IGCSE · Cambridge (CIE) · Maths

2 hours 25 questions

Calculator Questions

Congruence & Similarity

Congruence / Similarity / Similar Lengths / Similar Areas & Volumes

Medium (6 questions)	/17
Hard (11 questions)	/41
Very Hard (8 questions)	/36
Total Marks	**/94**

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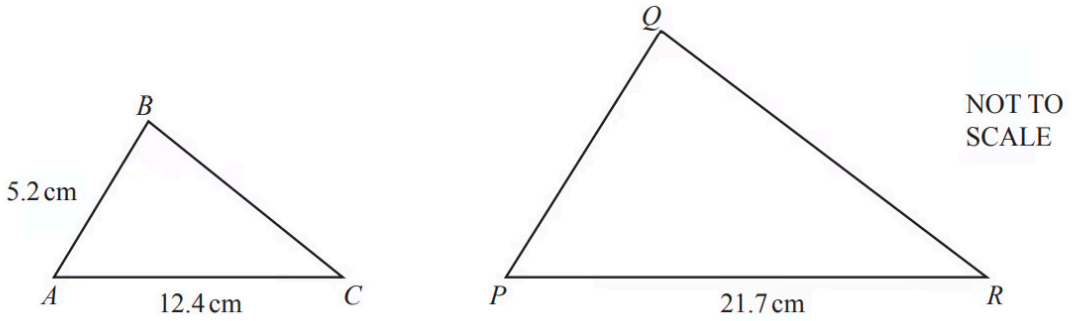
Medium Questions

1 Triangle ABC is similar to triangle PQR.

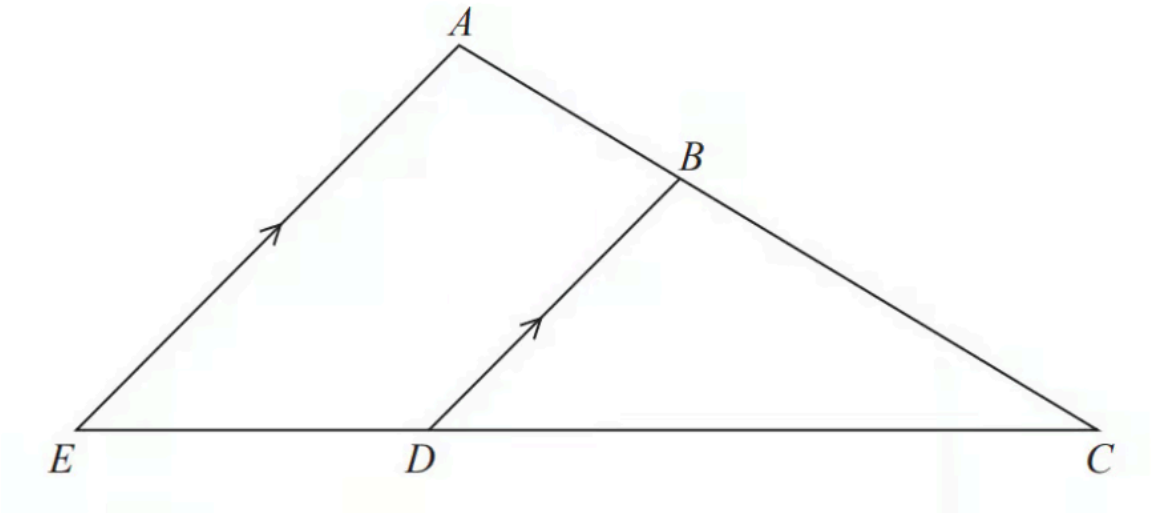


Find PQ.

PQ = ... cm

(2 marks)

2 (a)



ABC and *EDC* are straight lines.
EA is parallel to *DB*.

EC = 8.1 cm.
DC = 5.4 cm.
DB = 2.6 cm,

Work out the length of AE.

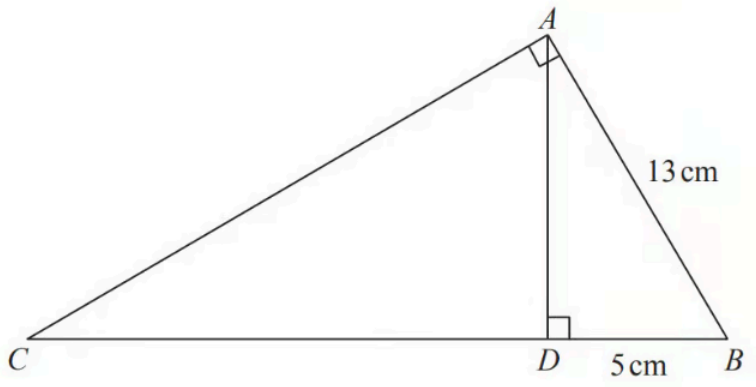
(2 marks)

(b) AC = 6.15 cm.

Work out the length of AB.

(2 marks)

3 ABC and ABD are two right-angled triangles.



Angle BAC = angle ADB = 90°

AB = 13 cm
DB = 5 cm

Work out the length of CB.

(3 marks)

4 Marianne sells two sizes of photo.
These photos are mathematically similar rectangles. The smaller photo has length 15 cm and width 12 cm. The larger photo has area 352.8 cm^2.

Calculate the length of the larger photo.

..... cm

(3 marks)

5 The diagram shows two cylinders, **A** and **B**

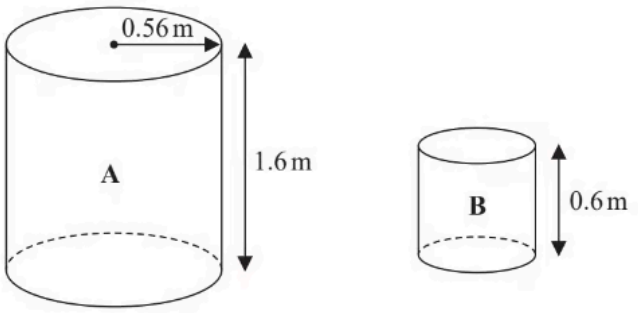


Diagram **NOT** accurately drawn

Cylinder **A** has height 1.6 m and radius 0.56 m.

Cylinder **B** is mathematically similar to cylinder **A**.
The height of cylinder **B** is 0.6 m.
Work out the radius of cylinder **B**.

..... m

(2 marks)

6 The diagram shows two water towers in Kuwait.

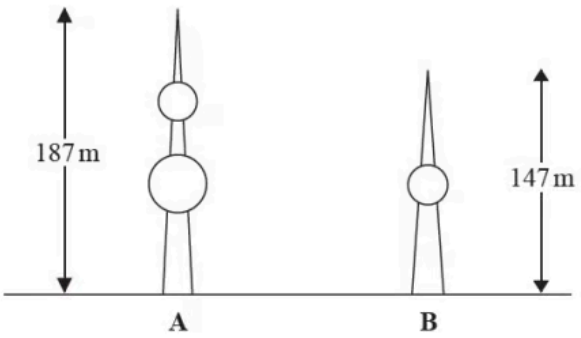


Diagram **NOT** accurately drawn

The real height of tower $\mathbf{A}$ is 187m.
The real height of tower $\mathbf{B}$ is 147m.

Ahmed makes a scale model of both towers.

The height of tower $\mathbf{A}$ on the scale model is 90cm.

Work out the height of tower $\mathbf{B}$ on the scale model. Give your answer correct to the nearest centimetre.

(3 marks)

Hard Questions

1 A paperweight has height 4 cm and volume 38.4 cm^3.
A mathematically similar paperweight has height 7 cm.

Calculate the volume of this paperweight.

..... cm^3

(3 marks)

2 Two mathematically similar containers have heights of 30 cm and 75 cm.
The larger container has a capacity of 5.5 litres.

Calculate the capacity of the smaller container.
Give your answer in millilitres.

..... ml

(3 marks)

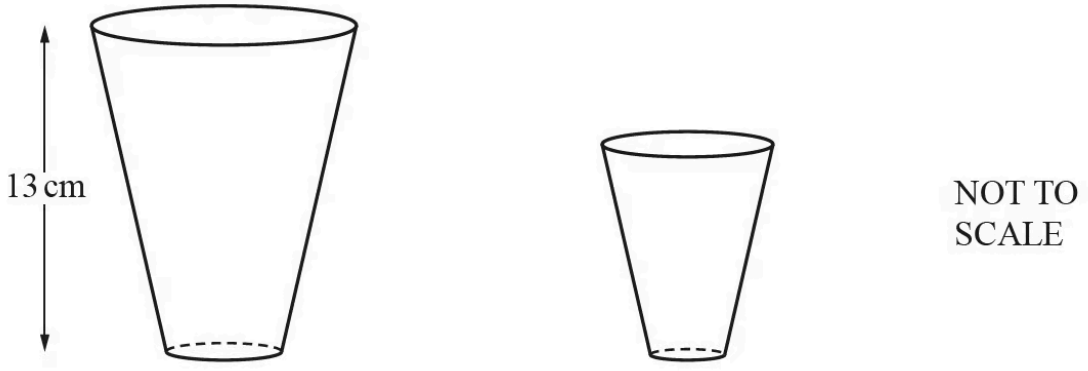
3 A model of a car has a scale 1:20.
The volume of the actual car is 12 m^3.

Find the volume of the model.
Give your answer in cubic centimetres.

.....cm^3

(3 marks)

4



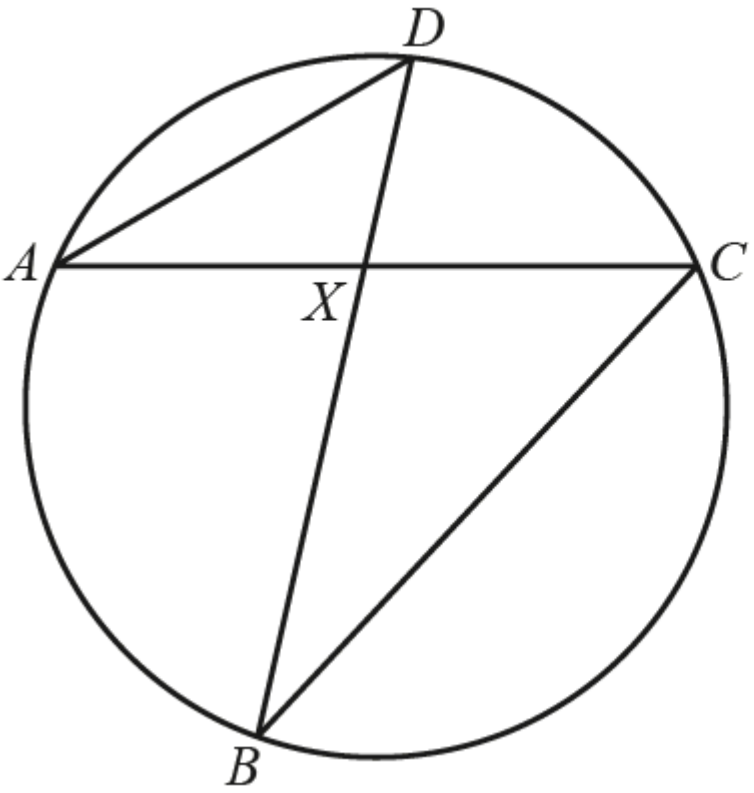
The diagram shows two glasses which are mathematically similar.
The larger glass has a capacity of 0.5 litres and the smaller glass has a capacity of 0.25 litres.
The height of the larger glass is 13 cm.

Calculate the height of the smaller glass.

..... cm

(3 marks)

5 (a)



NOT TO SCALE

A, *B*, *C* and *D* are points on the circumference of the circle.
AC and *BD* intersect at *X*.

Complete the statement.

Triangle *ADX* is ..... to triangle *BCX*.

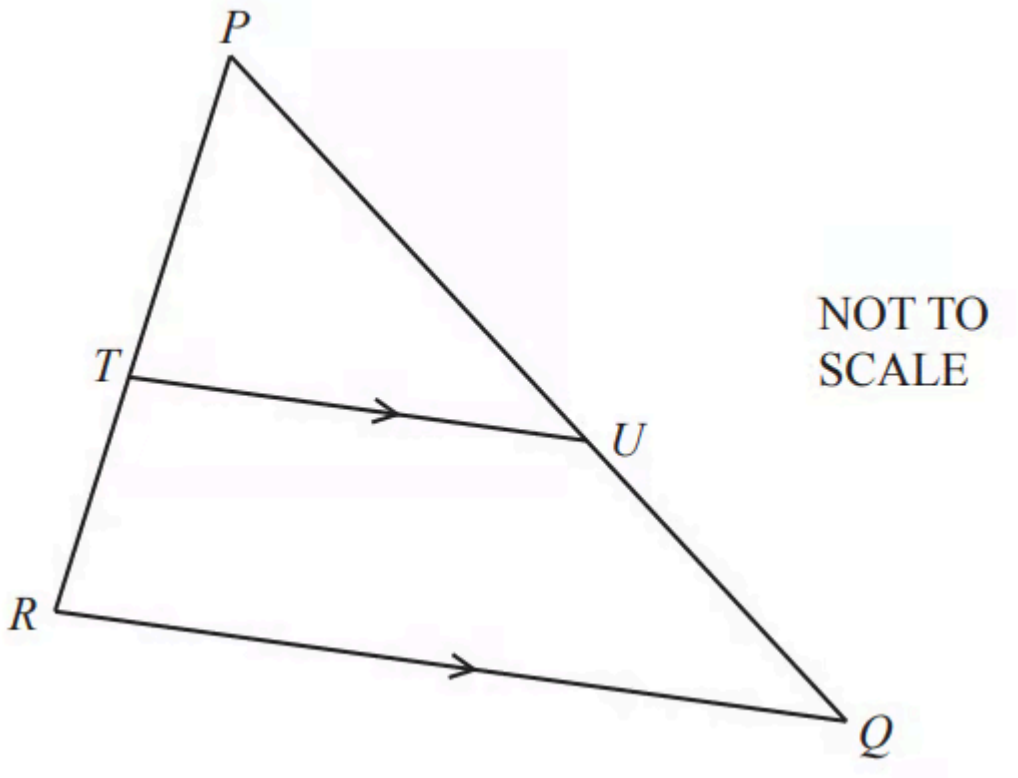
(1 mark)

(b) The area of triangle *ADX* is 36 cm^2 and the area of triangle *BCX* is 65.61 cm^2.
AX = 8.6 cm and *DX* = 7.2 cm. Find *BX*.

BX = ... cm

(3 marks)

6 (a)



PQR is a triangle.
T is a point on *PR* and *U* is a point on *PQ*.
RQ is parallel to *TU*.

Explain why triangle *PQR* is similar to triangle *PUT*. Give a reason for each statement you make.

(3 marks)

(b) *PT* : *TR* = 4 : 3

i) Find the ratio *PU* : *PQ*.

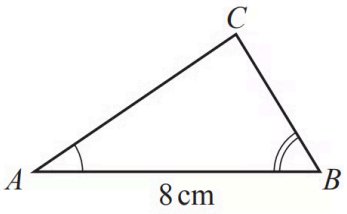
..... : ..... [1]

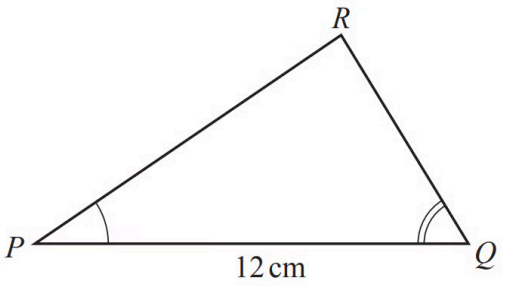
ii) The area of triangle *PUT* is 20cm^2. Find the area of the quadrilateral *QRTU*.

..... cm^2 [3]

(4 marks)

7 (a)





NOT TO SCALE

Triangle *ABC* is mathematically similar to triangle *PQR*.
The area of triangle *ABC* is 16 cm^2.

Calculate the area of triangle *PQR*.

..... cm^2

(2 marks)

(b) The triangles are the cross-sections of prisms which are also mathematically similar.
The volume of the smaller prism is 320 cm^3.

Calculate the length of the larger prism.

..... cm

(3 marks)

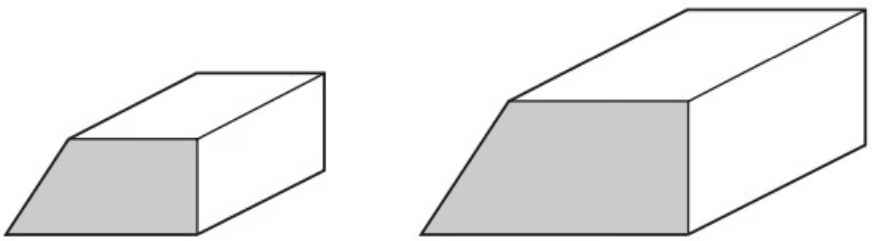
8 Two cones are mathematically similar.
The total surface area of the smaller cone is 80 cm^2. The total surface area of the larger cone is 180 cm^2. The volume of the smaller cone is 168 cm^3.

Calculate the volume of the larger cone.

..... cm^3

(3 marks)

9



NOT TO SCALE

The diagram shows two mathematically similar solid metal prisms.
The volume of the smaller prism is 648 cm^3 and the volume of the larger prism is 2187 cm^3.
The area of the cross-section of the smaller prism is 36 cm^2.

Calculate the area of the cross-section of the larger prism.

..... cm^2

(3 marks)

10 Two containers are mathematically similar.
The surface area of the larger container is 226 cm^2 and the surface area of the smaller container is 94 cm^2.
The volume of the larger container is 680 cm^3.

Find the volume of the smaller container.

..... cm^3

(3 marks)

11 Two cups A and B are made from a thin plastic and shaped as cones.

- Cup A has a radius of $3\ \text{cm}$ and a height of $12\ \text{cm}$.
- Cup B is geometrically similar to cup A.

The capacity of cup B is $252\pi\ \text{cm}^3$ more than cup A.

Find the radius of cup B.

(4 marks)

Very Hard Questions

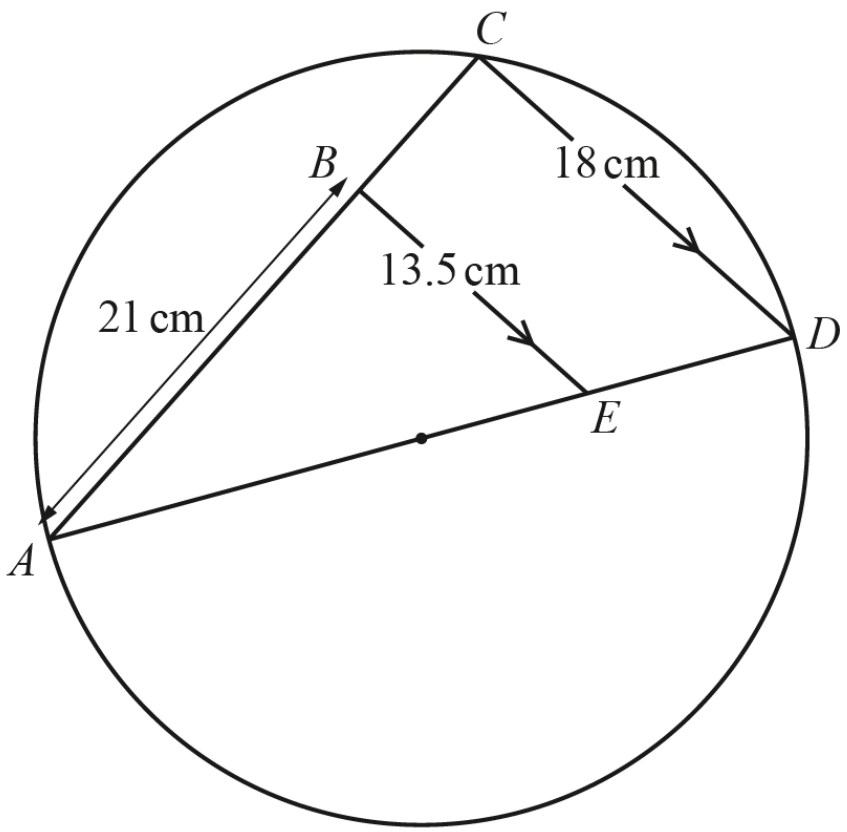
1 A model of a statue has a height of 4cm.
The volume of the model is 12 cm^3.
The volume of the statue is 40 500 cm^3.

Calculate the height of the statue.

..... cm

(3 marks)

2



NOT TO SCALE

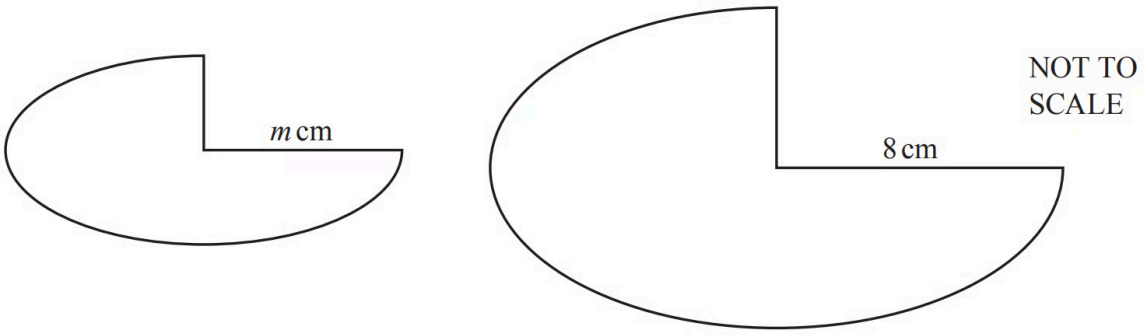
C lies on a circle with diameter AD.
B lies on AC and E lies on AD such that BE is parallel to CD.
AB = 21 cm, CD = 18 cm and BE = 13.5 cm.

Work out the radius of the circle.

..... cm

(5 marks)

3



The diagram shows two shapes that are mathematically similar.
The smaller shape has area 52.5 cm^2 and the larger shape has area 134.4 cm^2.

Calculate the value of m.

$m =$ .....

(3 marks)

4 The area of pentagon A is $73.5\ cm^2$.
The area of pentagon B is $6\ cm^2$.

Find the ratio perimeter of pentagon A : perimeter of pentagon B in its simplest form.

..... : .....

(2 marks)

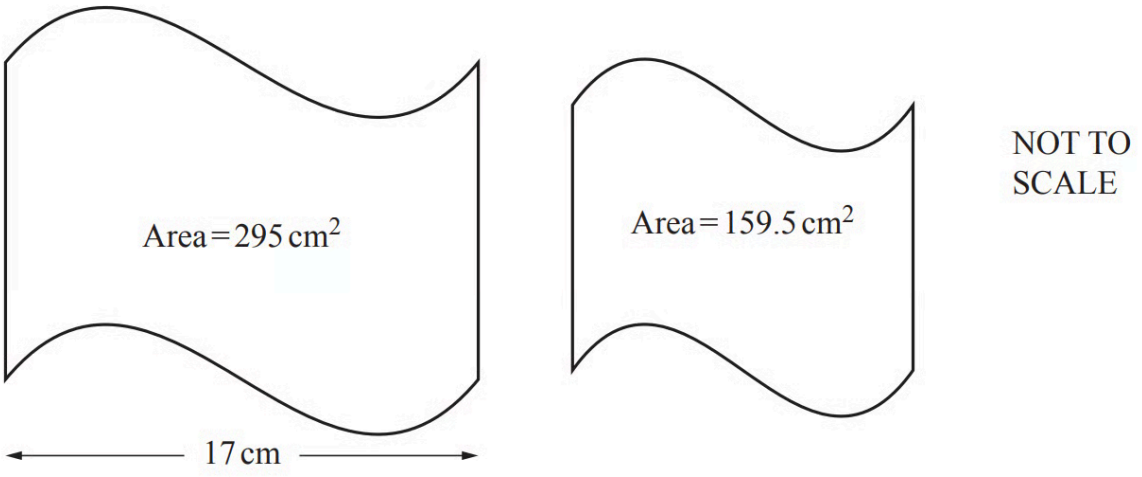
5 Manjeet has two mathematically similar bottles in her bathroom.
The large bottle holds 1.35 litres and is 29.7 cm high. The small bottle holds 0.4 litres.

Calculate the height of the small bottle.

..... cm

(3 marks)

6



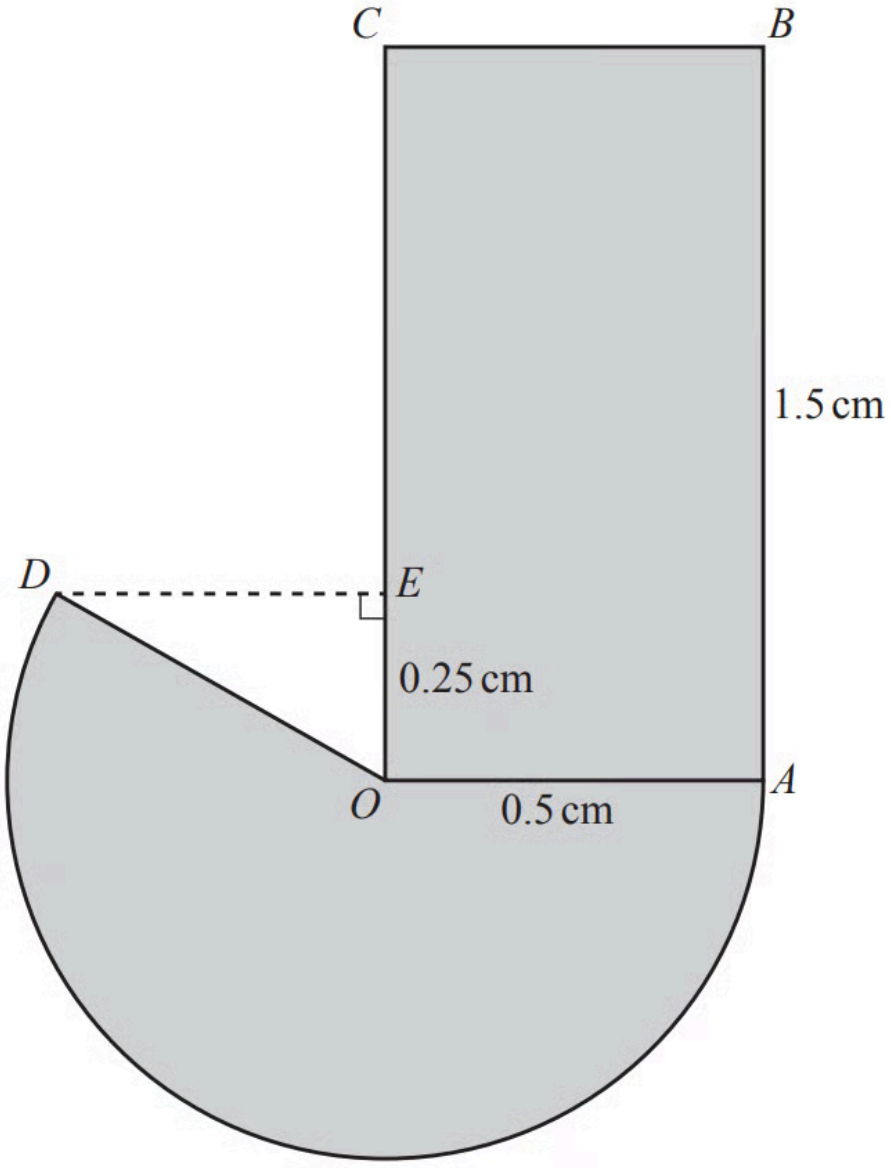
The diagram shows two mathematically similar shapes with areas $295\ \text{cm}^2$ and $159.5\ \text{cm}^2$.
The width of the larger shape is $17\ \text{cm}$.

Calculate the width of the smaller shape.

..... cm

(3 marks)

7 (a)



The diagram shows a company logo made from a rectangle and a major sector of a circle.
The circle has centre O and radius OA.
$OA = OD = 0.5$ cm and $AB = 1.5$ cm.
E is a point on OC such that $OE = 0.25$ cm and angle $OED = 90°$.

Calculate the perimeter of the logo.

..... cm

(5 marks)

(b) Calculate the area of the logo.

..... cm^2

(3 marks)

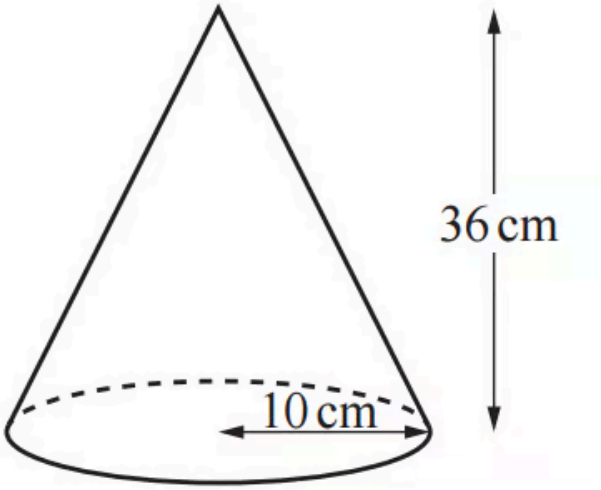
(c) A mathematically similar logo is drawn. The area of this logo is 77.44 cm^2.

Calculate the radius of the major sector in this logo.

..... cm

(3 marks)

8 (a)



NOT TO SCALE

A solid metal cone has radius 10 cm and height 36 cm.

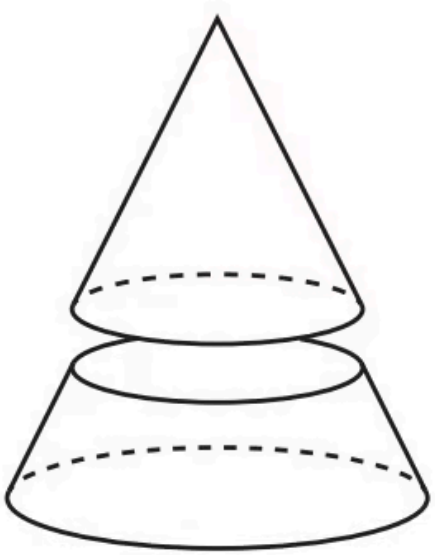
Calculate the volume of this cone.

[The volume, V, of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

..... cm^3

(2 marks)

(b) The cone is cut, parallel to its base, to give a smaller cone.



NOT TO SCALE

The volume of the smaller cone is half the volume of the original cone.

The smaller cone is melted down to make two different spheres.

The ratio of the radii of these two spheres is 1 : 2.

Calculate the radius of the smaller sphere.

[The volume, V, of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

..... cm

(4 marks)