres. [2 marks] _____ _____ _____ _____ _____

A contractor asks the construction company to mail them the building plan, which was weighed at 0.014 g.

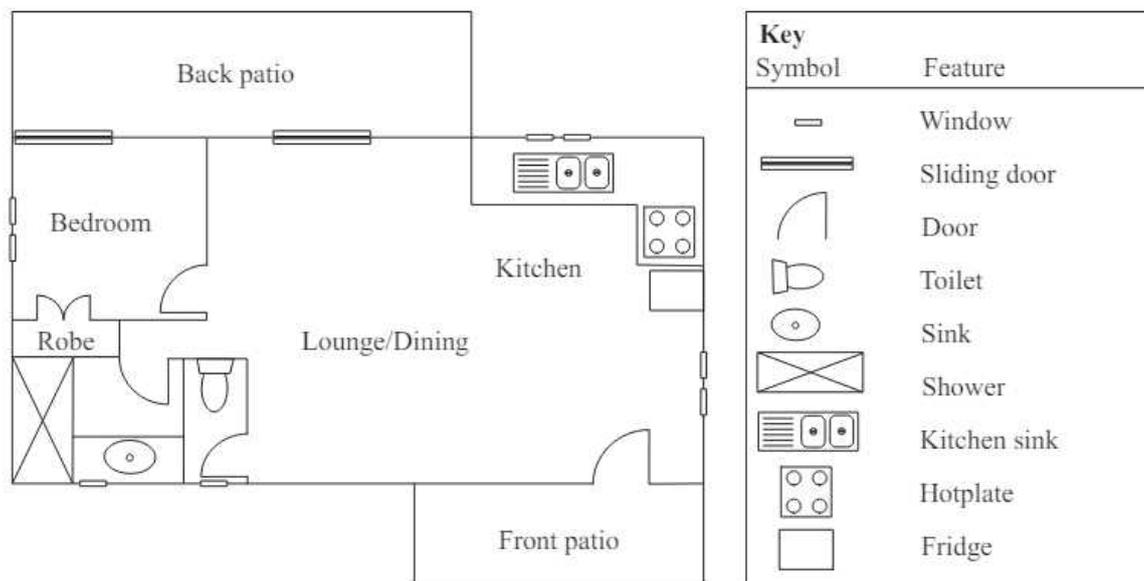When weighed on a post office scale, the mass is displayed in milligrams.

d) Write the mass in the empty cell of the scale. [1 mark]

Not to scale

2023 Phase 5 Part A Question 3 Scales, plans and models	A couple have drawn a scaled house plan, as shown.

a) How many sliding doors are there? [1 mark]

_____

b) The plan is labelled with a scale of 10 mm : 80 cm. Interpret what this scale means. [1 mark]

_____

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The dimensions of the front patio on the plan are 43 mm × 15 mm.

c) Calculate the actual area of the front patio in square metres. [2 marks]

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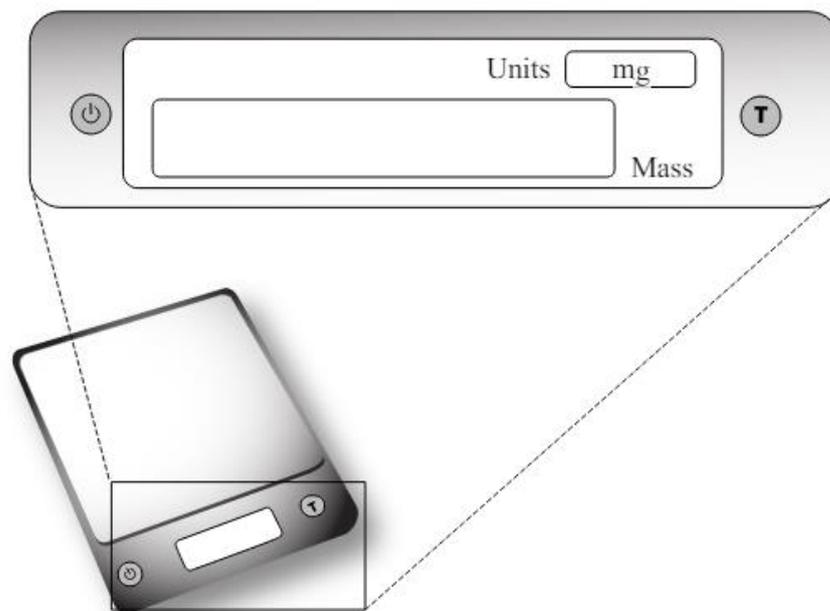
The construction company asks the couple to mail them their house plan, which was weighed at 0.026 g.

When weighed on a post office scale, the mass is displayed in milligrams.

d) Write the mass in the empty cell of the scale. [1 mark]

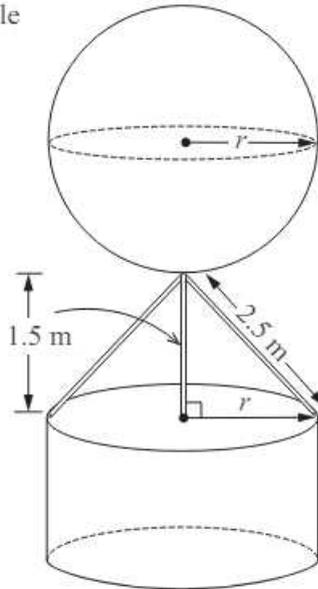Not to scale

|	
2023 Phase 5 Part A Question 6 **Scales, plans and models**	A fountain collects water in a sphere that then flows via three tubes into a cylindrical pool, as shown. The radius of the sphere and the cylinder are the same. Not to scale 1.5 m 2.5 m r a) Use Pythagoras' theorem to calculate the radius, r, of the cylinder in metres. [2 marks] b) Use the result from Question 6a) to calculate the volume of the sphere in cubic metres. [2 marks] c) Use the result from Question 6b) to determine the capacity of the sphere in litres. [1 mark] d) Use the result from Question 6c) to determine the number of times a 12 600 L cylinder can be filled with water from the sphere. [1 mark]
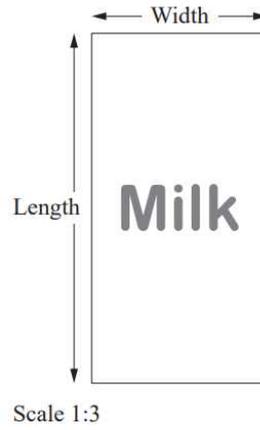
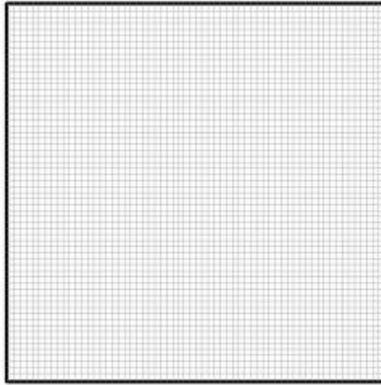|	
2022 **Part A** **Question 6** **Scales, plans** **and models**	The scale diagram shows the rectangular label on a carton of milk. a) Determine the actual width and length of the label in centimetres (cm). [3 marks] b) Calculate the actual area of the label in square centimetres (cm²). [1 mark] The mass of the carton of milk is 1.2 kilograms (kg). c) What is the mass of the carton of milk in grams (g)? [1 mark]

2021 Part A Question 4 Scales, plans and models	A square window is to be fitted with an intersect screen as shown in the scale diagram. Scale 1:30 Note: the measured side length should be 5cm. This note was not in the exam but has been added in this book in case the printing distorts the size of the square when printed. a) Determine the actual side length of the square window in metres (m) [3 marks] A square piece of mesh with an area of 2 square metres (m^2) is available to make the insect screen. b) Use the result from Question 4a) to determine if the square piece of mesh will fit the square window. [2 marks]

2021 **Part A** **Question 5** **Scales, plans** **and models**	A rectangular TV screen has a height of 95 centimetres (cm) and a diagonal length of 152 centimetres (cm). a) Sketch a two dimensional representation of the TV screen, labelled with the measurements converted to metres (m). The sketch does not need to be to scale. [2 marks] Note: If you make a mistake in the sketch, cancel it by ruling a single diagonal line through your work and use the additional response space on page 20 of this question and response book. b) Use the sketch from Question 5a) to calculate the width of the TV screen in metres (m), rounded to two decimal places. [3 marks]

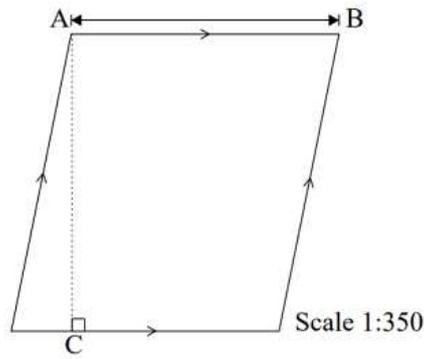A scale drawing of a block of land in the shape of a parallelogram is shown.

Scale 1:350

a) Determine the actual length of the side labelled AB in metres (m). [2 marks]

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b) Determine the actual length of the line labelled AC in metres (m). [2 marks]

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c) Calculate the actual area of the block of land, rounded to the nearest (m^2). [2 marks]

_____

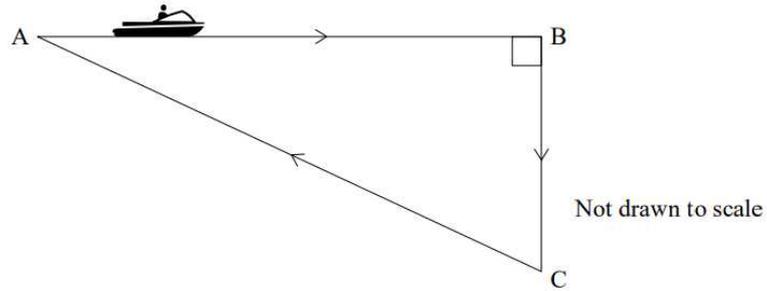_____

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2020 **Part A** **Question 9** **Scales, plans** **and models**	The diagram shows the round trip to be travelled by a boat, starting and ending at A. The boat will travel 60 kilometres (km) in a straight line from A to B, then 32 kilometres (km) in a straight line from B to C. a) Use Pythagoras' theorem to calculate the straight-line distance from C to A in kilometres (km). [2 marks] _____ _____ _____ _____ _____ The boat has enough fuel to travel 150 kilometres (km). b) Use the result from 9a) to determine if the boat has enough fuel to complete the round trip. [2 marks] _____ _____ _____ _____ _____

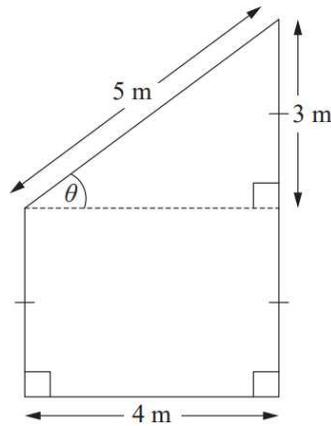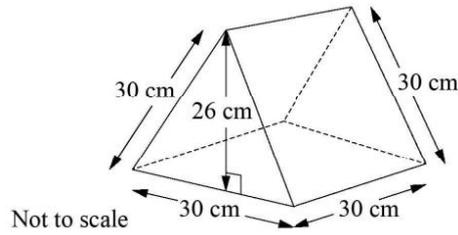|	
2021 **Part B** **Question 10** **Scales, plans** **and models**	A wall frame in the shape of a trapezium is represented in the scale diagram. The wall frame's actual measurements are shown in metres (m). 5 m 3 m θ 4 m Diagram to scale a) Measure the scale diagram to determine the scale used to represent the wall frame. Write the scale in simplest form. [2 marks] _____ _____ _____ b) Calculate the perimeter of the wall frame in metres (m). [1 mark] _____ _____ c) Use trigonometry to calculate angle θ in degrees. [2 marks] _____ _____ _____ _____ _____

2021 Part B Question 10 **Scales, plans and models**	Jay is using recycled plywood to make a birdhouse in the shape of a triangular prism, as shown.

30 cm · 26 cm · 30 cm · 30 cm · 30 cm

Not to scale

a) Construct a scale drawing of the net of the birdhouse, using a scale of 1:10, in the space provided. The response lines on the next page can be used for your workings [2 marks]

Note: If you make a mistake in the scale drawing, cancel it by ruling a single diagonal line through your work and use the additional response space on page 21 of this question and response book.

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b) Calculate the area of plywood required to make the birdhouse in (m^2) [3 marks]

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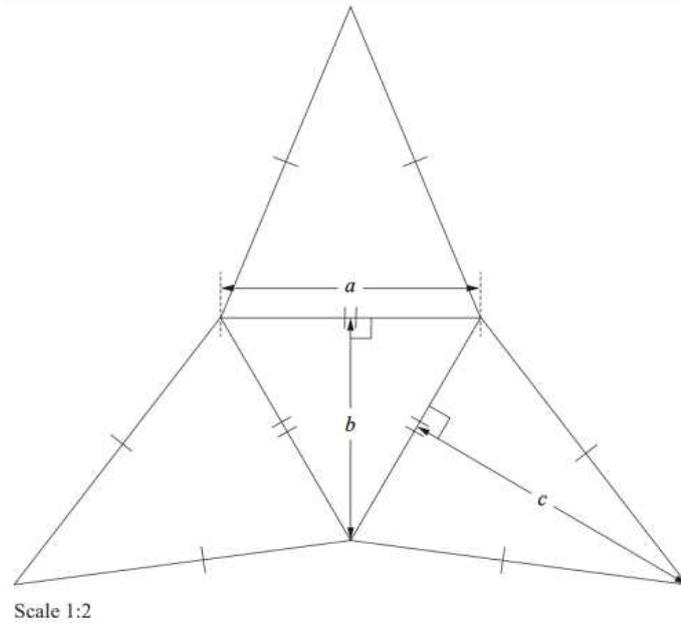_____

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2021 Part B Question 11 **Scales, plans and models**	A customer buys cardboard templates that can be folded to make gift boxes in the shape of a triangular based pyramid. The scale drawing shows the net for one cardboard template. The table shows the scale drawing measurements in centimetres (cm).

Scale 1:2

Dimension	Scale drawing measurement (cm)
a	5
b	4.3
c	6

Each cardboard template costs 2 cents per square centimetre (cents/cm^2). The customer assumes they can purchase 8 templates for under \$40. Evaluate the reasonableness of this assumption.

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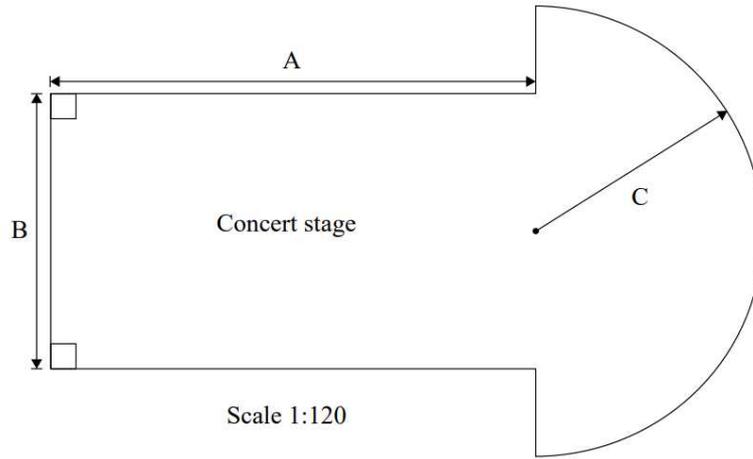
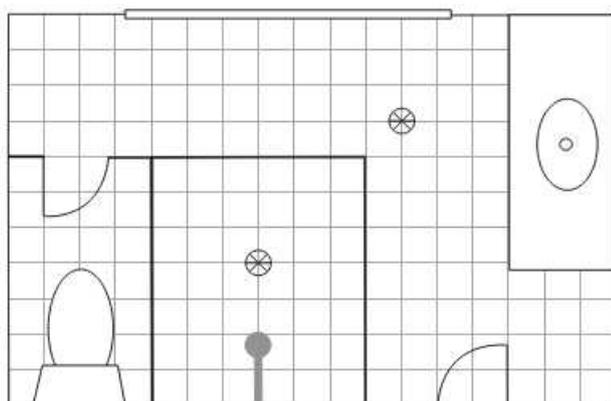|	
2020 **Part B** **Question 10** **Scales, plans** **and models**	The concert stage shown in the scale drawing is to be painted. a) Determine the actual lengths of A, B and C in metres (m). [2 marks] b) One tin of paint can coat an area of 20 square metres (m2). Determine if four tins of paint are enough to coat the concert stage. [3 marks]

2023 Phase 4 Part A Question 5 **Scales, plans and models**	The building plan for a bathroom renovation is shown. a) How many drains are there? [1 mark] b) The plan will be labelled with a scale 10 mm : 50 cm. Interpret what this scale means. [1 mark] The dimensions of the shower on the plan are 35 mm × 30 mm. c) Calculate the actual area of the shower in square metres. [2 marks] A contractor asks the construction company to mail them the building plan, which was weighed at 0.014 g. When weighed on a post office scale, the mass is displayed in milligrams. d) Write the mass in the empty cell of the scale. [1 mark]

a) How many drains are there? [1 mark]

Sample response	The response
2	• correctly states number of drains **[1 mark]**

b) The plan will be labelled with a scale 10 mm : 50 cm. Interpret what this scale means. [1 mark]

Sample response	The response
The scale states that every **10 mm on the plan represents 50 cm in real life** for the bathroom.	• correctly interprets the scale **[1 mark]**

The dimensions of the shower on the plan are 35 mm × 30 mm.

c) Calculate the actual area of the shower in square metres. [2 marks]

Sample response	The response
Area = L × W = 1.75 × 1.50 = 2.625 m²	• correctly applies the scale **[1 mark]** • calculates area **[1 mark]**

A contractor asks the construction company to mail them the building plan, which was weighed at 0.014 g.

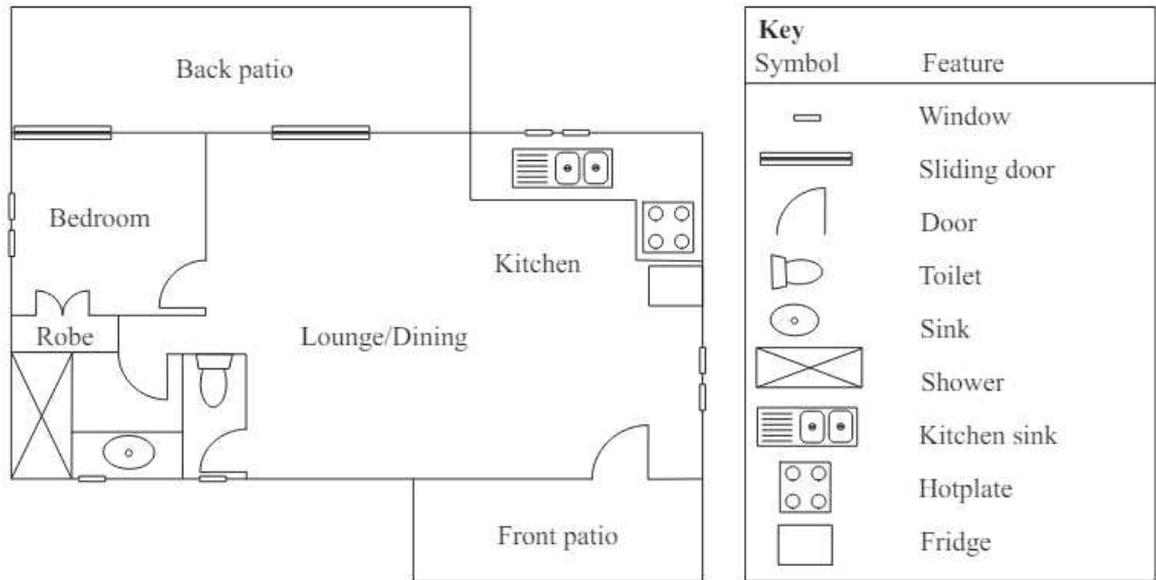When weighed on a post office scale, the mass is displayed in milligrams.

d) Write the mass in the empty cell of the scale. [1 mark]

Sample response	The response
Units mg 14 Mass	• correctly determines the mass **[1 mark]**

**2023
Phase 5
Part A
Question 3**

**Scales, plans
and models**

A couple have drawn a scaled house plan, as shown.

a) How many sliding doors are there? [1 mark]

Sample response	The response
2	• correctly states number of doors [1 mark]

b) The plan is labelled with a scale of 10 mm : 80 cm. Interpret what this scale means. [1 mark]

Sample response	The response
The scale states that every **10 mm** on the plan represents **80 cm** in real life for the house.	• correctly interprets scale [1 mark]

The dimensions of the front patio on the plan are 43 mm × 15 mm.

c) Calculate the actual area of the front patio in square metres. [2 marks]

Sample response	The response
$A = L \times W$ $= 3.44 \times 1.2$ $= 4.128 \text{ m}^2$	• correctly selects an appropriate rule [1 mark] • calculates area [1 mark]

The construction company asks the couple to mail them their house plan, which was weighed at 0.026 g.

When weighed on a post office scale, the mass is displayed in milligrams.

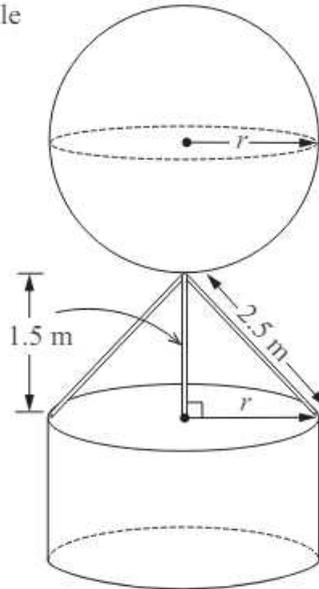d) Write the mass in the empty cell of the scale. [1 mark]

Sample response	The response
Units [mg] 26 Mass	• correctly determines mass [1 mark]

2023 Phase 5 Part A Question 6 Scales, plans and models	A fountain collects water in a sphere that then flows via three tubes into a cylindrical pool, as shown. The radius of the sphere and the cylinder are the same.

Not to scale

1.5 m   2.5 m   r

a) Use Pythagoras' theorem to calculate the radius, r, of the cylinder in metres. [2 marks]

Sample response	The response
$r = \sqrt{(c^2 - a^2)}$ $r = \sqrt{(2.5^2 - 1.5^2)}$ $r = 2$ m	• correctly selects an appropriate rule [1 mark] • calculates radius [1 mark]

b) Use the result from Question 6a) to calculate the volume of the sphere in cubic metres. [2 marks]

Sample response	The response
$V = \frac{4}{3}\pi r^3$ $= \frac{4}{3}\pi(2)^3$ ≈ 33.51 m³	• correctly selects an appropriate rule [1 mark] • calculates volume [1 mark]

c) Use the result from Question 6b) to determine the capacity of the sphere in litres. [1 mark]

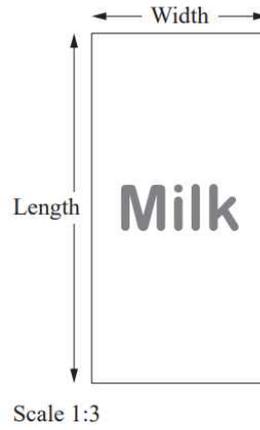| Sample response	The response
Capacity $= 33.51$ kL Capacity ≈ 33510 L	• converts capacity to litres [1 mark]

d) Use the result from Question 6c) to determine the number of times a 12 600 L cylinder can be filled with water from the sphere. [1 mark]

Sample response	The response
Number of times $= 33\,510 \div 12\,600$ ≈ 2.66	• determines number of times [1 mark]

2022 Part A Question 6 Scales, plans and models	The scale diagram shows the rectangular label on a carton of milk.

Scale 1:3

a) Determine the actual width and length of the label in centimetres (cm). [3 marks]

Sample Response	The response
Measured width = 3 cm Measured length = 6 cm	• correctly measures the width and the length [1 mark]
Actual width = 3 cm × 3 = 9 cm	• applies scale of 1:3 to width [1 mark]
Actual length = 6 cm × 3 = 18 cm	• applies scale of 1:3 to length [1 mark]

b) Calculate the actual area of the label in square centimetres (cm²). [1 mark]

| Sample Response	The response
Area of label, $A = bh$ $= 9 \times 18$ $= 162 \text{ cm}^2$	• calculates area of label [1 mark]

The mass of the carton of milk is 1.2 kilograms (kg).
c) What is the mass of the carton of milk in grams (g)? [1 mark]

Sample Response	The response
1200 g	• correctly converts kilograms to grams [1 mark]

| 2021
Part A
Question 4

Scales, plans
and models | A square window is to be fitted with an intersect screen as shown in the scale diagram. |
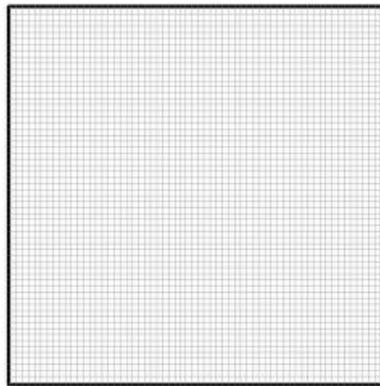
Scale 1:30

Note: the measured side length should be 5cm. This note was not in the exam but has been added in this book in case the printing distorts the size of the square when printed.

a) Determine the actual side length of the square window in metres (m) [3 marks]

Sample Response	The response
Measured side length = 5 cm	• correctly measures the side length [1 mark]
Actual side length = 5 cm × 30	• applies scale of 1:30 [1 mark]
= 150 cm = 1.5 m	• converts to metres [1 mark]

A square piece of mesh with an area of 2 square metres (m²) is available to make the insect screen.
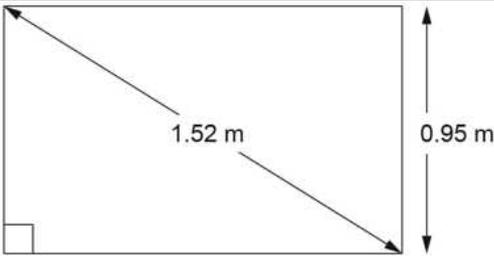b) Use the result from Question 4a) to determine if the square piece of mesh will fit the square window. [2 marks]

Sample Response	The response
Area of square frame, A = bh = 1.5 × 1.5 = 2.25 m²	• calculates area of square frame [1 mark]
The square piece of mesh will not fit the square frame, since 2.25 > 2.	• determines if square piece of mesh will fit square frame [1 mark]

2021 **Part A** **Question 5** **Scales, plans and models**	A rectangular TV screen has a height of 95 centimetres (cm) and a diagonal length of 152 centimetres (cm). a) Sketch a two dimensional representation of the TV screen, labelled with the measurements converted to metres (m). The sketch does not need to be to scale. [2 marks]

Sample Response	The response
152 cm = 1.52 m 95 cm= 0.95 m	• correctly converts centimetres to metres [1 mark]
 1.52 m 0.95 m	• provides a sketch with height and diagonal labelled appropriately [1 mark]

Note: If you make a mistake in the sketch, cancel it by ruling a single diagonal line through your work and use the additional response space on page 20 of this question and response book.

b) Use the sketch from Question 5a) to calculate the width of the TV screen in metres (m), rounded to two decimal places. [3 marks]

Sample Response	The response
Using Pythagoras' theorem $c^2 = a^2 + b^2$ Width (b) $b^2 = c^2 - a^2$ $b^2 = 1.52^2 - 0.95^2$ $b = \sqrt{1.52^2 - 0.95^2}$	• substitutes into appropriate rule [1 mark]
$b \approx 1.186 \ldots$	• calculates width of TV screen [1 mark]
$b \approx 1.19$ m (to 2 d.p.) The width of the TV screen is 1.19 m.	• rounds to two decimal places [1 mark]

2020 Part A Question 2 Scales, plans and models	A scale drawing of a block of land in the shape of a parallelogram is shown.
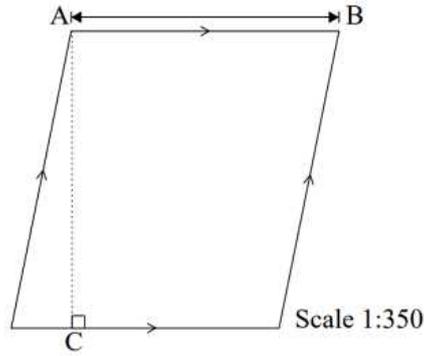
Scale 1:350

a) Determine the actual length of the side labelled AB in metres (m). [2 marks]

Sample Response	The response
Measured length = 4 cm	• correctly measures the length [1 mark]
Actual length = 4 cm × 350 = 1400 cm = 14 m	• applies scale of 1:350 and converts to metres [1 mark]

b) Determine the actual length of the line labelled AC in metres (m). [2 marks]

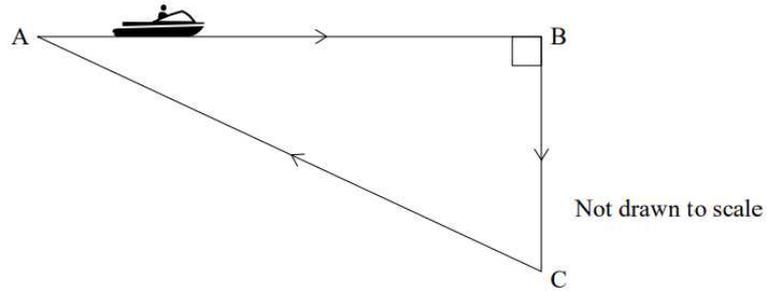| Sample Response	The response
Measured perpendicular height = 4.4 cm	• correctly measures the perpendicular height [1 mark]
Actual perpendicular height = 4.4 cm × 350 = 1540 cm = 15.4 m	• applies scale of 1:350 and converts to metres [1 mark]

c) Calculate the actual area of the block of land, rounded to the nearest (m^2). [2 marks]

Sample Response	The response
Area of block of land = bh = 14 m × 15.4 m	• substitutes into appropriate rule [1 mark]
= 215.6 ≈ 216 m^2	• calculates area rounded to nearest square metre [1 mark]

2020 Part A Question 9 Scales, plans and models	The diagram shows the round trip to be travelled by a boat, starting and ending at A.

The boat will travel 60 kilometres (km) in a straight line from A to B, then 32 kilometres (km) in a straight line from B to C.

a) Use Pythagoras' theorem to calculate the straight-line distance from C to A in kilometres (km). [2 marks]

Sample Response	The response
Using Pythagoras' theorem ($c^2 = a^2 + b^2$) Distance from C to A (c) $c^2 = a^2 + b^2$ $c^2 = 60^2 + 32^2$	• correctly substitutes into appropriate rule [1 mark]
$c = 68$ km	• calculates distance from C to A [1 mark]

The boat has enough fuel to travel 150 kilometres (km).

b) Use the result from 9a) to determine if the boat has enough fuel to complete the round trip. [2 marks]

Sample Response	The response
Distance for round trip = 60 + 32 + 68 = 160 km	• calculates total distance [1 mark]
As 160 km is longer than 150 km, the boat would not have enough fuel to complete the round trip.	• compares distances to determine if round trip is more than 150 km [1 mark]

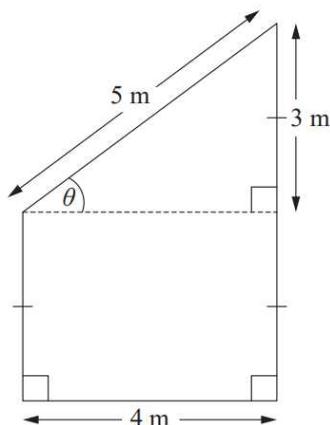|	
2021 **Part B** **Question 10** **Scales, plans and models**	A wall frame in the shape of a trapezium is represented in the scale diagram. The wall frame's actual measurements are shown in metres (m). Diagram to scale a) Measure the scale diagram to determine the scale used to represent the wall frame. Write the scale in simplest form. [2 marks]

Sample Response	The response
Measured width = 4 cm	• correctly measures a labelled dimension [1 mark]
Actual width = 4 m = 400 cm Scale is 1:100	• determines scale in simplest form [1 mark]

b) Calculate the perimeter of the wall frame in metres (m). [1 mark]

Sample Response	The response
Perimeter = 4 + 3 + 3 + 3 + 5 = 18 m	• correctly calculates the perimeter [1 mark]

c) Use trigonometry to calculate angle θ in degrees. [2 marks]

Sample Response	The response
Find θ using sin ratio: $\sin \theta = \dfrac{\text{opposite}}{\text{hypotenuse}}$ $\sin \theta = \dfrac{3}{5}$	• correctly selects and applies an appropriate rigonometric ratio [1 mark]
$\theta = \sin^{-1}\left(\dfrac{3}{5}\right) = 36.87°$	• calculates angle [1 mark]

Jay is using recycled plywood to make a birdhouse in the shape of a triangular prism, as shown.

30 cm 26 cm 30 cm

30 cm 30 cm

Not to scale
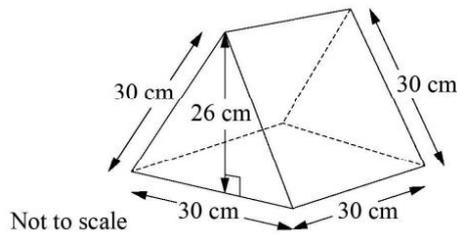
a) Construct a scale drawing of the net of the birdhouse, using a scale of 1:10, in the space provided. The response lines on the next page can be used for your workings [2 marks]

Note: If you make a mistake in the scale drawing, cancel it by ruling a single diagonal line through your work and use the additional response space on page 21 of this question and response book.

| Sample Response	The response
Scaled dimensions: Width of square face and base of triangle = 30 cm ÷ 10 = 3 cm Perpendicular height of triangular face = 26 cm ÷ 10 = 2.6 cm	• correctly converts actual side lengths and perpendicular height using scale [1 mark]
 2.6 cm 3 cm 3 cm * example only	• constructs accurate scale drawing of net showing all faces of birdhouse [1 mark]

b) Calculate the area of plywood required to make the birdhouse in (m^2) [3 marks]

Sample Response	The response
Area of square face, A = bh = 30 × 30 = 900 cm^2	• correctly calculates the square face area [1 mark]
Area of triangular face, $A = \frac{1}{2} bh$ $= \frac{1}{2} \times 30 \times 26 = 390$ cm^2	• correctly calculates the triangular face area [1 mark]
Total area of plywood = area of two triangular faces + area of three square faces = 2 × 390 + 3 × 900 = 3480 cm^2 = 0.348 m^2	• calculates area of plywood [1 mark]

A customer buys cardboard templates that can be folded to make gift boxes in the shape of a triangular based pyramid. The scale drawing shows the net for one cardboard template. The table shows the scale drawing measurements in centimetres (cm).

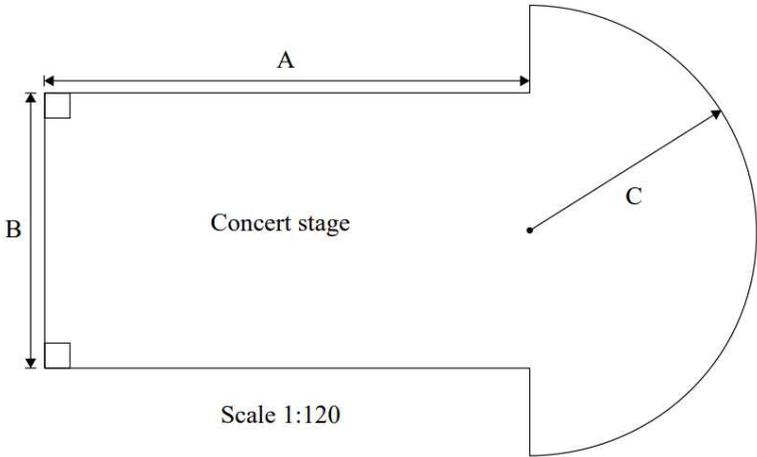Scale 1:2
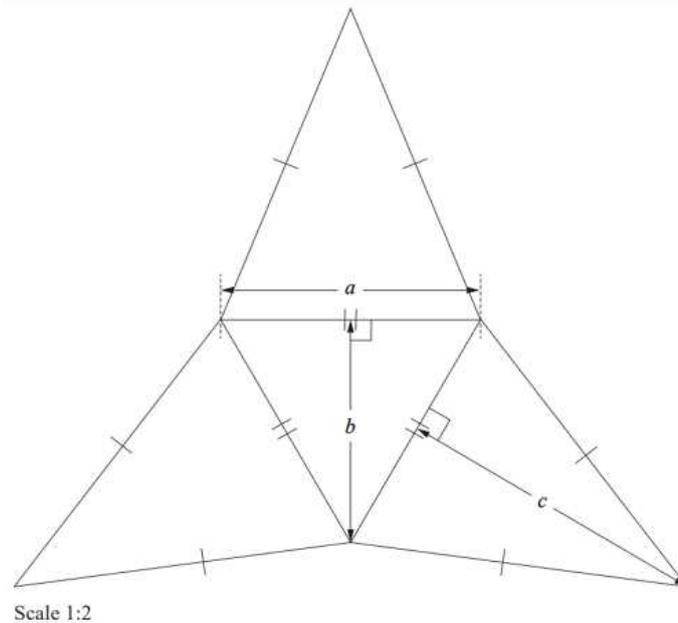
Dimension	Scale drawing measurement (cm)
a	5
b	4.3
c	6

Each cardboard template costs 2 cents per square centimetre (cents/cm^2). The customer assumes they can purchase 8 templates for under $40. Evaluate the reasonableness of this assumption.

Sample Response	The response
Face dimensions. Equilateral triangle: a = 5 cm Actual base length = 5 cm × 2 = 10 cm b = 4.3 cm Actual perpendicular height = 4.3 cm × 2 = 8.6 cm Isosceles triangle: Given base length = 5 cm (as above) Actual base length = 5 cm × 2 = 10 cm (as above) c = 6 cm Actual perpendicular height = 6 cm × 2 = 12 cm	• correctly converts the given base length and perpendicular heights using scale [1 mark]
Face areas. Equilateral triangle: Actual area, $A = \frac{1}{2}bh$ $= \frac{1}{2} \times 10 \times 8.6$ $= 43 \text{cm}^2$ Isosceles triangle: Actual area, $A = \frac{1}{2}bh$ $= \frac{1}{2} \times 10 \times 12$ $= 60 \text{ cm}^2$	• calculates actual area of each face [1 mark]
Surface area of one cardboard template = 43 + 3 × 60 = 223 cm^2	• calculates surface area of one cardboard template [1 mark]

	Cost of one template = 223 cm² × 2 cents/cm2 = 446 cents = $4.46 Cost of 8 templates = 8 × $4.46 = $35.68 $35.68 < $40	• calculates cost of 8 templates [1 mark]
	The customer can purchase 8 templates for $35.68, which is under $40, so their assumption is valid.	• provides a justified statement of reasonableness [1 mark]

2020
Part B
Question 10

Scales, plans and models

The concert stage shown in the scale drawing is to be painted.

Scale 1:120

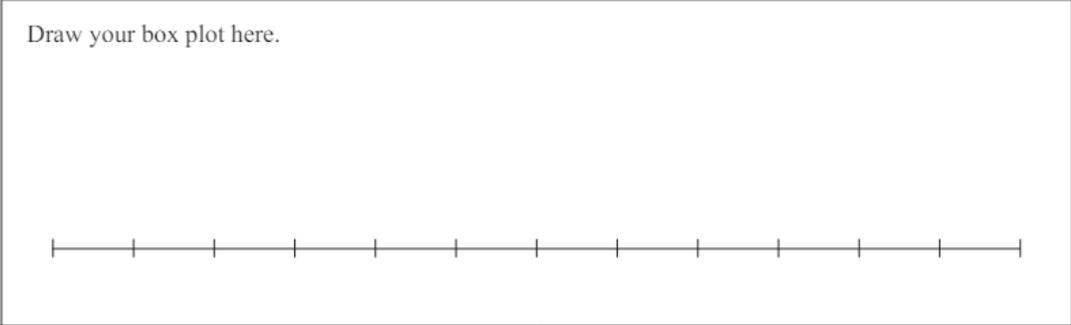a) Determine the actual lengths of A, B and C in metres (m). [2 marks]

Sample Response	The response
A = 7.7 cm × 120 = 924 cm = 9.24 m B = 4.4 cm × 120 = 528 cm = 5.28 m C = 3.6 cm × 120 = 432 cm = 4.32 m	• correctly measures the lengths of A, B and C [1 mark] • applies scale and converts to metres [1 mark]

b) One tin of paint can coat an area of 20 square metres (m2). Determine if four tins of paint are enough to coat the concert stage. [3 marks]

Sample Response	The response
Area of concert stage (composite shape) = area of rectangle + area of semicircle = 9.24 m × 5.28 m + π × (4.32 m)² ÷ 2	• substitutes into appropriate rule for composite shape [1 mark]
= 78.1 m²	• calculates area of concert stage in square metres [1 mark]
4 tins × 20 m²/tin = 80 m² Four tins cover 80 m², which is more than 78.1 m², so this is enough paint.	• makes a justified statement about the number of tins of paint available [1 mark]

Unit 3 – Topic 2: Summarising and comparing data

2023 **Phase 1** **Part A** **Question 2** **Summarising and comparing data**	Students were surveyed about the number of hours they spent on social media each day. The five-number summary in order is 2, 3, 4, 5 and 12. a) Use the five-number summary to construct a box plot. [3 marks] Draw your box plot here. b) Describe the spread of the box plot for the number of hours spent on social media each day. [2 marks]

2023 **Phase 1** **Part A** **Question 4** **Summarising and comparing data**	Students were surveyed to determine how much money they spent on lunch each week. The table shows the amounts rounded to the nearest dollar. Complete the five-number summary for money spent on lunch by writing an appropriate label or value in each empty cell of the table.

8	12	23	36	25	50	42	23	20	45	12

Minimum	Lower quartile (Q_1)			Maximum
	12		42	

2023 Phase 1 Part A Question 6 Summarising and comparing data	Students who walk to school were given a step counter to record their daily steps from home to school, as shown.

240	525	580	621	777	840	855	900	906	1020	1020

a) Determine the modal number of steps. [1 mark]

_____

_____

b) Calculate the mean number of steps, rounded to the nearest whole number. [2 marks]

_____

_____

_____

The school principal claims that the modal number of steps is greater than the mean number of steps.

c) Use the results from Questions 6a) and 6b) to evaluate the reasonableness of their claim. [1 mark]

_____

_____

_____

2023 Phase 2 Part A Question 1 Summarising and comparing data	The table shows the jump heights, in centimetres, of a Year 11 class.

29	22	29	49	30	36	47	37	38	41	45	42	45	41	37

Complete the five-number summary for the jump heights by writing an appropriate label or value in each empty cell of the table.

	Lower quartile (Q_1)	Median		Maximum
	30		45	

_____

_____

_____

2023 Phase 2 Part A Question 4 Summarising and comparing data	Twelve senior students were surveyed about the amount of money, in dollars, they planned to spend on their end-of-school celebrations, as shown.

450	450	700	1000	1000	1000	1200	1500	1500	1800	2000	2500

a) Determine the modal amount of spending money. [1 mark]

b) Calculate the mean amount of spending money. [2 marks]

A student claims that the mean amount of spending money would be less than the modal amount of spending money.

c) Use the results from Questions 4a) and 4b) to evaluate the reasonableness of their claim. [1 mark]

2023 Phase 2 Part A Question 9 **Summarising and comparing data**	A personal trainer collected their daily exercise times from last week. The five-number summary in order is 30, 72, 76, 80 and 85. a) Use the five-number summary to construct a box plot. [3 marks] Draw your box plot here. b) Describe the spread of the box plot for the personal trainer's exercise times last week. [2 marks]

2023 Phase 3 Part A Question 4 **Summarising and comparing data**	A person's body oxygen level test (BOLT) score measures the number of seconds a person lasts before feeling the need to take a breath. The five-number summary for individual scores in order is 26, 27, 30, 34 and 45. a) Use the five-number summary to construct a box plot. [3 marks] Draw your box plot here. b) Describe the spread of the box plot for the BOLT scores. [2 marks]

2023
Phase 3
Part A
Question 6

Summarising
and
comparing
data

A coach recorded the heights of a Year 5 class in centimetres and displayed the results in the table.

125	98	102	100	120	103	118	110	120	125

Complete the five-number summary for the heights by writing an appropriate label or value in each empty cell of the table.

Minimum		Median	Upper quartile (Q_3)	
	102		120	

2023
Phase 3
Part A
Question 8

Summarising
and
comparing
data

A survey revealed the annual amount of money students saved in dollars.

500	500	750	750	1000	1250	1250	1500	1500	1750	1750	1750	2250

a) Determine the modal amount of money saved. [1 mark]

b) Calculate the mean amount of money saved. [2 marks]

The company running the survey claims that the mean amount of money saved is greater than the modal amount of money saved.

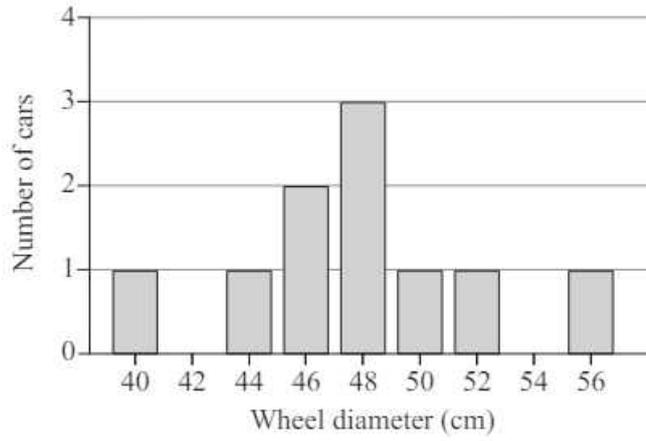c) Use the results from Questions 8a) and 8b) to evaluate the reasonableness of their claim. [1 mark]

2023
Phase 4
Part A
Question 4

Summarising
and
comparing
data

The wheel diameters of 10 different cars are recorded as shown.

a) Calculate the mean wheel diameter. [2 marks]

_____

_____

_____

_____

b) Determine the median wheel diameter. [2 marks]

_____

_____

_____

_____

c) Describe the spread of the dataset. [1 mark]

_____

_____

_____
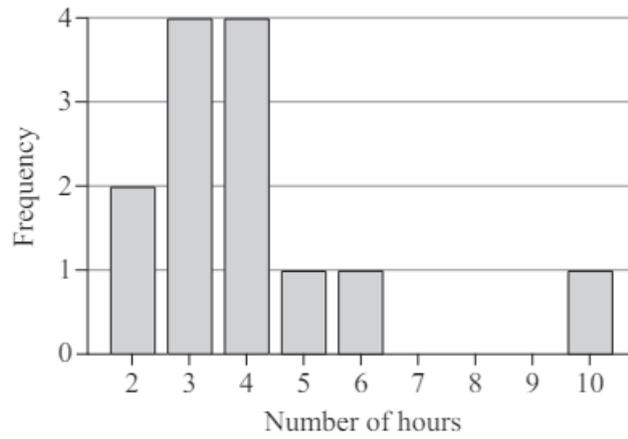
2023
Phase 5
Part A
Question 2

Summarising
and
comparing
data

A parent recorded the time (in hours) their child spent on social media during a school week, as shown.

a) Calculate the median time spent on social media. [2 marks]

b) Determine the mean time spent on social media. [2 marks]

c) Describe the spread of the dataset. [1 mark]

A family donated shoes to a charity. The collection of different shoe sizes is shown.

2	2	2	3	3	4	4	4	4	6	7	8	9

a) Determine the modal shoe size. [1 mark]

b) Complete the five-number summary for the shoe sizes by writing an appropriate value in each empty cell of the table. [2 marks]

Minimum	Lower quartile (Q_1)	Median	Upper quartile (Q_3)	Maximum
	2.5		6.5	

c) Construct a box plot to represent the data. [2 marks]
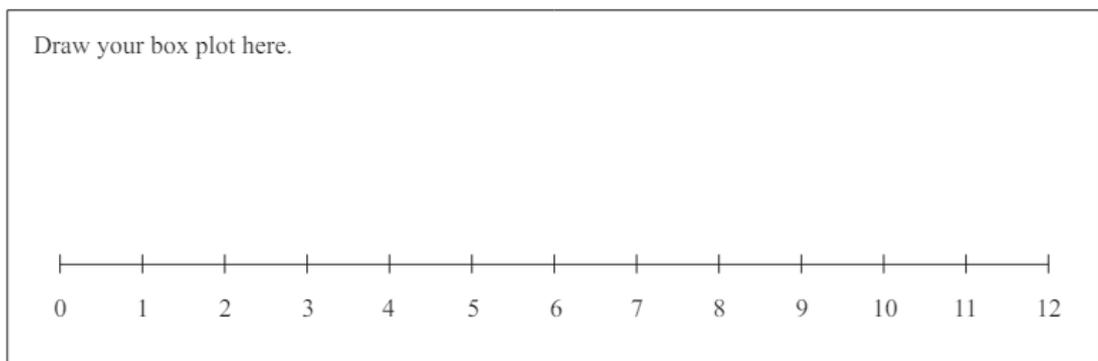
Draw your box plot here.

0   1   2   3   4   5   6   7   8   9   10   11   12

2022 Part A Question 2	Dancers invite family members to a performance. The number of family members invited by 11 dancers is shown in the table.										
Summarising and comparing data											

Dancers invite family members to a performance. The number of family members invited by 11 dancers is shown in the table.

Number of family members	4	1	5	2	3	2	4	2	3	5	2

a) List the values from smallest to largest. [1 mark]

b) Determine the median number of family members. [1 mark]

c) State the modal number of family members. [1 mark]

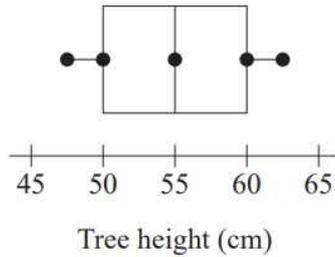d) Calculate the mean number of family members. [2 marks]

2022 Part A Question 5 **Summarising and comparing data**	A council planted trees along Main Street several years ago. The box plot shows the distribution of tree heights, in centimetres (cm), at the time of planting.

Tree height (cm)

a) State the median tree height, in centimetres (cm), at the time of planting. [1 mark]

_____

b) Describe the spread of the box plot for the tree heights at the time of planting. [1 mark]

_____

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All trees have grown in height since being planted. The five-number summary for the current tree heights, in metres (m), is 1.6, 1.8, 2.0, 2.2, 3.0.

c) Use the five-number summary to construct a box plot for the current tree heights. [2 marks]

Draw your box plot here.

Note: If you make a mistake in the box plot, cancel it by ruling a single diagonal line through your work and use the additional response space on page 17 of this question and response book.

d) Describe the spread of the box plot for the current tree heights. [1 mark]

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2022
Part A
Question 9

Summarising
and
comparing
data

Students were surveyed about the distance they travelled to school in kilometres (km). The results for 18 students are shown in the stem-and-leaf plot.

Stem	Leaf
0	1 1 2 3 3 4 5 5 7 9
1	2 2 4 4 6 8
2	0 3

Key: 1|2 = 12 km

Complete the five-number summary for distance travelled by writing an appropriate label or value in each empty cell of the table.

	Lower quartile (Q_1)		Upper quartile (Q_3)	
	3		14	

2021
Part A
Question 7

Summarising
and
comparing
data

Twelve people were surveyed about the number of phone calls they made on a particular day. The results are displayed in the dot plot.

Number of phone calls
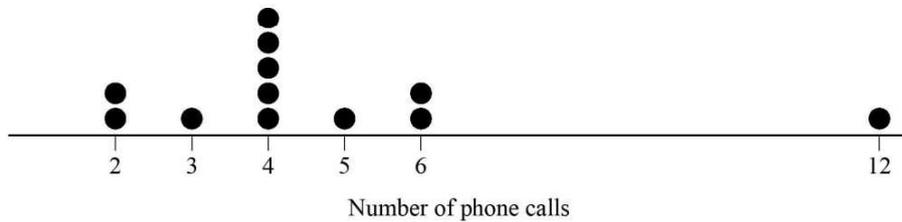
a) Identify the modal number of phone calls. [1 mark]

b) Describe the spread for the number of phone calls. [2 marks]

2021
Part A
Question 8

Summarising
and
comparing
data

A student attended 12 netball training sessions. The number of goals they scored during each training session is recorded in the table.

Number of goals	12	11	6	21	5	10	8	14	18	16	15	16

a) Calculate the mean number of goals scored, rounded to a whole number. [3 marks]

b) Complete the five-number summary for the number of goals scored by writing an appropriate label or value in each empty cell of the table. [4 marks]

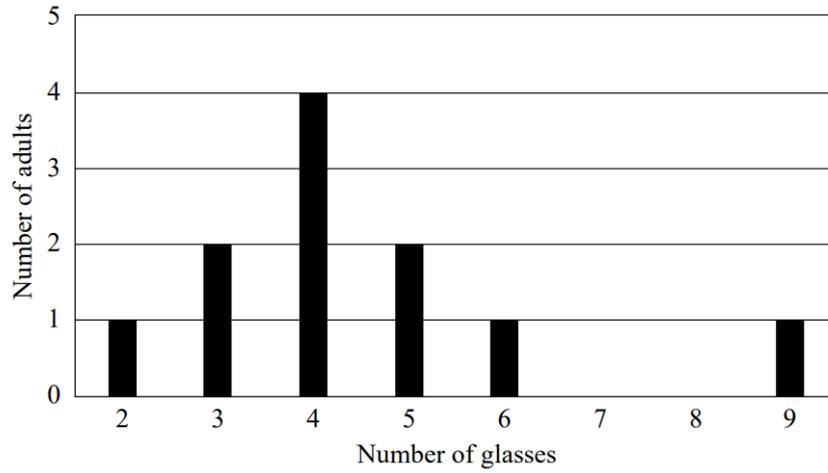|	Lower quartile (Q_1)		Upper quartile (Q_3)	
	9		16	

2020 **Part A** **Question 5** **Summarising and comparing data**	A survey recorded the number of glasses of water consumed by adults in 24 hours. The results from 11 adults are shown in the graph.

a) Identify the modal number of glasses of water consumed. [1 mark]

_____

b) List the 11 survey results in order. [1 mark]

_____

c) Determine the median number of glasses of water consumed. [1 mark]

_____

d) Calculate the mean number of glasses of water consumed. [2 marks]

_____

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_____

_____

e) Describe the spread of the data [1 mark]

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2020
Part A
Question 8

Summarising
and
comparing
data

A customer regularly purchases drinks in a 600-millilitre (mL) cup from a takeaway shop. The data shows the actual volume of nine of the drinks in millilitres (mL).

| Volume (mL) | 580 | 597 | 592 | 573 | 550 | 568 | 556 | 545 | 582 |

Use a five-number summary to construct a box plot for this data.

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Draw your box plot here.

Note: If you make a mistake in the box plot, cancel it by ruling a single diagonal line through your work and use the additional space on page 18 of this question and response book.

2023 Paper 1 Part B Question 11 **Summarising and comparing data**	A film critic claims that sequels earn more opening weekend income, on average, than the original movies. Frequency table 1 shows the total opening weekend income, in millions of dollars ($m), for recent original movies in a series.

Original movies

Total opening weekend income ($m)	Frequency
100	2
110	1
120	2
130	2
140	2
150	2

Frequency table 2 shows the total opening weekend income, in millions of dollars ($m), for recent sequels in a series.

Sequels

Total opening weekend income ($m)	Frequency
110	2
120	2
130	2
140	3
150	2

Use two suitable measures of central tendency to evaluate the reasonableness of the critic's claim. Justify your decision using mathematical reasoning.

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2023 Paper 2 Part B Question 11 **Summarising and comparing data**	A netball coach claims that the average weekly number of points scored by the top goal shooter on the junior team will be less than the average weekly number of points scored by the top goal shooter on the senior team. At the end of the season, the data for the top goal shooters is collected as shown. Investigate the suitability of using measures of central tendencies, excluding the mode, to evaluate the reasonableness of the coach's claim. Justify your decision using mathematical reasoning. (5 marks)

2023 Paper 3 Part B Question 11
 	
Summarising and comparing data
	A teacher claims that, on average, students in their Year 12 class are taller than students in their Year 11 class. The data for the student heights is displayed in the back-to-back stem-and-leaf plot.
	
	Leaf: Year 12 class Stem Leaf: Year 11 class
	
	                   16 7 9
	9 6 5 3 3 2 2 1 0 17 0 1 3 3 6 8
	            7 1 18 1 1
	                  19 7
	
	Key: $17\mid6 = 176$ cm
	
	Investigate the suitability of using measures of central tendencies, excluding the mode, to evaluate the reasonableness of the teacher's claim. Justify your decision using mathematical reasoning. (5 marks)

2023 Paper 4 Part B Question 11	Sharnee is comparing two kinds of potting mix for a sunflower garden. The best potting mix will produce the tallest flowers.

Summarising and comparing data

The growth heights of sunflowers using potting mix A are represented in a box plot.

Growth height (cm)

The growth heights (cm) of sunflowers using potting mix B are shown.

108	105	98	105	99	98	97	98	104	96	100

Sharnee believes that potting mix A is best for growing the tallest sunflowers. Evaluate the reasonableness of this belief. Justify your decision using mathematical reasoning. (5 marks)

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2023 Paper 5 Part B Question 11 **Summarising and comparing data**	Dee had a competition with a neighbour to see who was the better gardener. They both planted the same seedlings and recorded their growth heights over a set period of time The growth heights of Dee's seedlings in centimetres are shown | 14	14	10	21	23	15	11	19	12	12	16 | The growth heights of the neighbour's seedlings are represented as a box plot. Dee grew the tallest plant, while the neighbour had more consistent growth heights. Both claim they are the better gardener. Evaluate the reasonableness of their claims and decide who was the better gardener. Justify your decision using mathematical reasoning. (5 marks)

**2021
Part B
Question 11**

Summarising and comparing data

A newspaper article used histograms to claim that a household could save water by reducing the average number of washing loads completed per week. A reader analysed the data and concluded that each histogram actually shows the same average number of washing loads.

Current number of loads

Number of weeks vs Number of washing loads per week

Reduced number of loads

Number of weeks vs Number of washing loads per week

Use all measures of central tendency to evaluate the reasonableness of the reader's conclusion. Compare the shape of the histograms to identify characteristics that led the newspaper to claim a reduction in the average number of washing loads completed per week.

2020
Part B
Question 11

Summarising
and
comparing
data

The heights of a sample of pine trees growing in two plantations were measured in metres (m). The results are shown.

Plantation A		Plantation B
	0	9
4 2	1	1
5	1	7 7 8 9
4 3 2	2	4
9 9 7 5	2	5 5 6
6	3	1

$1|2 = 12$ metres (m)

It is claimed that the heights of the pine trees in Plantation A are smaller on average and less varied than the heights of the pine trees in Plantation B.

Use a measure of central tendency and a measure of spread to draw a conclusion about this claim. [5 marks]

2023 Phase 1 Part A Question 2 **Summarising and comparing data**	Students were surveyed about the number of hours they spent on social media each day. The five-number summary in order is 2, 3, 4, 5 and 12.

a) Use the five-number summary to construct a box plot. [3 marks]

Sample response	The response
Draw your box plot here.	• correctly labels appropriate scale on number line [1 mark] • correctly draws box section [1 mark] • draws whisker sections connecting to box [1 mark]

b) Describe the spread of the box plot for the number of hours spent on social media each day. [2 marks]

Sample response	The response
The data is **clustered between 3 and 5**. There is an **outlier of 12**.	• identifies data is clustered [1 mark] • identifies an outlier [1 mark]

2023 Phase 1 Part A Question 4 **Summarising and comparing data**	Students were surveyed to determine how much money they spent on lunch each week. The table shows the amounts rounded to the nearest dollar.

8	12	23	36	25	50	42	23	20	45	12

Complete the five-number summary for money spent on lunch by writing an appropriate label or value in each empty cell of the table.

Minimum	Lower quartile (Q_1)			Maximum
	12		42	

Sample response	The response
	• correctly adds appropriate headings [1 mark] • correctly orders values [1 mark] • correctly determines minimum and maximum values [1 mark] • correctly determines median [1 mark]

Students who walk to school were given a step counter to record their daily steps from home to school, as shown.

| 240 | 525 | 580 | 621 | 777 | 840 | 855 | 900 | 906 | 1020 | 1020 |

a) Determine the modal number of steps. [1 mark]

Sample response	The response
Mode = 1020	• correctly determines mode **[1 mark]**

b) Calculate the mean number of steps, rounded to the nearest whole number. [2 marks]

Sample response	The response
$\text{Mean} = \dfrac{\sum x}{n}$ $= \dfrac{8284}{11}$ $= 753.09$ steps $= 753$ steps (to the nearest whole number)	• correctly uses an appropriate strategy **[1 mark]** • calculates mean and rounds appropriately **[1 mark]**

The school principal claims that the modal number of steps is greater than the mean number of steps.

c) Use the results from Questions 6a) and 6b) to evaluate the reasonableness of their claim. [1 mark]

Sample response	The response
1020 > 753 so the principal's claim is very reasonable.	• provides a justified decision linked to prior reasoning **[1 mark]**

The table shows the jump heights, in centimetres, of a Year 11 class.

| 29 | 22 | 29 | 49 | 30 | 36 | 47 | 37 | 38 | 41 | 45 | 42 | 45 | 41 | 37 |

Complete the five-number summary for the jump heights by writing an appropriate label or value in each empty cell of the table.

Sample response	The response
<table><tr><td>Minimum</td><td>Lower quartile (Q_1)</td><td>Median</td><td>Upper quartile (Q_3)</td><td>Maximum</td></tr><tr><td>22</td><td>30</td><td>38</td><td>45</td><td>49</td></tr></table> 22, 29, 29, 30, 36, 37, 37, 38, 41, 41, 42, 45, 45, 47, 49	• correctly adds appropriate headings **[1 mark]** • correctly orders values **[1 mark]** • correctly determines minimum and maximum values **[1 mark]** • correctly determines median **[1 mark]**

2023 Phase 2 Part A Question 4 **Summarising and comparing data**	Twelve senior students were surveyed about the amount of money, in dollars, they planned to spend on their end-of-school celebrations, as shown.

450	450	700	1000	1000	1000	1200	1500	1500	1800	2000	2500

a) Determine the modal amount of spending money. [1 mark]

Sample response	The response
Mode = $1000	• correctly determines mode **[1 mark]**

b) Calculate the mean amount of spending money. [2 marks]

Sample response	The response
Mean $= \dfrac{\sum x}{n}$ $= \dfrac{15\ 100}{12}$ $= \$1258.33$	• correctly uses an appropriate strategy **[1 mark]** • calculates mean **[1 mark]**

A student claims that the mean amount of spending money would be less than the modal amount of spending money.

c) Use the results from Questions 4a) and 4b) to evaluate the reasonableness of their claim. [1 mark]

Sample response	The response
Since $1258.33 > $1000, the student's claim is not reasonable.	• provides a justified decision linked to prior reasoning **[1 mark]**

2023 Phase 2 Part A Question 9 **Summarising and comparing data**	A personal trainer collected their daily exercise times from last week. The five-number summary in order is 30, 72, 76, 80 and 85.

a) Use the five-number summary to construct a box plot. [3 marks]

Sample response	The response
Draw your box plot here.	• correctly labels appropriate scale on number line **[1 mark]** • correctly draws box section **[1 mark]** • draws whisker sections connecting to box **[1 mark]**

b) Describe the spread of the box plot for the personal trainer's exercise times last week. [2 marks]

Sample response	The response
The **middle 50%** of the times **are evenly spread** out. There is an **outlier at 30** minutes.	• identifies data is evenly distributed around the box section **[1 mark]** • identifies an outlier **[1 mark]**

2023 **Phase 3** **Part A** **Question 4** **Summarising and comparing data**	A person's body oxygen level test (BOLT) score measures the number of seconds a person lasts before feeling the need to take a breath. The five-number summary for individual scores in order is 26, 27, 30, 34 and 45. a) Use the five-number summary to construct a box plot. [3 marks]

Sample response	The response
Draw your box plot here. 24 26 28 30 32 34 36 38 40 42 44 46 48	• correctly labels appropriate scale on number line **[1 mark]** • correctly draws box section **[1 mark]** • draws whisker sections connecting to box **[1 mark]**

b) Describe the spread of the box plot for the BOLT scores. [2 marks]

Sample response	The response
The **middle 50%** of the scores **are evenly spread out.** There is an **outlier** BOLT score **of 45 seconds.**	• identifies data is evenly distributed around the box section **[1 mark]** • identifies an outlier **[1 mark]**

2023 **Phase 3** **Part A** **Question 6** **Summarising and comparing data**	A coach recorded the heights of a Year 5 class in centimetres and displayed the results in the table.

125	98	102	100	120	103	118	110	120	125

Complete the five-number summary for the heights by writing an appropriate label or value in each empty cell of the table.

Minimum		Median	Upper quartile (Q_3)	
	102		120	

Sample response					The response
Minimum	Lower quartile (Q_1)	Median	Upper quartile (Q_3)	Maximum	• correctly adds appropriate headings **[1 mark]** • correctly orders values **[1 mark]** • correctly determines minimum and maximum values **[1 mark]** • correctly determines median **[1 mark]**
98	102	114	120	125	
98, 100, 102, 103, 110, 118, 120, 120, 125, 125					

2023 Phase 3 Part A Question 8	A survey revealed the annual amount of money students saved in dollars.

500	500	750	750	1000	1250	1250	1500	1500	1750	1750	1750	2250

Summarising and comparing data

a) Determine the modal amount of money saved. [1 mark]

Sample response	The response
Mode = $1750	• correctly determines mode [1 mark]

b) Calculate the mean amount of money saved. [2 marks]

Sample response	The response
$Mean = \dfrac{\sum x}{n}$ $= \dfrac{16500}{13}$ $\approx \$1269.23$	• correctly uses an appropriate strategy [1 mark] • calculates mean [1 mark]

The company running the survey claims that the mean amount of money saved is greater than the modal amount of money saved.
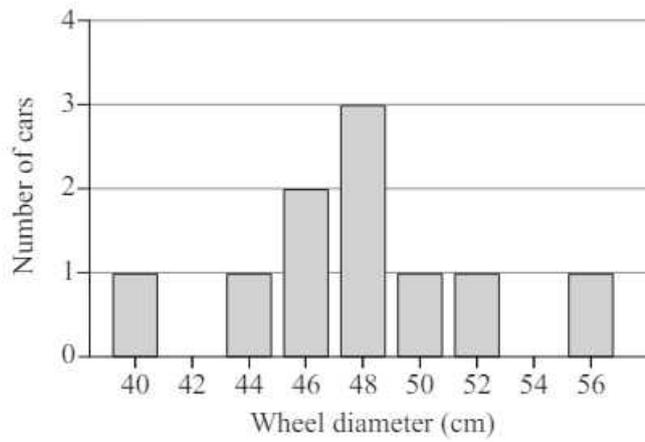
c) Use the results from Questions 8a) and 8b) to evaluate the reasonableness of their claim. [1 mark]

Sample response	The response
$1269.23 < $1750 so the claim is not reasonable.	• provides a justified decision linked to prior reasoning [1 mark]

	The wheel diameters of 10 different cars are recorded as shown.
2023 Phase 4 Part A Question 4 **Summarising and comparing data**	

a) Calculate the mean wheel diameter. [2 marks]

Sample response	The response
Mean $= \dfrac{\sum x}{n}$ $\bar{x} = \dfrac{478}{10}$ $\bar{x} = 47.8$ cm	• correctly uses an appropriate strategy **[1 mark]** • calculates mean **[1 mark]**

b) Determine the median wheel diameter. [2 marks]

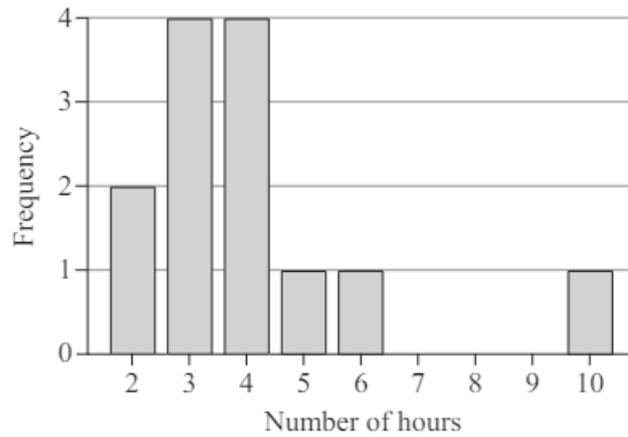| Sample response	The response
40, 44, 46, 46, 48 | 48, 48, 50, 52, 56 Median = 48 cm	• correctly uses an appropriate strategy **[1 mark]** • calculates median **[1 mark]**

c) Describe the spread of the dataset. [1 mark]

Sample response	The response
Data is **tightly packed around** the middle between 46 and 48-cm wheel sizes.	• correctly identifies data is clustered **[1 mark]**

A parent recorded the time (in hours) their child spent on social media during a school week, as shown.

a) Calculate the median time spent on social media. [2 marks]

Sample response	The response
2, 2, 3, 3, 3, 3, 4, 4, 4, 4, 5, 6, 10 Median = **4** hours	• correctly uses an appropriate strategy **[1 mark]** • calculates median **[1 mark]**

b) Determine the mean time spent on social media. [2 marks]

Sample response	The response
Mean $= \frac{\sum x}{n}$ $\bar{x} = \frac{53}{13}$ $\bar{x} \approx$ **4.0769** hours	• correctly uses an appropriate strategy **[1 mark]** • calculates mean **[1 mark]**

c) Describe the spread of the dataset. [1 mark]

Sample response	The response
There is a possible **outlier** of 10 hours.	• correctly describes spread of the dataset **[1 mark]**

A family donated shoes to a charity. The collection of different shoe sizes is shown.

2	2	2	3	3	4	4	4	4	6	7	8	9

a) Determine the modal shoe size. [1 mark]

Sample response	The response
4	• correctly identifies mode **[1 mark]**

b) Complete the five-number summary for the shoe sizes by writing an appropriate value in each empty cell of the table. [2 marks]

Sample response					The response
Minimum	Lower quartile (Q_1)	Median	Upper quartile (Q_3)	Maximum	• correctly identifies median **[1 mark]** • correctly identifies minimum and maximum values **[1 mark]**
2	2.5	4	6.5	9	

c) Construct a box plot to represent the data. [2 marks]

Sample response	The response
Draw your box plot here.	• draws box section **[1 mark]** • draws whisker sections connecting to box **[1 mark]**

2022 Part A Question 2 Summarising and comparing data	Dancers invite family members to a performance. The number of family members invited by 11 dancers is shown in the table.

Number of family members	4	1	5	2	3	2	4	2	3	5	2

a) List the values from smallest to largest. [1 mark]

Sample Response	The response
1, 2, 2, 2, 2, 3, 3, 4, 4, 5, 5	• correctly lists the values from smallest to largest [1 mark]

b) Determine the median number of family members. [1 mark]

Sample Response	The response
3	• determines median [1 mark]

c) State the modal number of family members. [1 mark]

Sample Response	The response
2	• correctly identifies the mode [1 mark]

d) Calculate the mean number of family members. [2 marks]

Sample Response	The response
Mean $= \frac{\sum x}{n}$ $= \frac{33}{11}$	• correctly shows use of an appropriate strategy [1 mark]
$= 3$ family members	• calculates mean [1 mark]

2022 Part A Question 5 Summarising and comparing data	A council planted trees along Main Street several years ago. The box plot shows the distribution of tree heights, in centimetres (cm), at the time of planting.
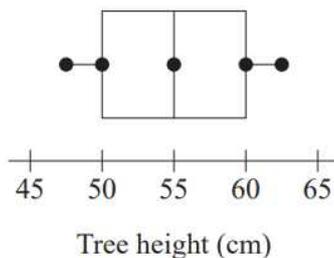
Tree height (cm)

a) State the median tree height, in centimetres (cm), at the time of planting. [1 mark]

Sample Response	The response
55	• correctly states the median [1 mark]

b) Describe the spread of the box plot for the tree heights at the time of planting. [1 mark]

Sample Response	The response
The box plot is symmetrical around 55 cm	• correctly identifies box plot is symmetrical [1 mark]

All trees have grown in height since being planted. The five-number summary for the current tree heights, in metres (m), is 1.6, 1.8, 2.0, 2.2, 3.0.

c) Use the five-number summary to construct a box plot for the current tree heights. [2 marks]

Sample Response	The response
Draw your box plot here. 	• correctly plots a value from the five-number summary using an appropriate scale [1 mark] • correctly constructs box plot using an appropriate scale [1 mark]

d) Describe the spread of the box plot for the current tree heights. [1 mark]

Sample Response	The response
The box plot is positively skewed	• identifies box plot is not symmetrical [1 mark]

2022 Part A Question 9 Summarising and comparing data	Students were surveyed about the distance they travelled to school in kilometres (km). The results for 18 students are shown in the stem-and-leaf plot.

Key: 1|2 = 12 km

Complete the five-number summary for distance travelled by writing an appropriate label or value in each empty cell of the table.

Sample Response	The response
Median = middle score = 8 Minimum = 1 Maximum = 23	• correctly determines the median [1 mark] • correctly determines the minimum and maximum [1 mark]
Five-number summary:	• enters appropriate labels and corresponding values into table [1 mark]

Minimum	Lower quartile (Q₁)	Median	Upper quartile (Q₃)	Maximum
1	3	8	14	23

2021 Part A Question 7 Summarising and comparing data	Twelve people were surveyed about the number of phone calls they made on a particular day. The results are displayed in the dot plot.

Number of phone calls

a) Identify the modal number of phone calls. [1 mark]

Sample Response	The response
4	• correctly identifies the mode [1 mark]

b) Describe the spread for the number of phone calls. [2 marks]

Sample Response	The response
The number of phone calls is clustered around 4. There is an outlier of 12 phone calls.	• correctly identifies data is clustered [1 mark] • correctly identifies presence of an outlier [1 mark]

**2021
Part A
Question 8**

**Summarising
and
comparing
data**

A student attended 12 netball training sessions. The number of goals they scored during each training session is recorded in the table.

Number of goals	12	11	6	21	5	10	8	14	18	16	15	16

a) Calculate the mean number of goals scored, rounded to a whole number. [3 marks]

Sample Response	The response
Mean $= \frac{\sum x}{n}$ $= \frac{152}{12}$	• correctly substitutes into appropriate rule [1 mark]
$= 12.66\ldots$	• calculates mean [1 mark]
≈ 13 goals	• rounds to whole number [1 mark]

b) Complete the five-number summary for the number of goals scored by writing an appropriate label or value in each empty cell of the table. [4 marks]
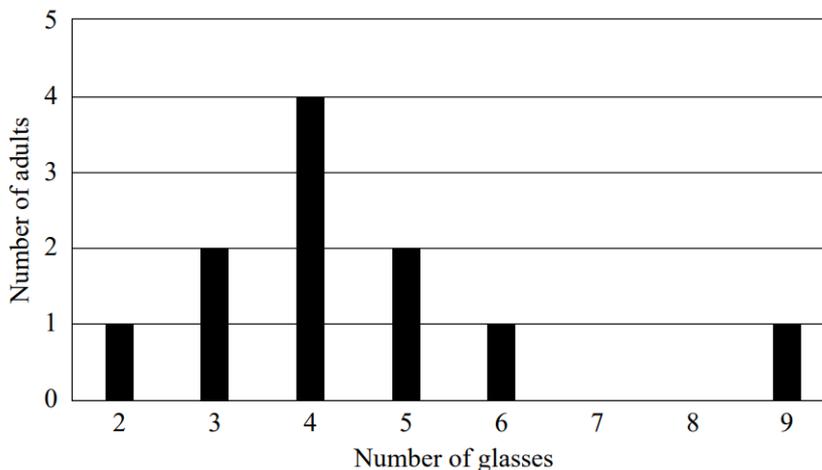
	Lower quartile (Q_1)		Upper quartile (Q_3)	
	9		16	

Sample Response	The response
5, 6, 8, 10, 11, 12, 14, 15, 16, 16, 18, 21	• correctly orders the values [1 mark]
Median = middle score = 13	• correctly determines the median [1 mark]
Minimum = 5 Maximum = 21	• correctly determines the minimum and maximum [1 mark]
Five-number summary: <table><tr><td>min</td><td>Q₁</td><td>median</td><td>Q₃</td><td>max</td></tr><tr><td>5</td><td>9</td><td>13</td><td>16</td><td>21</td></tr></table>	• enters appropriate labels and corresponding values into table [1 mark]

2020 Part A Question 5 Summarising and comparing data	A survey recorded the number of glasses of water consumed by adults in 24 hours. The results from 11 adults are shown in the graph.

a) Identify the modal number of glasses of water consumed. [1 mark]

Sample Response	The response
4 glasses	•correctly identifies the mode [1 mark]

b) List the 11 survey results in order. [1 mark]

Sample Response	The response
2 3 3 4 4 4 4 5 5 6 9	• correctly orders the values [1 mark]

c) Determine the median number of glasses of water consumed. [1 mark]

Sample Response	The response
4	• determines median [1 mark]

d) Calculate the mean number of glasses of water consumed. [2 marks]

Sample Response	The response
$\text{Mean} = \frac{\text{sum of all data values}}{\text{number of data values}}$ $= \frac{(2 + 3 + 3 + 4 + 4 + 4 + 4 + 5 + 5 + 6 + 9)}{11}$ $= \frac{49}{11}$	• correctly substitutes into an appropriate rule [1 mark]
$= 4.\overline{45}$	• calculates mean [1 mark]

e) Describe the spread of the data [1 mark]

Sample Response	The response
The data is clustered around 4 glasses.	• describes at least one valid aspect of the spread of data [1 mark]

2020 **Part A** **Question 8** **Summarising and comparing data**	A customer regularly purchases drinks in a 600-millilitre (mL) cup from a takeaway shop. The data shows the actual volume of nine of the drinks in millilitres (mL). | Volume (mL)	580	597	592	573	550	568	556	545	582
---|---|---|---|---|---|---|---|---|---| Use a five-number summary to construct a box plot for this data. | Sample Response	The response
545 550 556 568 573 580 582 592 597	• correctly orders the values [1 mark]
Lowest value = 545 1st quartile = 553 Median = 573 3rd quartile = 587 Highest value = 597	• correctly determines the 1st quartile [1 mark] • correctly determines the median [1 mark] • correctly determines the 3rd quartile [1 mark]
Draw your box plot here. 	• accurately constructs box plot using an appropriate scale [1 mark] | Note: If you make a mistake in the box plot, cancel it by ruling a single diagonal line through your work and use the additional space on page 18 of this question and response book.

2023 Paper 1 Part B Question 11 **Summarising and comparing data**	A film critic claims that sequels earn more opening weekend income, on average, than the original movies. Frequency table 1 shows the total opening weekend income, in millions of dollars ($m), for recent original movies in a series. **Original movies** | Total opening weekend income ($m)	Frequency
100	2
110	1
120	2
130	2
140	2
150	2 | Frequency table 2 shows the total opening weekend income, in millions of dollars ($m), for recent sequels in a series. **Sequels** | Total opening weekend income ($m)	Frequency
110	2
120	2
130	2
140	3
150	2	

Use two suitable measures of central tendency to evaluate the reasonableness of the critic's claim. Justify your decision using mathematical reasoning.
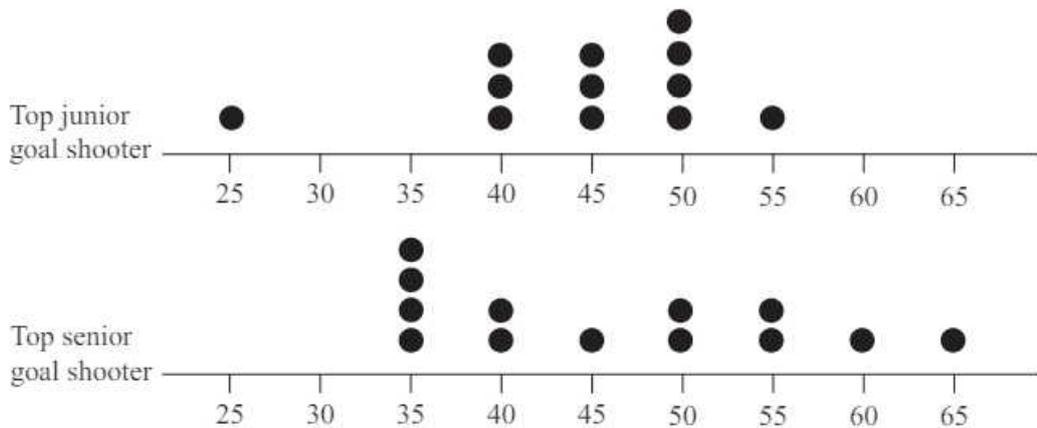
Sample response	The response
Original Movies: $\text{mean} = \dfrac{\sum x}{n}$ $\text{mean} = \dfrac{1390}{11}$ $\text{mean} \approx \$126.36 \text{ m}$ $\text{median} = \$130 \text{ m}$ Sequel Movies: $\text{mean} = \dfrac{1440}{11}$ $\text{mean} \approx \$130.91 \text{ m}$ $\text{median} = \$130 \text{ m}$ The medians are the same for original and sequel movies but the mean for sequel movies is higher than the mean for original movies. So, using the mean the critic's claim is reasonable to suggest that sequel movies earn more on opening weekends than their original movies, because $131 million is more than $126 million.	• correctly determines original movie mean **[1 mark]** • correctly determines original movie median **[1 mark]** • correctly determines sequel movie mean **[1 mark]** • correctly determines sequel movie median **[1 mark]** • provides a justified statement of reasonableness **[1 mark]**

**2023
Paper 2
Part B
Question 11**

Summarising and comparing data

A netball coach claims that the average weekly number of points scored by the top goal shooter on the junior team will be less than the average weekly number of points scored by the top goal shooter on the senior team.

At the end of the season, the data for the top goal shooters is collected as shown.

Investigate the suitability of using measures of central tendencies, excluding the mode, to evaluate the reasonableness of the coach's claim. Justify your decision using mathematical reasoning. (5 marks)
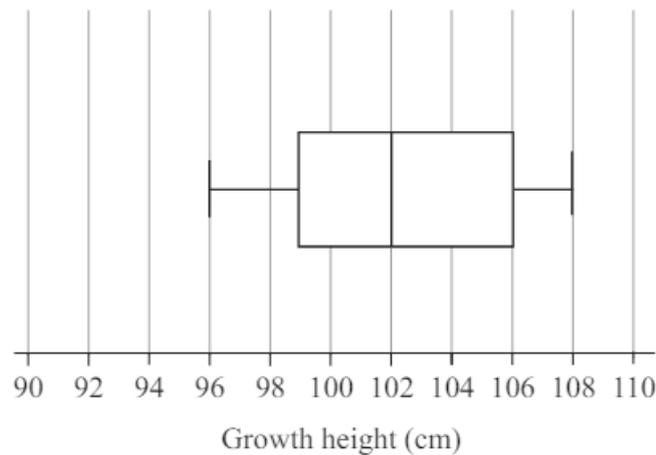
Sample response	The response
Junior top goal shooter data: $\text{mean} = \dfrac{\sum x}{n}$ $\text{mean} = \dfrac{535}{12}$ $\text{mean} \approx \mathbf{44.58}$ $\text{median} = \mathbf{45}$ Senior top goal shooter data: $\text{mean} = \dfrac{600}{13}$ $\text{mean} \approx \mathbf{46.15}$ $\text{median} = \mathbf{45}$ The median weekly number of goals for both top goal shooters are the same, but the mean weekly number of goals achieved by the junior goal shooter is less than the mean weekly number of goals achieved by the senior goal shooter. Therefore, the coach's claim is quite reasonable, because an outlier score (25) from the junior goal shooter was included in the calculation, which greatly decreased the mean.	• correctly calculates top junior goal shooter mean [1 mark] • correctly calculates top junior goal shooter median [1 mark] • correctly calculates top senior goal shooter mean [1 mark] • correctly calculates top senior goal shooter median [1 mark] • provides a justified statement of reasonableness [1 mark]

**2023
Paper 3
Part B
Question 11**

**Summarising
and
comparing
data**

A teacher claims that, on average, students in their Year 12 class are taller than students in their Year 11 class. The data for the student heights is displayed in the back-to-back stem-and-leaf plot.

Leaf: Year 12 class	Stem	Leaf: Year 11 class
	16	7 9
9 6 5 3 3 2 2 1 0	17	0 1 3 3 6 8
7 1	18	1 1
	19	7

Key: $17\,|\,6 = 176$ cm

Investigate the suitability of using measures of central tendencies, excluding the mode, to evaluate the reasonableness of the teacher's claim. Justify your decision using mathematical reasoning. (5 marks)

Sample response	The response
Year 12 data: $$\text{mean} = \frac{\sum x}{n}$$ $$\text{mean} = \frac{1929}{11}$$ **mean** $\approx$ **175.36** cm **median** $\approx$ **173** cm Year 11 data: $$\text{mean} = \frac{1936}{11}$$ **mean** $\approx$ **176** cm **median** $\approx$ **173** cm The medians for both classes are the same but the mean for the Year 12 class is less than the mean for the Year 11 class. So 'on average' it is not reasonable for the teacher to claim that the Year 12 class is taller than the Year 11 class, because an outlier from the Year 11 class (197 cm) was included in the calculation, which greatly increased the mean.	• correctly calculates Year 12 mean **[1 mark]** • correctly calculates Year 12 median **[1 mark]** • correctly calculates Year 11 mean **[1 mark]** • correctly calculates Year 11 median **[1 mark]** • provides a justified statement of reasonableness **[1 mark]**

2023 Paper 4 Part B Question 11 **Summarising and comparing data**	Sharnee is comparing two kinds of potting mix for a sunflower garden. The best potting mix will produce the tallest flowers. The growth heights of sunflowers using potting mix A are represented in a box plot.

Growth height (cm)

The growth heights (cm) of sunflowers using potting mix B are shown.

108	105	98	105	99	98	97	98	104	96	100

Sharnee believes that potting mix A is best for growing the tallest sunflowers. Evaluate the reasonableness of this belief. Justify your decision using mathematical reasoning. (5 marks)

Sample response	The response
Five-number summary of growth heights using potting mix A: 	Min	Q_1	Med	Q_3	Max
---	---	---	---	---
96	99	102	106	108 | Five-number summary of growth heights using potting mix B: | Min	Q_1	Med	Q_3	Max
---	---	---	---	---
96	98	99	105	108	 Almost 75% of potting mix A's sunflowers were of the same height or greater than potting mix B's median, i.e. 50% of potting mix B's sunflowers were shorter than the majority of potting mix A's sunflowers. Potting mix A's median growth heights are higher than potting mix B's median growth heights (median A = 102 cm > median B = 99 cm). This suggests that potting mix B has less favourable growth heights. Sharnee's belief is reasonable as potting mix A provides consistently taller sunflowers.	• correctly determines five-number summary for growth heights using potting mix A data **[1 mark]** • correctly determines five-number summary for growth heights using potting mix B data **[1 mark]** • interprets quartile growth heights using both potting mixes data **[1 mark]** • interprets median growth heights using both potting mixes data **[1 mark]** • provides a justified statement of reasonableness **[1 mark]**

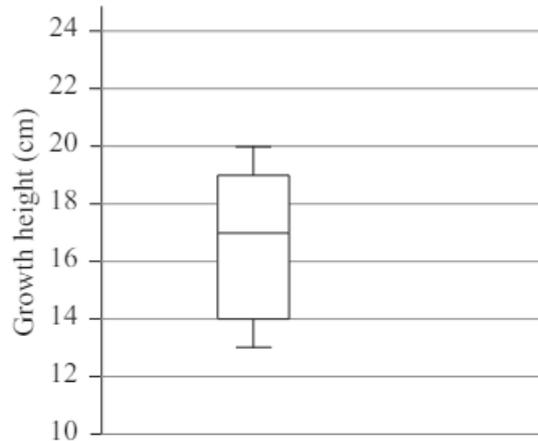|	
2023 **Paper 5** **Part B** **Question 11** **Summarising** **and** **comparing** **data**	Dee had a competition with a neighbour to see who was the better gardener. They both planted the same seedlings and recorded their growth heights over a set period of time The growth heights of Dee's seedlings in centimetres are shown

14	14	10	21	23	15	11	19	12	12	16

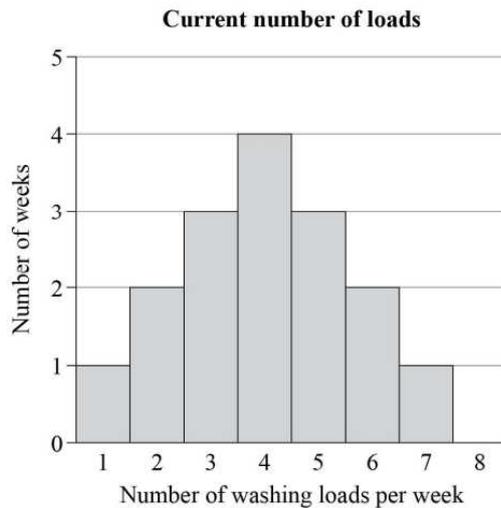The growth heights of the neighbour's seedlings are represented as a box plot. (5 marks)

Dee grew the tallest plant, while the neighbour had more consistent growth heights. Both claim they are the better gardener. Evaluate the reasonableness of their claims and decide who was the better gardener. Justify your decision using mathematical reasoning

Sample response	The response
Dee's five-number summary (from table data): 	Min	Q₁	Med	Q₃	Max	 |---|---|---|---|---|
10	12	14	19	23 | Neighbour's five-number summary (from box plot): | Min	Q₁	Med	Q₃	Max | |---|---|---|---|---|
13	14	17	19	20	 Almost 75% of the neighbour's plants were of the same height or greater than Dee's median, i.e. 50% of Dee's plants were smaller than the majority of the neighbour's plants.	• correctly determines five-number summary for growth heights for Dee's seedlings **[1 mark]** • correctly determines five-number summary for growth heights for neighbour's seedlings **[1 mark]** • interprets median growth heights of seedlings for Dee and neighbour **[1 mark]**
Neighbour's range has the same numerical value as Dee's IQR (i.e. neighbour's range = 7 cm and Dee's IQR = 7 cm). This suggests Dee's seedlings have less favourable growth heights, therefore not as consistent as the neighbour's. Neighbour's claim is reasonable and would be deemed as the better gardener due to more consistent growth heights.	• interprets ranges of seedlings' growth heights for Dee and neighbour **[1 mark]** • provides a justified statement of reasonableness **[1 mark]**

2021 Part B Question 11 Summarising and comparing data	A newspaper article used histograms to claim that a household could save water by reducing the average number of washing loads completed per week. A reader analysed the data and concluded that each histogram actually shows the same average number of washing loads.

Current number of loads

Reduced number of loads

Use all measures of central tendency to evaluate the reasonableness of the reader's conclusion. Compare the shape of the histograms to identify characteristics that led the newspaper to claim a reduction in the average number of washing loads completed per week.

Sample Response	The response
Data generated from the 1st histogram: 1 2 2 3 3 3 4 4 4 4 5 5 5 6 6 7 Mode = 4 Median = middle value = 4 Mean = $\frac{\sum x}{n}$ $= \frac{64}{16}$ $= 4$ Data generated from the 2nd histogram: 2 2 2 2 2 3 3 3 4 4 4 5 6 7 7 8 Mode = 2 Median = middle value = 3.5 Mean = $\frac{\sum x}{n}$ $= \frac{64}{16}$ $= 4$	• correctly identifies the mode for each dataset [1 mark] • correctly calculates median for each dataset [1 mark] • correctly calculates mean for each dataset [1 mark]
The mean is the same for both datasets, as is the total number of washing loads. Therefore, the reader's conclusion is valid.	• provides a justified statement about the reasonableness of the reader's conclusion [1 mark]
The first histogram is symmetrical and shows that in most weeks the household currently completes 4 loads of washing. The second histogram is positively skewed and shows that in most weeks the household could complete 2 loads of washing. This led the newspaper to claim a reduction in the average number of washing loads completed per week.	• provides a comparative statement about the shape of the histograms [1 mark]

2020
Part B
Question 11

Summarising
and
comparing
data

The heights of a sample of pine trees growing in two plantations were measured in metres (m). The results are shown.

Plantation A		Plantation B
	0	9
4 2	1	1
5	1	7 7 8 9
4 3 2	2	4
9 9 7 5	2	5 5 6
6	3	1

$1|2 = 12$ metres (m)

It is claimed that the heights of the pine trees in Plantation A are smaller on average and less varied than the heights of the pine trees in Plantation B.

Use a measure of central tendency and a measure of spread to draw a conclusion about this claim. [5 marks]

Sample Response	The response
$1|2 = 12$ metres (m) Plantation A · Plantation B Median height for Plantation A = 24 m Median height for Plantation B = 19 m As 24 > 19 the median height is larger for Plantation A.	• correctly determines a measure of central tendency for each plantation [1 mark] • compares measures of central tendency to identify a larger measure for Plantation A compared to Plantation B [1 mark]
Interquartile range (IQR) for Plantation A: $29 − 15 = 14$ m Interquartile range (IQR) for Plantation B: $25 − 17 = 8$ m	• correctly determines a measure of spread for each plantation [1 mark]
As 14 > 8 the interquartile range is larger for Plantation A.	• compares measures of spread to identify a larger measure for Plantation A compared to Plantation B [1 mark]
The claim is not valid as the median height and the interquartile range are larger for Plantation A than for Plantation B, which means the pine tree heights in Plantation A are larger (not smaller) on average and more (not less) varied than the pine tree heights in Plantation B.	• makes a justified conclusion by linking reasoning to statistical measures [1 mark]