HIGHER

6.8 Similar Shapes (Area and Volume): Test Pack

Total Marks

EDEXCEL 1MA1 · Calculator allowed · about 60 minutes

Name: _____ Date: ____ / ____ / _____

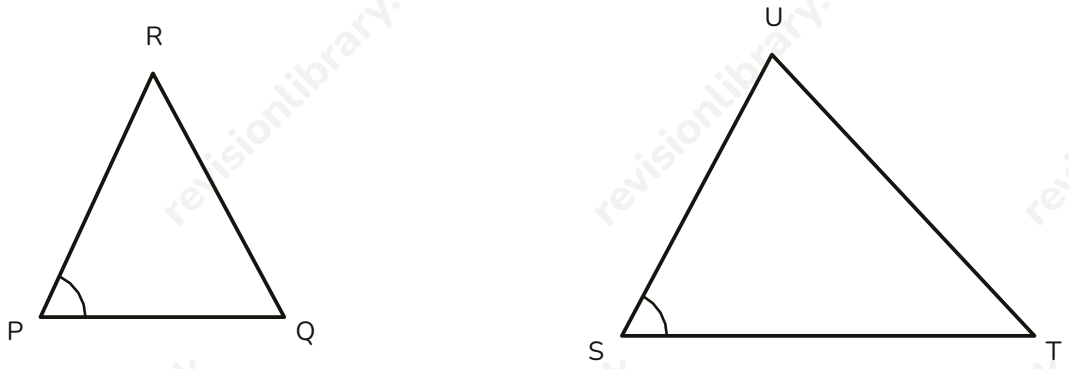
Answer ALL questions. Show all your working.

1 Two mathematically similar shapes have a linear scale factor of 3 from the smaller shape to the larger shape. The area of the smaller shape is 8 cm². Work out the area of the larger shape.

(Total for Question 1 is 2 marks)

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2 Triangle PQR is mathematically similar to triangle STU, where P corresponds to S, Q corresponds to T and R corresponds to U.



(a) Write down the relationship between angle P and angle S. **(1)**

.....

(b) Write down the relationship between the ratio PQ:ST and the ratio QR:TU. **(1)**

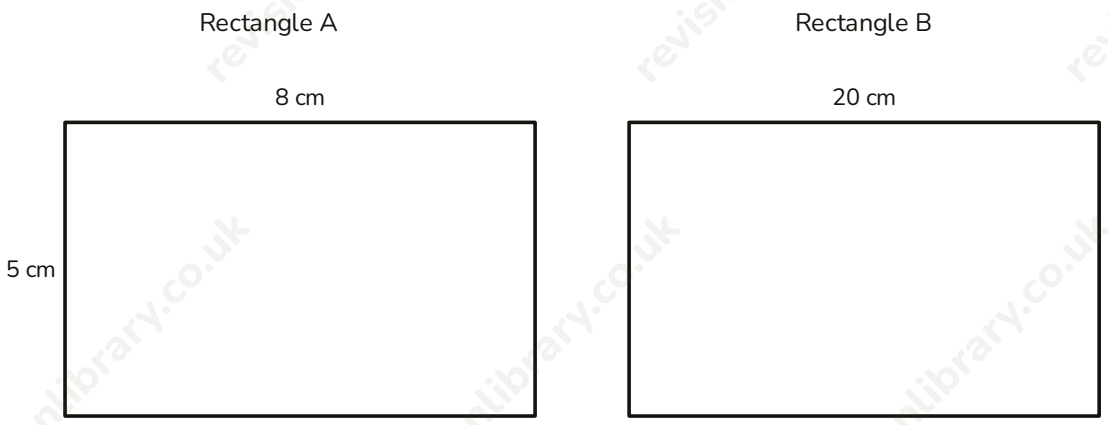
.....

(Total for Question 2 is 2 marks)

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3 Rectangle A and rectangle B are mathematically similar. Rectangle A has length 8 cm and width 5 cm. Rectangle B has length 20 cm.

Diagram NOT accurately drawn



(a) Work out the scale factor of the enlargement from rectangle A to rectangle B. **(1)**

.....

(b) Work out the width of rectangle B. **(2)**

.....

(Total for Question 3 is 3 marks)

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4 Shape A is enlarged by scale factor 3 to give mathematically similar shape B.

(a) Circle the correct statement. **(1)**

- ☐ A) Area of B = 3 x Area of A
- ☐ B) Area of B = 9 x Area of A
- ☐ C) Area of B = 6 x Area of A
- ☐ D) Area of B = 27 x Area of A

(Total for Question 4 is 1 mark)

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5 Two mathematically similar shapes have areas of 20 cm² and 45 cm². Find the linear scale factor from the smaller shape to the larger shape.

(Total for Question 5 is 2 marks)

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6 A company sells two mathematically similar spherical balloons. The small balloon has diameter 20 cm and costs £3.50. The large balloon has diameter 35 cm and costs £9.50. The company intends the cost of each balloon to be proportional to the amount of material used to make it (its surface area).

(a) Work out the surface area scale factor from the small balloon to the large balloon. **(2)**

.....

(b) Use your answer to part (a) to work out what the large balloon should cost if the cost is exactly proportional to surface area. **(2)**

.....

(c) The large balloon actually costs £9.50. Comment on whether the large balloon is good value for money compared with the small balloon, giving a reason. **(1)**

(Total for Question 6 is 5 marks)

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7 Two similar tins have heights 2 cm and 1 cm. The first has volume 40 cm^3. Work out the volume of the second.

(Total for Question 7 is 3 marks)

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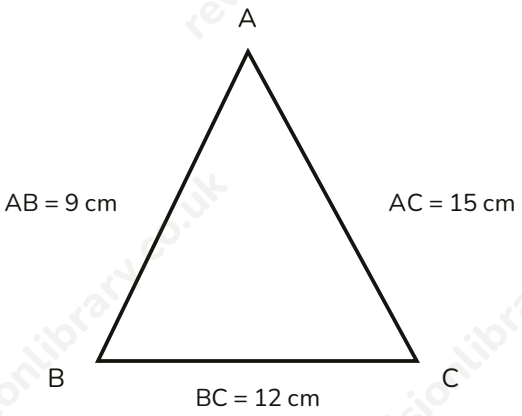
8 Two similar pizza boxes have areas 12 cm^2 and 27 cm^2. A length on the first is 10 cm. Work out the corresponding length on the second.

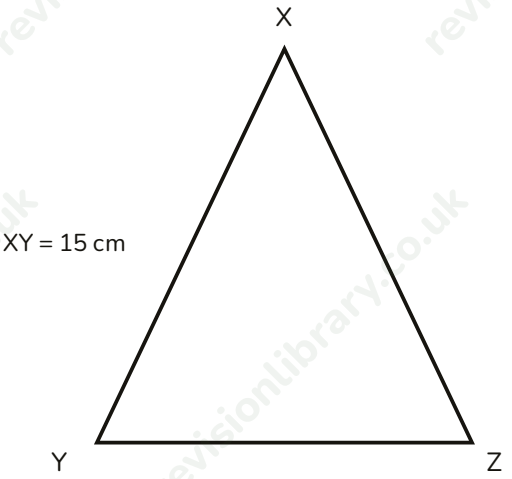
(Total for Question 8 is 3 marks)

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9 Triangle ABC is mathematically similar to triangle XYZ, where A corresponds to X, B corresponds to Y and C corresponds to Z. AB = 9 cm, BC = 12 cm and AC = 15 cm. XY = 15 cm.

Diagram NOT accurately drawn





(a) Calculate the length of YZ. **(2)**

.....

(b) Calculate the length of XZ. **(1)**

.....

(Total for Question 9 is 3 marks)

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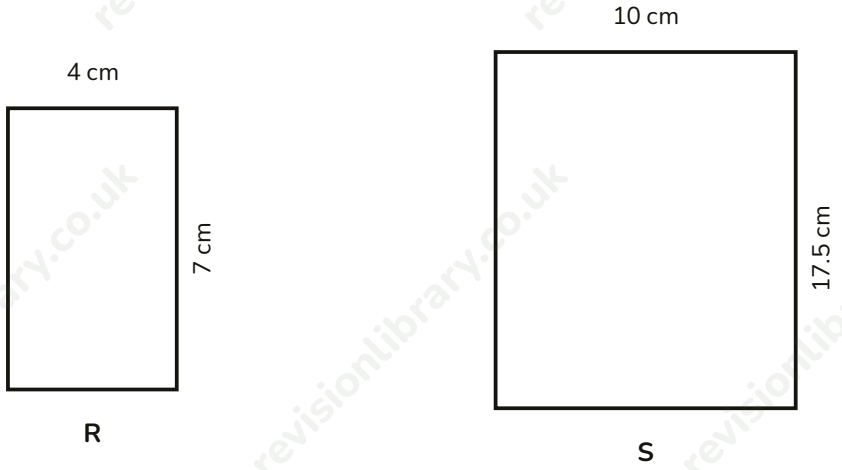
10 Two similar vases have volumes 54 cm^3 and 128 cm^3. The first vase is 27 cm high. Work out the height of the second vase.

(Total for Question 10 is 3 marks)

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11 Rectangle R and rectangle S are mathematically similar. Rectangle R measures 4 cm by 7 cm. Rectangle S measures 10 cm by 17.5 cm. Show that the area scale factor from rectangle R to rectangle S is 6.25.

Diagram NOT accurately drawn



(Total for Question 11 is 3 marks)

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12 The linear scale factor between two mathematically similar shapes is 0.4. Work out the area scale factor.

(Total for Question 12 is 2 marks)

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13 Shape M and shape N are mathematically similar. A side of shape M has length (x + 2) cm. The corresponding side of shape N has length (3x - 4) cm. The area scale factor from shape M to shape N is 4. Work out the value of x.

(Total for Question 13 is 3 marks)

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14 Two mathematically similar shapes have perimeters in the ratio 4:9. Find the ratio of their areas.

(Total for Question 14 is 2 marks)

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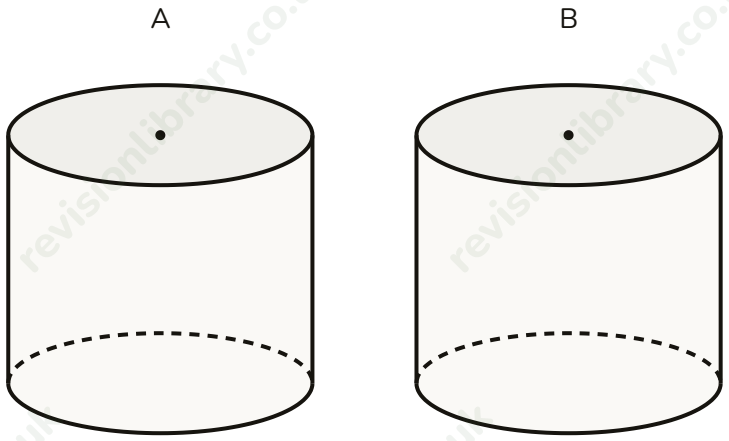
15 Funnel P and funnel Q are mathematically similar. The volumes of funnel P and funnel Q are in the ratio 27:1000. The slant height of funnel P is 9 cm. Work out the slant height of funnel Q.

(Total for Question 15 is 3 marks)

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16 Cylinder A and cylinder B are mathematically similar. The ratio of their curved surface areas is 4:9. The volume of cylinder A is 32 cm^3. Show that the volume of cylinder B is 108 cm^3.

Diagram NOT accurately drawn



(Total for Question 16 is 3 marks)

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Mark scheme · 6.8 Similar Shapes (Area and Volume): Test Pack

Question 1

area scale factor = 3^2 (=9) **M1**

72 cao, units cm^2 **A1**

Answer: 72 cm^2

Question 2

(a) angle P = angle S (oe, corresponding angles in similar shapes are equal) **B1**

(a) Answer: Angle P = Angle S

(b) PQ:ST = QR:TU (oe, corresponding sides are in the same ratio / are proportional) **B1**

(b) Answer: PQ:ST = QR:TU (the corresponding sides are in the same ratio)

Question 3

(a) 2.5 oe (e.g. 5/2) **B1**

(a) Answer: 2.5

(b) 5 x their (a), or 5 x 2.5 **M1**

(b) 12.5 cao **A1**

(b) Answer: 12.5 cm

Question 4

(a) Area of B = 9 x Area of A **B1**

(a) Answer: Area of B = 9 x Area of A

Question 5

area ratio = 45/20 (=2.25) oe **M1**

1.5 cao **A1**

Answer: 1.5

Question 6

(a) linear scale factor = 35/20 (=1.75) **M1**

(a) 3.0625 cao (1.75^2) **A1**

(a) Answer: 3.0625

(b) 3.50 x their (a) **M1**

(b) 10.72 (pounds) awrt, cao **A1**

(b) Answer: £10.72 (awrt)

(c) correct comment with supporting reason, e.g. the large balloon is better value because its actual cost (£9.50) is less than the cost predicted by the surface area scale factor (£10.72) **C1**

(c) Answer: The large balloon is better value for money, since £9.50 is less than the £10.72 that proportional pricing would suggest.

Question 7

volume scale factor $(1/2)^3$ oe **M1**

40 x 1/8 oe **M1**

5 cm^3 cao **A1**

Answer: 5 cm^3

Question 8

length scale factor $\sqrt{27/12}$ = 3/2 **M1**

10 x 3/2 oe **M1**

15 cm cao **A1**

Answer: 15 cm

Question 9

(a) scale factor = 15/9 (=5/3) oe, or 12 x 15/9 **M1**

(a) 20 cao **A1**

(a) Answer: 20 cm

(b) 25 ft (ft their scale factor from (a) x 15) **A1**

(b) Answer: 25 cm

Question 10

cube root of (128/54) = 4/3 **M1**

27 x 4/3 **M1**

36 cm cao **A1**

Answer: 36 cm

Question 11

linear scale factor using one pair of corresponding sides, e.g. 10/4 (=2.5) or 17.5/7 (=2.5) **M1**

check using the other pair of corresponding sides, e.g. 17.5/7 (=2.5), confirming a consistent scale factor of 2.5 **M1**

6.25 cso (2.5^2 = 6.25; answer is given, full working required) **A1**

Answer: 6.25 (shown)

Question 12

0.4^2 set up **M1**

0.16 cao **A1**

Answer: 0.16

Question 13

linear scale factor = $\sqrt{4}$ (=2) **M1**

3x - 4 = 2(x + 2) oe equation formed **M1**

x = 8 cao **A1**

Answer: x = 8

Question 14

$4^2 : 9^2$ set up (perimeter scales with the linear scale factor) **M1**

16:81 cao oe **A1**

Answer: 16:81

Question 15

linear scale factor = $\sqrt[3]{1000/27}$ (=10/3, awrt 3.33) **M1**

9 x 10/3 **M1**

30 cao, units cm **A1**

Answer: 30 cm

Question 16

linear scale factor = $\sqrt{9/4}$ (=1.5) **M1**

volume scale factor = 1.5^3 (=3.375); 32 x 3.375 **dM1**

108 cso (answer given, full working required) **A1**

Answer: 108 cm^3 (shown)

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