

Similar shapes

Exam questions

Foundation and Higher tiers

Please write clearly in block capitals.

Name

Class **Teacher**

Time allowed: 70 minutes

Materials

For this booklet you need a black pen, a pencil, a ruler, a rubber and a calculator for Section B.

Instructions

- Use black ink or black ballpoint pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer all questions in the spaces provided.
- **Section A** (questions 1 to 11): you must not use a calculator.
- **Section B** (questions 12 to 19): you may use a calculator.
- Do all rough work in this booklet. Cross through any work you do not want marked.

Information

- The marks for each question are shown in brackets.
- The maximum mark for this booklet is 63.

Advice

- Read each question carefully.
- In all calculations, show clearly how you work out your answer.

For teacher's use

Q	Mark	Q	Mark
1		11	
2		12	
3		13	
4		14	
5		15	
6		16	
7		17	
8		18	
9		19	
10			
TOTAL			

Section A



You must not use a calculator

Do not
write
outside
the box

- 1 Rectangle A is 4 cm wide and 6 cm long.

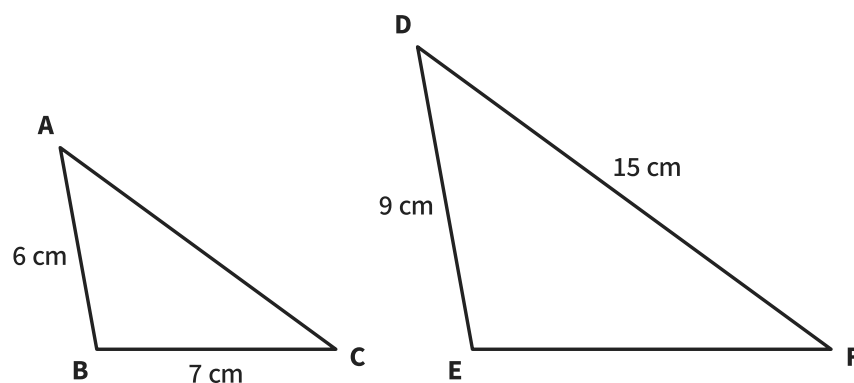
Which of these rectangles is similar to rectangle A?

Circle your answer.

5 cm by 7 cm 6 cm by 9 cm 8 cm by 10 cm 6 cm by 8 cm

[1 mark]

- 2 Triangle ABC is similar to triangle DEF.



Not drawn accurately

- (a) Work out the length of EF.

Answer _____ cm

[2 marks]

- (b) Work out the length of AC.

Answer _____ cm

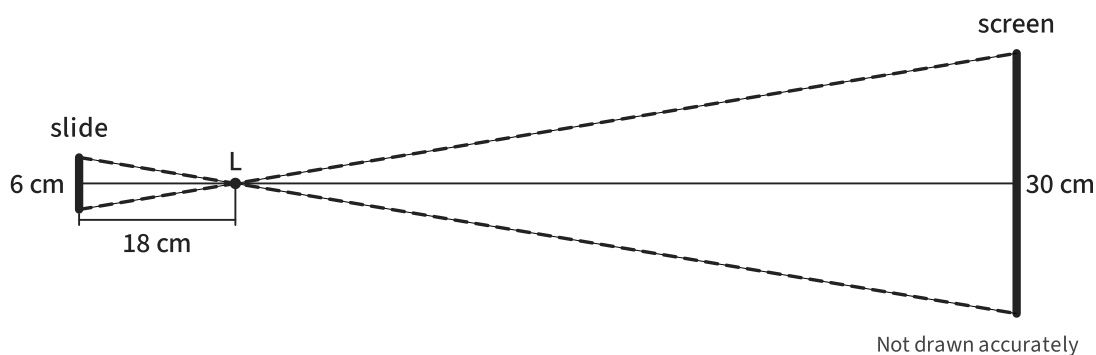
[2 marks]

- 3** Two pentagons are similar.
The ratio of their corresponding sides is 2 : 5
The perimeter of the smaller pentagon is 18 cm

Work out the perimeter of the larger pentagon.

Answer _____ cm
[2 marks]

- 4** In a projector, light from a slide passes through a point L and makes a picture on a screen.
The slide and the screen are parallel.
The slide is 6 cm high and the picture is 30 cm high.
The slide is 18 cm from L.



Work out the distance from L to the screen.
Give your answer in metres.

Answer _____ m
[3 marks]

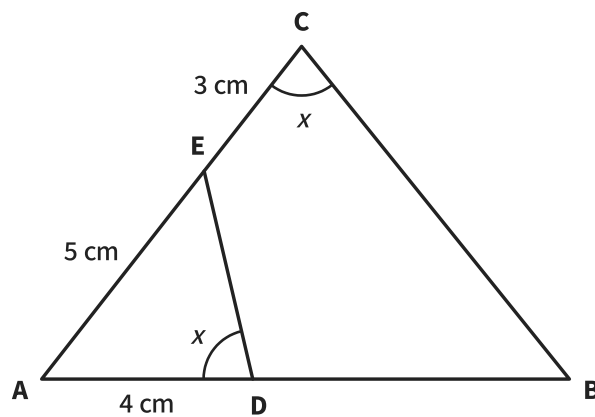
- 5** Triangle P has two angles of 48° and 61°
 Triangle Q has two angles of 71° and 48°
 Sam says,
"Triangles P and Q are similar."

Is Sam correct?

Give a reason for your answer.

[2 marks]

- 6** ABC is a triangle.
 D is a point on AB and E is a point on AC.
 Angle ADE = angle ACB



Not drawn accurately

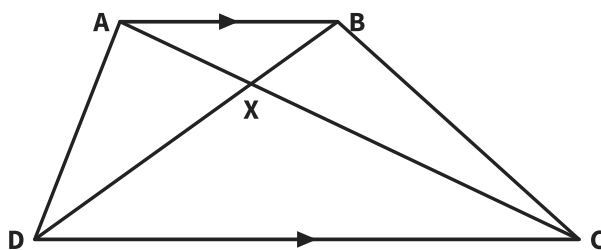
Work out the length of DB.

Answer _____ cm

[3 marks]

7

ABCD is a trapezium with AB parallel to DC.
The diagonals AC and BD meet at X.



Not drawn accurately

- (a) Prove that triangle ABX is similar to triangle CDX.

[3 marks]

- (b) $AB = 6$ cm, $DC = 15$ cm and $AC = 14$ cm
Work out the length of AX.

Answer _____ cm

[2 marks]

8

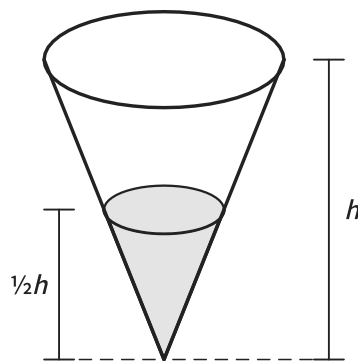
Two vases are mathematically similar.
The smaller vase is 10 cm tall and the larger vase is 15 cm tall.
The surface area of the smaller vase is 240 cm^2
Work out the surface area of the larger vase.

Answer _____ cm^2

[2 marks]

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- 9** A glass is in the shape of a cone, with its point at the bottom. The height of the glass is h . Ben fills the glass with water to a depth of $\frac{3}{4}h$. He then drinks some of the water. The depth of the water is now $\frac{1}{2}h$.



Not drawn accurately

What fraction of the water in the glass did Ben drink?

Answer _____

[4 marks]

- 10** Two solid statues are mathematically similar.
The surface areas of the statues are 45 cm^2 and 180 cm^2 .
The volume of the smaller statue is 60 cm^3 .
Work out the volume of the larger statue.

Answer _____ cm^3

[3 marks]

11

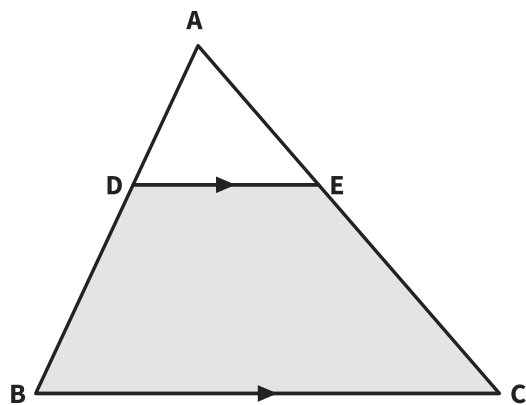
ABC is a triangle.

D is a point on AB and E is a point on AC.

DE is parallel to BC.

$AD : DB = 2 : 3$

The area of the trapezium DBCE is 63 cm^2



Not drawn accurately

Work out the area of triangle ADE.

Answer _____ cm^2

[3 marks]

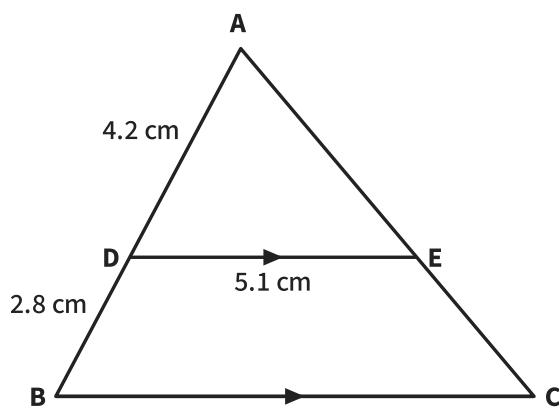
Do not
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Section B

You may use a calculator

Do not
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outside
the box

- 12** D is a point on AB and E is a point on AC.
DE is parallel to BC.



Not drawn accurately

Work out the length of BC.

Answer _____ cm

[3 marks]

13

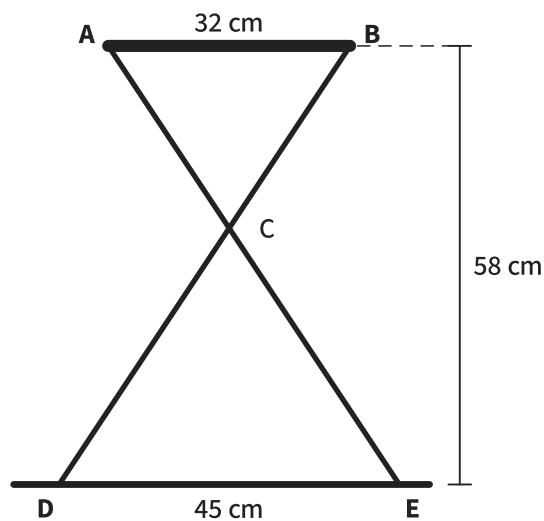
The diagram shows the side view of a folding stool.

The legs AE and BD cross at C.

The seat AB is parallel to the floor DE.

AB = 32 cm and DE = 45 cm

The seat is 58 cm above the floor.



Not drawn accurately

Work out the height of C above the floor.

Give your answer to 1 decimal place.

Answer _____ cm

[3 marks]

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- 14** Two bottles are mathematically similar.
The smaller bottle holds 330 ml and the larger bottle holds 1.2 litres
The smaller bottle is 12 cm tall.

Work out the height of the larger bottle.
Give your answer to 1 decimal place.

Answer _____ cm

[3 marks]

- 15** A map has a scale of 1 : 35 000
On the map, a lake has an area of 9.42 cm^2

Work out the real area of the lake in km^2
Give your answer to 3 significant figures.

Answer _____ km^2

[3 marks]

16

A company makes a solid metal model of a lighthouse.
It then makes a larger model that is mathematically similar to the first one and 20% taller.
Both models are made from the same metal.

- (a) Work out the percentage increase in the surface area.

Answer _____ %

[2 marks]

- (b) Ella says,
“*The mass of the larger model is 60% more than the mass of the first model.*”
Is Ella correct?
You must show your working.

[2 marks]

17

A plant pot is a frustum of a cone.

The frustum is made by removing a small cone from a large cone.

The top of the pot has a diameter of 30 cm and the base has a diameter of 18 cm.

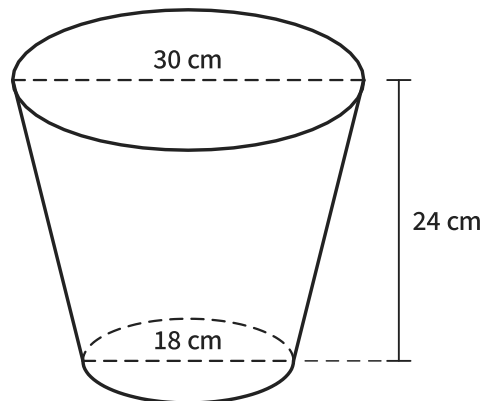
The pot is 24 cm tall.

Kai fills 4 of these pots with compost.

Compost is sold in 15 litre bags.

Volume of a cone = $\frac{1}{3}\pi r^2 h$ where r is the radius and h is the perpendicular height.

1 litre = 1000 cm³



Not drawn accurately

How many bags of compost does Kai need to buy?

You must show your working.

Answer _____

[5 marks]

18

A garden centre sells two stone birdbaths that are mathematically similar.

They are made from the same stone.

The mass of the small birdbath is 18 kg and the mass of the large birdbath is 42 kg

- (a) The whole surface of each birdbath is covered with a sealant of the same thickness.
The large birdbath needs 600 ml of sealant.
Work out how much sealant the small birdbath needs.
Give your answer to the nearest millilitre.

Answer _____ ml

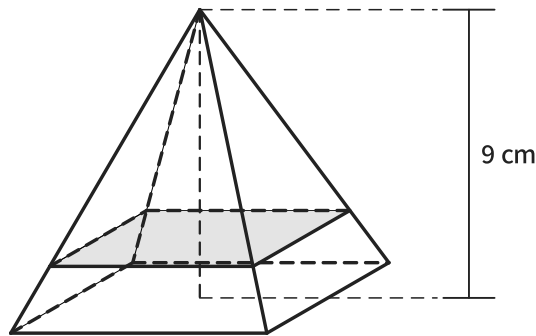
[3 marks]

- (b) The large birdbath is 24 cm taller than the small birdbath.
Work out the height of the small birdbath.
Give your answer to 1 decimal place.

Answer _____ cm

[2 marks]

- 19** A glass paperweight is a solid pyramid with a square base. The pyramid is 9 cm tall. The paperweight is cut into two pieces by a cut parallel to the base. The two pieces have equal volumes.



Not drawn accurately

- (a)** Work out the height of the bottom piece.
Give your answer to 2 decimal places.

Answer _____ cm

[3 marks]

- (b)** Work out the ratio
total area of the sloping faces of the top piece : total area of the sloping faces of the bottom piece
Give your answer in the form $n : 1$ where n is given to 2 decimal places.

Answer _____

[2 marks]

END OF QUESTIONS