
Two figures are similar if they have the same shape, same angles but different size. The symbol for similarity is ≅

$If \Delta ABC \cong \Delta PQR, \ then \quad \frac{AB}{PQ} = \frac{BC}{QR} = \frac{AC}{PR} = k$ **(**where k is some constant)

and the corresponding angles are equal. $\angle A = \angle P, \ \angle B = \angle Q \ and \ \angle C = \angle R$

Area of similar figures: Volume of similar solid figures**:** Mass of similar solids:

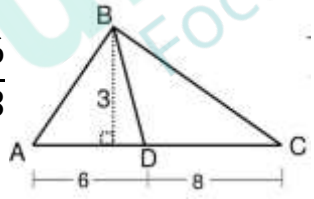
$$\frac{A_1}{A_2} = \left(\frac{side\,1}{side\,2}\right)^2 \qquad \frac{V_1}{V_2} = \left(\frac{side\,1}{side\,2}\right)^3 \qquad \frac{m_1}{m_2} = \left(\frac{side\,1}{side\,2}\right)^3$$

Relationship between Area and Volume of similar figures:

$$\sqrt[2]{\frac{A1}{A2}} = \sqrt[3]{\frac{V1}{V2}}$$

If two triangles have equal height then the ratio of their areas is the ratio of their bases

$$\frac{\text{Area } \Delta ABD}{\Delta\text{Area } DBC} = \frac{6}{8}$$





1. Some cones are mathematically similar.
   Two of the cones have radii in the ratio 2: 3.
   Write down the ratio of their masses. [1]
   0580/42/M/J/15 Q4(c)(ii)

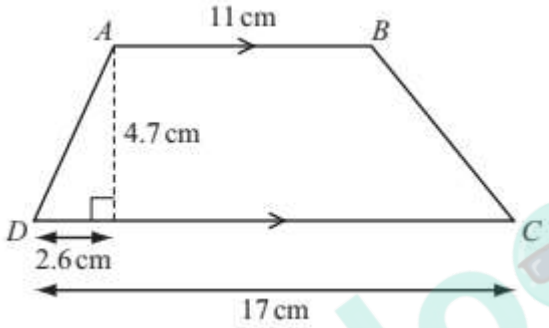
2. A company makes solid chocolate eggs and their shapes are mathematically similar.
   The eggs have height 2 cm and 6 cm.
   The mass of the small egg is 4 g.
   Calculate the mass of the large egg. [2]
   0580/21/M/J/11 Q6)

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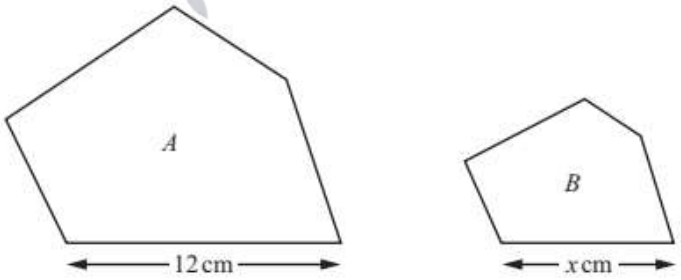
3. Two mathematically similar triangles, T and U have two corresponding sides of lengths 3 cm and 12 cm.
   The area of triangle T is 5cm^2.
   Find the area of triangle U.[2]
   0580/22/M/J/18 Q11)

4. ABCD is a trapezium.



   (a) Calculate the area of the trapezium ABCD. [2]
   (b) A **similar** trapezium has perpendicular height 9.4cm.
   Calculate the area of this trapezium. [3]
   0580/43/O/N/14 Q1

5. A and B are two similar pentagons.



   The area of A is 126 cm^2 and the area of B is 56cm^2.
   Calculate the value of x. [3]
   0580/27/M/J/14 Q16)

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6. Cylinder A is mathematically similar to cylinder B.
   The height of cylinder A is 10 cm and
   its surface area is 440cm^2.
   The surface area of cylinder B is 3960cm^2.
   Calculate the height of cylinder B. [3]
   0580/21/O/N/17 Q20 (b)

7. Two mathematically similar shapes have areas
   262cm^2 and 65.5cm^2.
   The width of the larger shape is 17 cm.
   Calculate the width of the smaller shape. [3]
   0580/42/M/J/19 Q10(c)

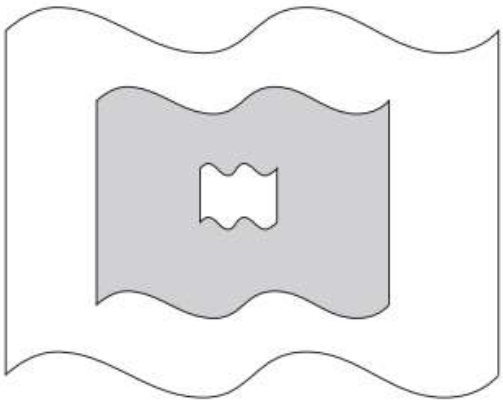
8. Marianne sells two sizes of photo.
   These photos are mathematically similar rectangles.
   The smaller photo has length 15cm and width 12cm.
   The larger photo has area 352.8cm^2.
   Calculate the length of the larger photo.
   0580/41/O/N/18 Q1(b)

9. A quadrilateral P is enlarged by a scale factor of 1.2
   to give quadrilateral Q.
   The area of quadrilateral P is 20cm^2.
   Calculate the area of quadrilateral Q. [2]
   0580/43/M/J/22 Q2(b)

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10. The diagram shows three shapes that are mathematically similar.



The heights of the shapes are in the ratio
small : medium : large = 1 : 5 : 8.
Find the ratio shaded area : total unshaded area.
Give your answer in its simplest form. [4]
0580/21/O/N/21 Q15)

11. Two mathematically similar containers have heights of 30cm and 75cm.
The larger container has a capacity of 5.5 litres.
Calculate the capacity of the smaller container.
Give your answer in millilitres.[3]
0580/22/O/N/19 Q13)

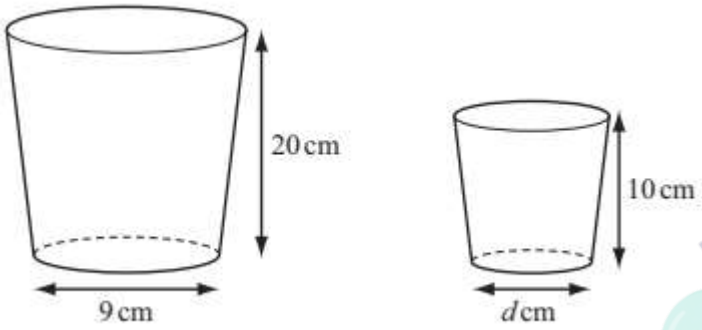
12. The volumes of two similar cones are $36\pi cm^3$ and $288\pi cm^3$.
The base radius of the smaller cone is 3cm.
Calculate the base radius of the larger cone [3]
0580/23/M/J/13 Q6)

13. Two mathematically similar vases are such that,
Vase A has height 20 cm and volume $1500cm^3$.
Vase B has volume $2592cm^3$.
Calculate h, the height of vase B. [3]
0580/23/M/J/16 Q21 (b)

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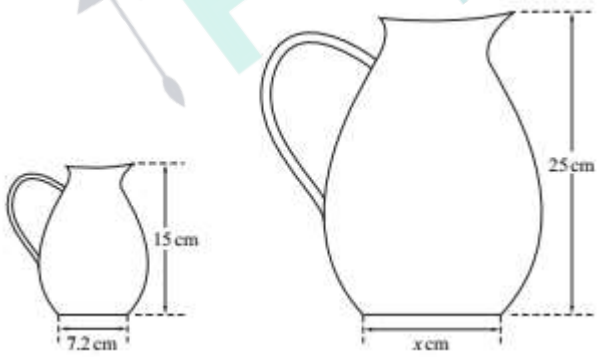


14. The diagrams show two mathematically similar containers.
The larger container has a base with diameter 9 cm and a height 20 cm.
The smaller container has a base with diameter d cm and a height 10 cm.



(a) Find the value of d.
(b) The larger container has a capacity of 1600 ml.
Calculate the capacity of the smaller container. [2]
0580/23/M/J/11 Q17)

15. (a) The diagram shows two jugs that are mathematically similar.



Find the value of x. [2]
(b) Two glasses that are mathematically similar.
The height of the larger glass is 16 cm and its volume is 375 cm^3.
The height of the smaller glass is y cm and its volume is 192 cm^3.
Find the value of y. [3]
0580/22/O/N/15 Q21)

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16. A cone, with radius x and height y, has a volume W.

Find, in terms of W, the volume of

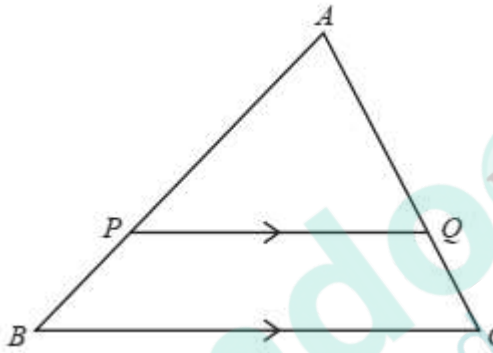
(i) a similar cone, with both radius and height 3 times larger, [1]

(ii) a cone of radius $2x$ and height y [1]

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

0580/04/O/N/09 Q7)(c)

17. (a) In the diagram, PQ is parallel to BC.



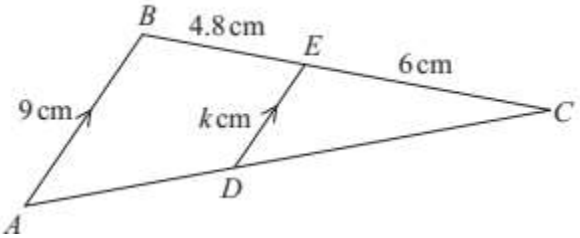
APB and AQC are straight lines.

PQ = 8 cm, BC = 10cm and AB = 9cm.

Calculate PB. [2]

0580/23/M/J/18 Q25)(a)

18. Triangles CBA and CED are similar.



AB is parallel to DE.

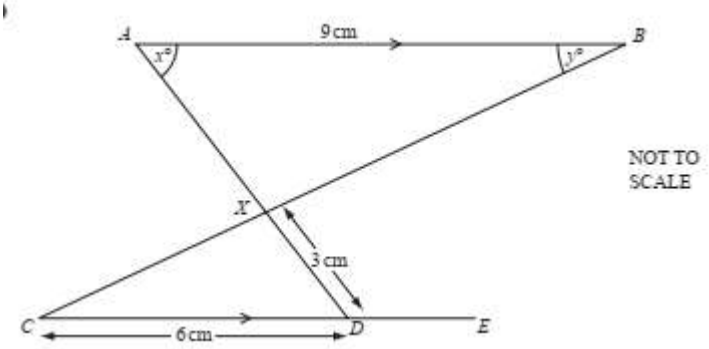
AB = 9cm, BE = 4.8cm, EC = 6cm and ED = k cm.

Work out the value of k. [2]

0580/23/M/J/16 Q21

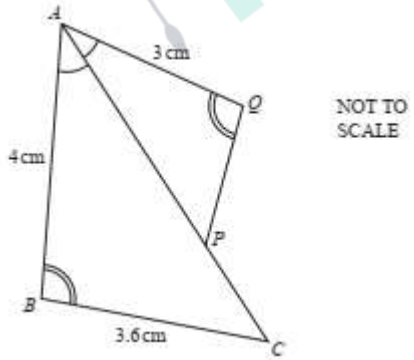
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19. The lines AB and CDE are parallel.



AD and CB intersect at X.
AB = 9 cm, CD = 6 cm and DX = 3 cm.
(i) Complete the following statement.
Triangle ABX is _____ to triangle DCX. [1]
(ii) Calculate the length of AX. [2]
(iii) The area of triangle DCX is 6 cm^2.
Calculate the area of triangle ABX. [2]
(iv) Angle BAX = x° and angle ABX = y°.
Find angle AXB and angle XDE in terms of x and/or y. [2]
0580/42/M/J/10 Q9(a)

20. The diagram shows two triangles ACB and APQ.

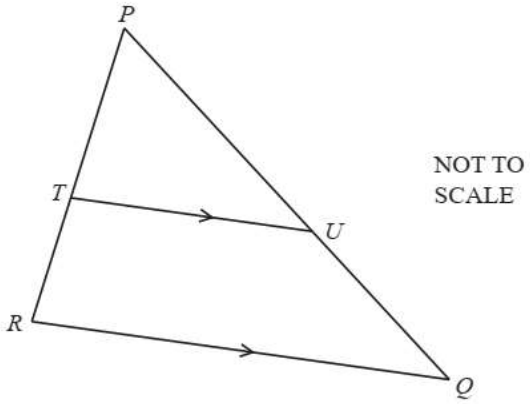


Angle PAQ = angle BAC and angle AQP = angle ABC.
AB = 4 cm, BC = 3.6 cm and AQ = 3 cm.
(i) Complete the following statement.
Triangle ACB is ……..to triangle APQ. [1]
(ii) Calculate the length of PQ. [2]
(iii) The area of triangle ACB is 5.6 cm^2.
Calculate the area of triangle APQ. [2]
0580/43/M/J/10 Q5(a)

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21. PQR is a triangle.



T is a point on PR and U is a point on PQ.
RQ is parallel to TU.
(i) Explain why triangle PQR is similar to triangle PUT.
Give a reason for each statement you make.
.....
.....
.....
..... [3]
(ii) PT : TR = 4 : 3
(a) Find the ratio PU : PQ. [1]
(b) The area of triangle PUT is $20cm^2$.
Find the area of the quadrilateral QRTU. [3]
0580/43/O/N/20 Q5

22. Two cones are mathematically similar.
The total surface area of the smaller cone is $80cm^2$.
The total surface area of the larger cone is $180cm^2$.
The volume of the smaller cone is $168cm^3$.
Calculate the volume of the larger cone. [3]
0580/41/O/N/19 Q4(c)

23. Two mathematically similar solid metal prisms are such that.
The volume of the smaller prism is $648cm^3$ and the volume of the larger prism is $2187cm^3$.
The area of the cross-section of the smaller prism is $36cm^2$.
Calculate the area of the cross-section of the larger prism. [3]
0580/43/O/N/19 Q6(b)(i)

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24. The two containers are mathematically similar in shape.
The larger container has a volume of 3456cm^3 and a surface area of 1024cm^2.
The smaller container has a volume of 1458cm^3.
Calculate the surface area of the smaller container. [4]
0580/22/M/J/14 Q18)

Answer

1) 8 : 27	13) 24
2) 108	14) (a)4.5 (b)200
3) 80	15) (a)12 (b)12.8
4) (a) 65.8 (b) 263.2	16) (i) 27 W(ii)4W
5) 8	17) 1.8
6) 30	18) (a)5 (b)24
7) 8.5	19) (a) (i) Similar (ii) 4.5 (iii) 13.5 (iv) 180 – x – y oe 180 – x oe
8) 21	20) (i) Similar (ii) 2.7 (iii) 3.15
9) 28.8	21) (i) Angle PTU = angle PRQ corresponding , Angle PUT = angle PQR corresponding , Angle RPQ is common oe hence Corresponding angles are equal oe (ii)(a)4:7 (b) 41.25
10) 3 : 5	22) 567
11) 352	23) 81
12) 6	24) 576

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