## Similar shapes


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4.



The two triangles ABC and PQR are mathematically similar.
Angle A = angle P .
Angle $\mathrm{B}=$ angle Q .
$\mathrm{AB}=8 \mathrm{~cm}$.
$\mathrm{AC}=26 \mathrm{~cm}$.
$\mathrm{PQ}=12 \mathrm{~cm}$.
$\mathrm{QR}=45 \mathrm{~cm}$.
(a) Calculate the length of PR.
(b) Calculate the length of BC .
5.

$A B$ is parallel to $D E$. $A C E$ and $B C D$ are straight lines.
$\mathrm{AB}=6 \mathrm{~cm}$,
$\mathrm{AC}=8 \mathrm{~cm}$,
$\mathrm{CD}=13.5 \mathrm{~cm}$,
$\mathrm{DE}=9 \mathrm{~cm}$.
(a) Calculate the length of CE.
(b) Calculate the length of BC .
1.


Diagram NOT accurately drawn
AB is parallel to XY .
The lines AY and BX intersect at P .
$\mathrm{AB}=6 \mathrm{~cm}$.
$\mathrm{XP}=12.5 \mathrm{~cm}$.
$X Y=15 \mathrm{~cm}$.

Work out the length of BP.


BE is parallel to CD .
ABC and AED are straight lines.
$\mathrm{AB}=4 \mathrm{~cm}, \mathrm{BC}=6 \mathrm{~cm}, \mathrm{BE}=5 \mathrm{~cm}, \mathrm{AE}=4.8 \mathrm{~cm}$.
(a) Calculate the length of CD.
(b) Calculate the length of ED.
2.


## Diagram NOT accurately drawn

$B E$ is parallel to $C D$.
$\mathrm{AB}=9 \mathrm{~cm}, \mathrm{BC}=3 \mathrm{~cm}, \mathrm{CD}=7 \mathrm{~cm}, \mathrm{AE}=6 \mathrm{~cm}$.
(a) Calculate the length of ED.
(b) Calculate the length of BE.
5.

X and Y are two geometrically similar solid shapes.
The total surface area of shape X is $450 \mathrm{~cm}^{2}$ The total surface area of shape $Y$ is $800 \mathrm{~cm}^{2}$

The volume of shape X is $1350 \mathrm{~cm}^{3}$.
Calculate the volume of shape Y .


Two cones, P and Q , are mathematically similar.
The total surface area of cone $P$ is $24 \mathrm{~cm}^{2}$.
The total surface area of cone Q is $96 \mathrm{~cm}^{2}$
The height of cone P is 4 cm .
(a) Work out the height of cone Q .

The volume of cone P is $12 \mathrm{~cm}^{3}$
(b) Work out the volume of cone Q .
(a)


NOT TO
SCALE

Triangles $C B A$ and $C E D$ are similar.
$A B$ is parallel to $D E$.
$A B=9 \mathrm{~cm}, B E=4.8 \mathrm{~cm}, E C=6 \mathrm{~cm}$ and $E D=k \mathrm{~cm}$.
Work out the value of $k$.

$$
k=
$$

(b)


Vase A


Vase B

The diagram shows two mathematically similar vases.
Vase A has height 20 cm and volume $1500 \mathrm{~cm}^{3}$.
Vase B has volume $2592 \mathrm{~cm}^{3}$.

Calculate $h$, the height of vase $B$.

$$
\begin{equation*}
h=. \tag{3}
\end{equation*}
$$




The diagram shows two jugs that are mathematically similar.

Find the value of $x$.

$$
\text { Answer(a) } x=
$$

(b)


NOT TO
SCALE

The diagram shows two glasses that are mathematically similar.
The height of the larger glass is 16 cm and its volume is $375 \mathrm{~cm}^{3}$.
The height of the smaller glass is $y \mathrm{~cm}$ and its volume is $192 \mathrm{~cm}^{3}$.
Find the value of $y$.

14 Two containers are mathematically similar. Their volumes are $54 \mathrm{~cm}^{3}$ and $128 \mathrm{~cm}^{3}$. The height of the smaller container is 4.5 cm .

Calculate the height of the larger container.

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The two containers are mathematically similar in shape.
The larger container has a volume of $3456 \mathrm{~cm}^{3}$ and a surface area of $1024 \mathrm{~cm}^{2}$.
The smaller container has a volume of $1458 \mathrm{~cm}^{3}$.
Calculate the surface area of the smaller container.

1 (a) $A B C D$ is a trapezium.

(i) Calculate the length of $A D$.

Answer(a)(i) $A D=$
cm [2]
(ii) Calculate the size of angle $B C D$.

Answer(a)(ii) Angle $B C D=$
(iii) Calculate the area of the trapezium $A B C D$.
(b) A similar trapezium has perpendicular height 9.4 cm .

Calculate the area of this trapezium.
(d)


The $180000 \mathrm{~cm}^{3}$ of water reaches the level $E F$ as shown above. $E F=x \mathrm{~cm}$ and the height of the water is $h \mathrm{~cm}$.
(i) Using the properties of similar triangles, show that $h=2(x-50)$.

Answer(d)(i)
(ii) Using $h=2(x-50)$, show that the shaded area, in $\mathrm{cm}^{2}$, is $x^{2}-2500$.

Answer(d)(ii)
(iii) Find the value of $x$.

$$
\begin{equation*}
\text { Answer(d)(iii) } x= \tag{2}
\end{equation*}
$$

(iv) Find the value of $h$.


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A company sells cereals in boxes which measure 10 cm by 25 cm by 35 cm .
They make a special edition box which is mathematically similar to the original box.
The volume of the special edition box is $15120 \mathrm{~cm}^{3}$.
Work out the dimensions of this box.
(d)


NOT TO SCALE

The diagram shows two similar figures.
The areas of the figures are $5 \mathrm{~cm}^{2}$ and $7.2 \mathrm{~cm}^{2}$.
The lengths of the bases are $l \mathrm{~cm}$ and 6.9 cm .
Calculate the value of $l$.

Answer(d) $l=$ $\qquad$
3.


The diagram represents a large cone of height 6 cm and base diameter 18 cm .
The large cone is made by placing a small cone A of height 2 cm and base diameter 6 cm on top of a frustum $B$.

Calculate the volume of the frustum B. Give your answer in terms of $\prec$.

6


NOT TO
SCALE

A company makes solid chocolate eggs and their shapes are mathematically similar. The diagram shows eggs of height 2 cm and 6 cm .
The mass of the small egg is 4 g .
Calculate the mass of the large egg.

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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 $d \mathrm{~cm}$ and a height 10 cm .
(a) Find the value of $d$.

$$
\begin{equation*}
\operatorname{Answer}(a) d= \tag{1}
\end{equation*}
$$

(b) The larger container has a capacity of 1600 ml .

Calculate the capacity of the smaller container.

