HIGHER

3.3 Similarity: Length, Area and Volume Scale Factors: 1-hour Pack

Total Marks

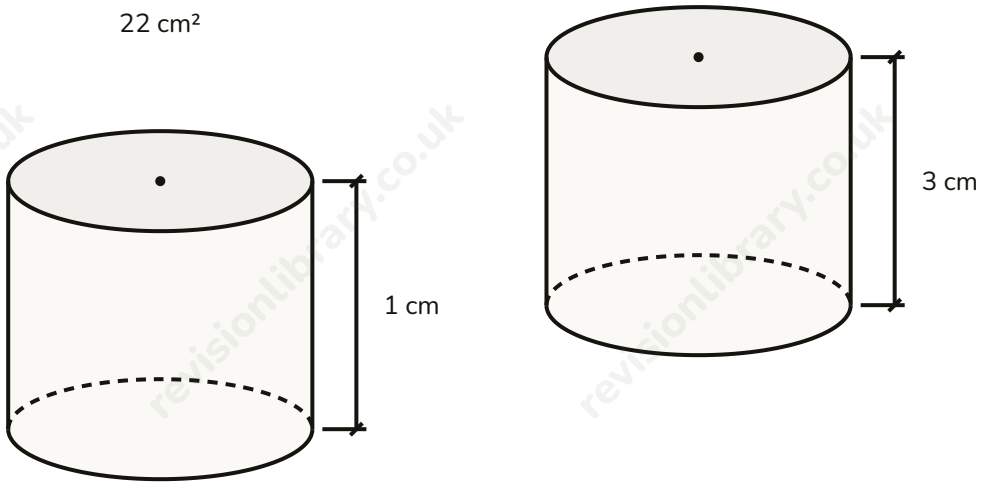
EDEXCEL 4MA1 · Calculator allowed · about 60 minutes

Name: _____ Date: ____ / ____ / _____

Answer in full sentences for any question that asks to 'Show that' or to 'Explain'. Spend about 60 minutes on the paper.

1 Two similar cylinders have heights 1 cm and 3 cm. The surface area of the smaller one is 22 cm².
Find the surface area of the larger one.

Diagram NOT accurately drawn



(Total for Question 1 is 3 marks)

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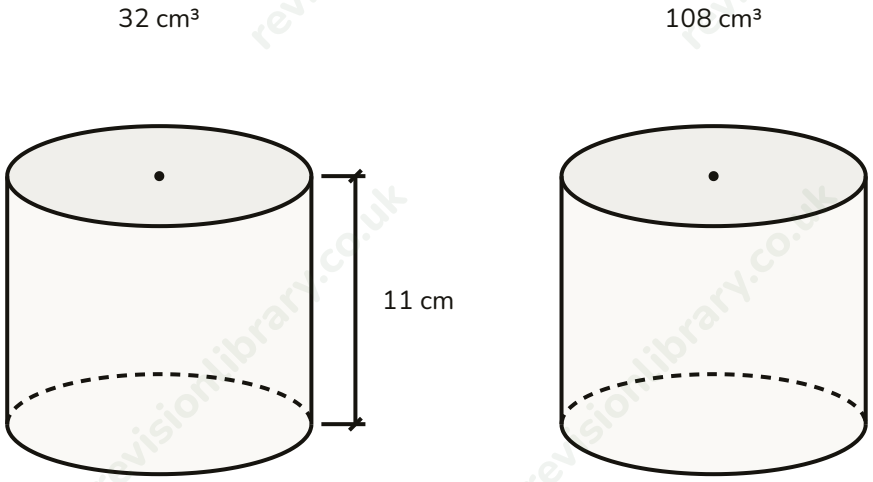
2 Two jars are mathematically similar. The small jar is 15 cm tall and holds 3375 ml. The large jar is 25 cm tall.
Work out how much the large jar holds.

(Total for Question 2 is 3 marks)

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3 Two similar cylinders have volumes 32 cm³ and 108 cm³. The first has a height of 11 cm.
Find the height of the second.

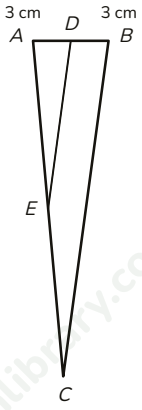
Diagram NOT accurately drawn



(Total for Question 3 is 4 marks)

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4 In triangle ABC, the point D lies on AB and the point E lies on AC, with DE parallel to BC. AD = 3 cm and DB = 3 cm. The area of triangle ADE is 20 cm².
Find the area of the trapezium DBCE.



(Total for Question 4 is 4 marks)

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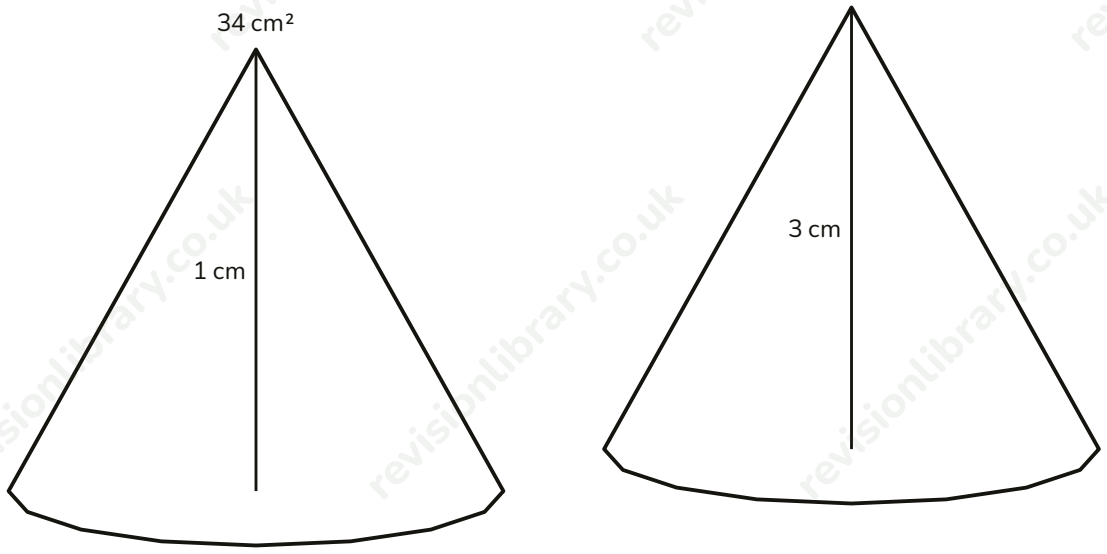
5 The lengths of two similar bottles are in the ratio 3 : 5.
Write down (a) the ratio of their surface areas, (b) the ratio of their volumes. Give each in its simplest whole-number form.

(Total for Question 5 is 4 marks)

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6 Two similar cones have heights 1 cm and 3 cm. The surface area of the smaller one is 34 cm^2. Find the surface area of the larger one.

Diagram NOT accurately drawn



(Total for Question 6 is 3 marks)

7 Two similar bottles have volumes 40 cm^3 and 1715 cm^3. The first has a height of 6 cm. Find the height of the second.

(Total for Question 7 is 4 marks)

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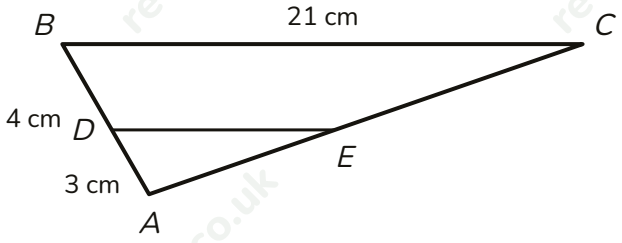
8 Two rectangles are similar. The first has a side of length 6 cm that corresponds to a side of length 2 cm on the second. Another side of the first rectangle is 9 cm long.
Find the length of the corresponding side of the second rectangle.

(Total for Question 8 is 3 marks)

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9 In triangle ABC, the point D lies on AB and the point E lies on AC, with DE parallel to BC. AD = 3 cm and DB = 4 cm. BC = 21 cm.
Find the length of DE.

Diagram NOT accurately drawn



(Total for Question 9 is 4 marks)

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10 Two similar statues have heights 5 cm and 3 cm. The surface area of the larger one is 20 cm^2.
Find the surface area of the smaller one.

(Total for Question 10 is 3 marks)

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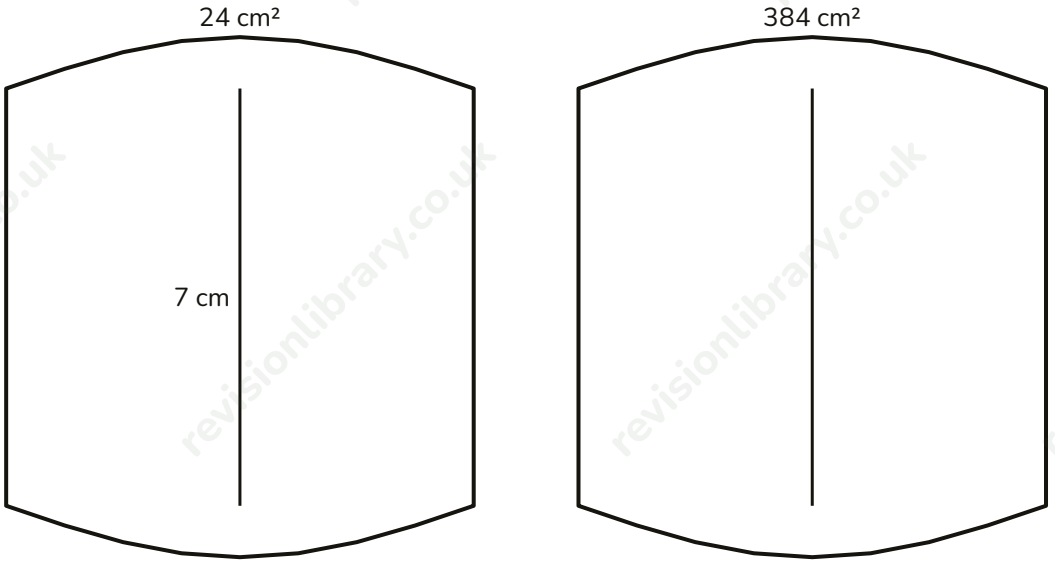
11 Two jars are mathematically similar. Corresponding lengths on their labels are in the same ratio as the heights of the jars. The small jar is 10 cm tall and its label has an area of 11 cm². The large jar is 15 cm tall.
Work out the area of the label on the large jar.

(Total for Question 11 is 3 marks)

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12 Two similar cylinders have surface areas 24 cm² and 384 cm². The first has a height of 7 cm.
Find the height of the second.

Diagram NOT accurately drawn



(Total for Question 12 is 4 marks)

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Mark scheme · 3.3 Similarity: Length, Area and Volume Scale Factors: 1-hour Pack

Question 1

length scale factor = 3	**M1**
surface area scale factor = $(3)^2 = 9$	**M1**
surface area = 198 cm²	**A1**

Answer: 198 cm^2

Question 2

length scale factor = 25/15 = 5/3	**M1**
volume scale factor = $(5/3)^3 = 125/27$	**M1**
15625 ml	**A1**

Answer: 15625 ml

Question 3

volume ratio = 108/32 = 27/8	**M1**
length scale factor = cube root of 27/8 = 3/2	**M1**
11 x 3/2	**M1**
16.5 cm	**A1**

Answer: 16.5 cm

Question 4

triangles ADE and ABC are similar	**B1**
area scale factor = $(6/3)^2 = 4$	**M1**
area of triangle ABC = 20 x 4 = 80	**M1**
trapezium = 80 - 20 = 60 cm²	**A1**

Answer: 60 cm^2

Question 5

areas are in the ratio of the squares of the lengths	**M1**
(a) 9:25	**A1**
volumes are in the ratio of the cubes of the lengths	**M1**
(b) 27:125	**A1**

Answer: (a) 9 : 25; (b) 27 : 125

Question 6

length scale factor = 3	**M1**
surface area scale factor = $(3)^2 = 9$	**M1**
surface area = 306 cm²	**A1**

Answer: 306 cm^2

Question 7

volume ratio = 1715/40 = 343/8	**M1**
length scale factor = cube root of 343/8 = 7/2	**M1**
6 x 7/2	**M1**
21 cm	**A1**

Answer: 21 cm

Question 8

scale factor = 2/6 = 1/3	**M1**
9 x 1/3	**M1**
3 cm	**A1**

Answer: 3 cm

Question 9

triangles ADE and ABC are similar	**B1**
scale factor = AD/AB = 3/7	**M1**
DE = 21 x 3/7	**M1**
DE = 9 cm	**A1**

Answer: 9 cm

Question 10

length scale factor = 3/5 = 3/5	**M1**
surface area scale factor = $(3/5)^2 = 9/25$	**M1**
surface area = 7.2 cm²	**A1**

Answer: 7.2 cm^2

Question 11

length scale factor = 15/10 = 3/2	**M1**
area scale factor = $(3/2)^2 = 9/4$	**M1**
24.75 cm²	**A1**

Answer: 24.75 cm^2

Question 12

surface area ratio = 384/24 = 16	**M1**
length scale factor = square root of 16 = 4	**M1**
7 x 4	**M1**
28 cm	**A1**

Answer: 28 cm

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