

SIMILARITY AND CONGRUENCE

Summary;

Similar shapes are identical in shape but not in size

The ratio of the corresponding sides of similar shapes is the same and is called linear scale factor.

For any two similar shapes;

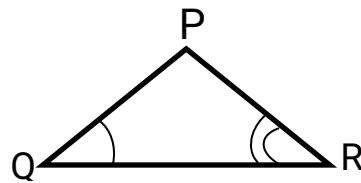
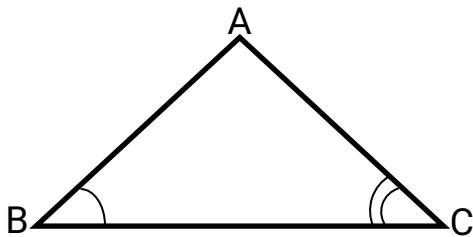
i) Ratio of length= linear scale factor (L.S.F)

ii) Ratio of areas = $(\text{L.S.F})^2$

iii) Ratio of volumes = $(\text{L.S.F})^3$

The following properties apply to similar shapes;

i) Corresponding angles are equal as shown



thus $\angle A = \angle P$, $\angle B = \angle Q$ and $\angle C = \angle R$

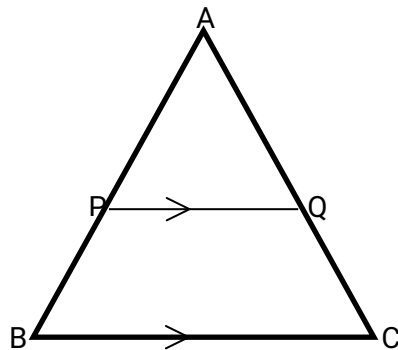
ii) The ratios between corresponding sides are equal

$$\frac{AB}{PQ} = \frac{AC}{PR} = \frac{BC}{QR} \quad \text{or} \quad \frac{PQ}{AB} = \frac{PR}{AC} = \frac{QR}{BC}$$

Congruent figures are the ones which are exactly the same size

Examples:

1. In the figure below, PQ is parallel to BC

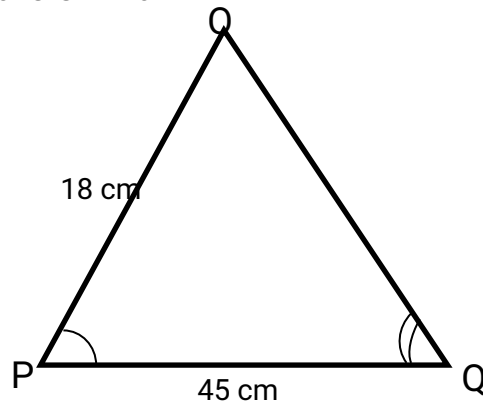
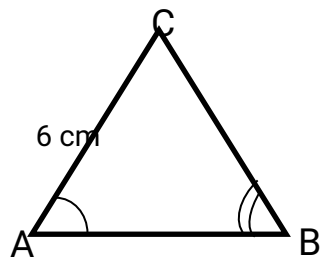


- i) Show that triangles ABC and APQ are similar

(Hint: show that the triangles are equiangular)

- ii) Write down the ratios between their corresponding sides

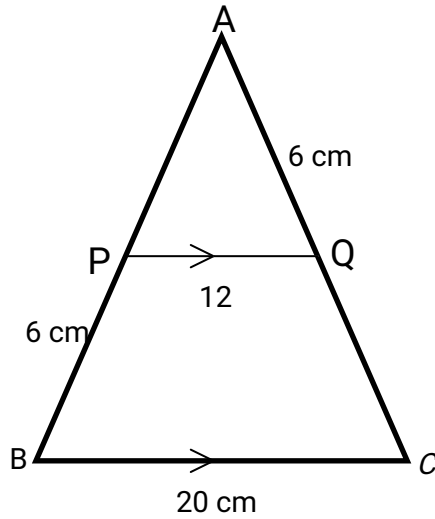
2. The triangle ABC and PQR below are similar



Determine the;

- i) linear scale factor
- ii) length AB
- iii) ratio of area of triangle ABC that of PQR

3.



a) Find the lengths AP and QC

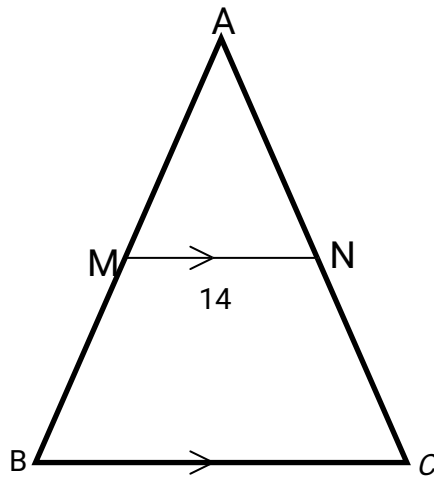
b) If the area of triangle APQ is 26.14 cm^2 , find the;

i) area of triangle ABC

ii) Area of trapezium PBCQ

4. In the figure below, MN is parallel to BC. $MN = 14 \text{ cm}$ and

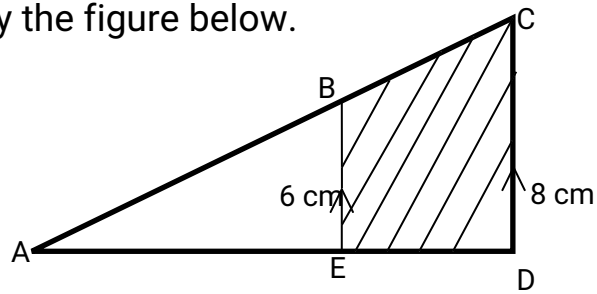
$AM: MB = 2:3$



a) Find the length BC

b) If the area of triangle ABC is 150 cm^2 , find the area of trapezium MBCN.

5. Study the figure below.

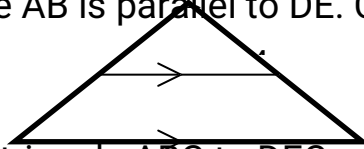


If $AD = 12$ cm, find the area of the shaded region

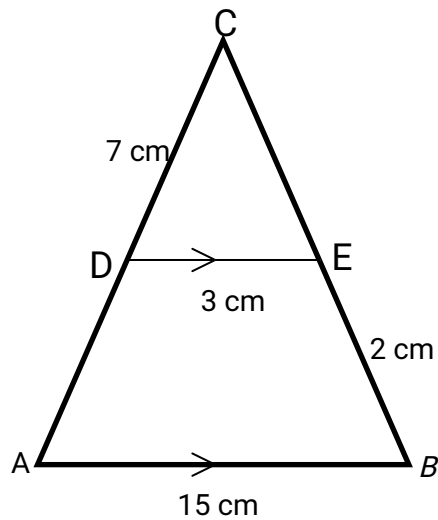
In the figure above AB is parallel to DE . Calculate the;

i) length AD

ii) ratio of area of triangle ABC to DEC



6.



1. s

In the above AB is parallel to DE , DC = 7 cm, BE = 2 cm.

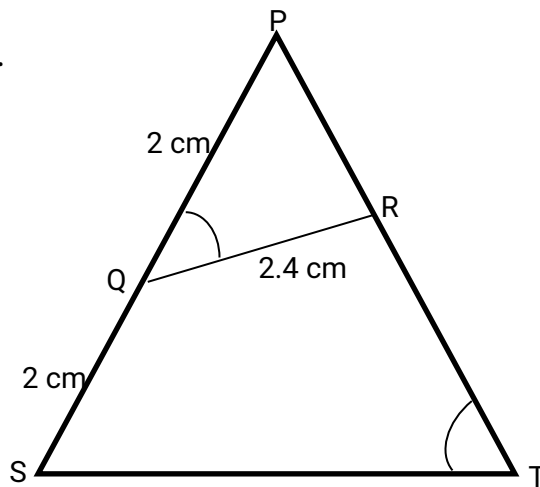
a) Calculate the length of;

i)AD

ii)CE

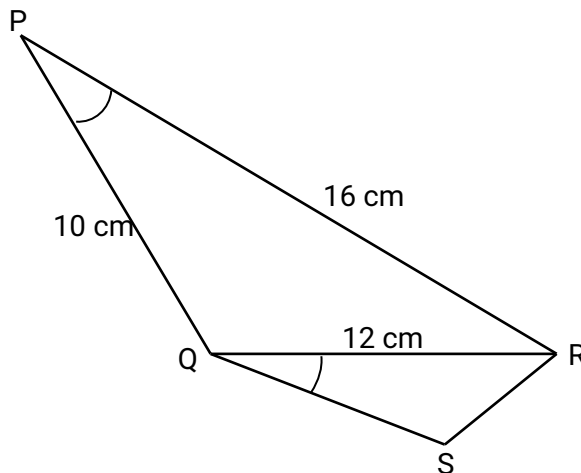
b) Given that the area of DEC is 30 cm^2 , find the area of quadrilateral ABED.

2.



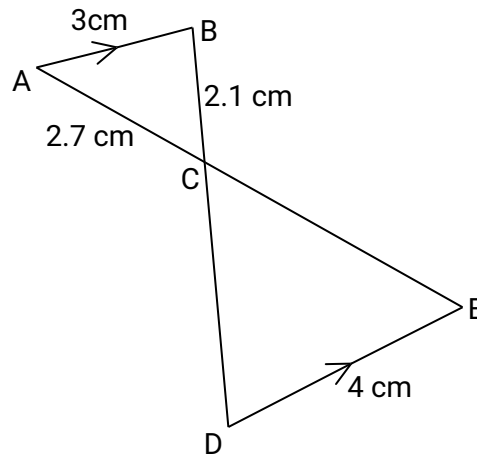
In the figure triangles PQR and PST are similar and PS= 5cm. Calculate the length of PR and ST.

3.



The triangles PQR and QSR are similar. Calculate the lengths QS and SR.

4.



In the figure AB is parallel to DE. Calculate the lengths CD and CE.

Word problems:

1. The areas of two similar triangles are 18 cm^2 and 32 cm^2 respectively. If the base of the smaller triangle is 6 cm, find the base of the larger triangle.

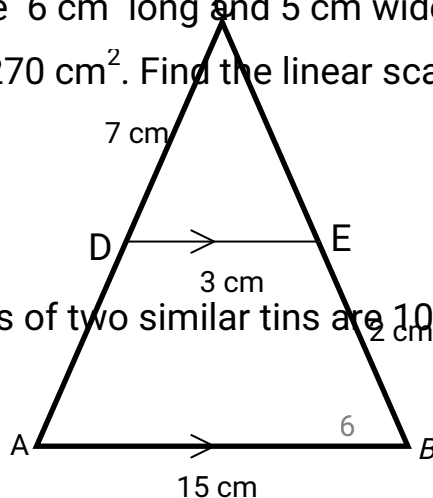
(8 cm)

2. Two similar figures have corresponding sides of length 3 cm and 5 cm. If the area of the larger figure is 100 cm^2 find the area of the smaller figure

(36 cm^2)

3. A rectangle 6 cm long and 5 cm wide is enlarged so that its area becomes 270 cm^2 . Find the linear scale factor

(3)



4. The heights of two similar tins are 10 cm and 15 cm respectively. If

the volume of the larger tin is 405 cm^3 , find the volume of the smaller tin

(120 cm³)

5. A beaker of height 21 cm has volume 135 cm^3 . Find the height of a similar beaker whose volume is 40 cm^3

(14 cm)

6. A tank has a volume of 6400 cm^3 and surface area 800 cm^2 . Find the surface area of a similar tank whose volume is 2700 cm^3

(450 cm²)

7. A cone has volume of 120 cm^3 and surface area of 48 cm^2 . Find the volume of a similar cone whose surface area is 108 cm^2

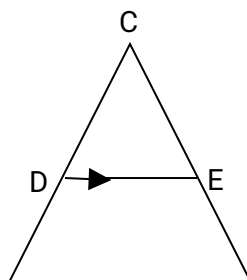
(405 cm³)

8. A cylinder of radius 2 cm has height of 3.5 cm is enlarged so that its volume becomes 1188 cm^3 . Find the linear scale factor

(3)

EER

1. In the figure below DE is parallel to AB. AB= 15 cm , DE = 12 cm and AD = 4cm



find the;

- i) length of CD
- ii) area of trapezium ABED if area of triangle CDE is 288 cm^2

2. A tank of height 7.5 cm has capacity of 540 cm^3 . Find the capacity of a similar tank whose height is 5 cm
3. A tank of height 2m and width 1.4 m has capacity of 3.08 m^3 . Find the height and width of a similar tank whose capacity is 83.16 m^3
4. Two solids have a linear scale factor of 3. Given that the larger one has surface area of 324 cm^2 and volume of 405 cm^3 , find the volume and surface area of the other.
5. The volumes of two similar cups are 64 cm^3 and 343 cm^3 respectively. Find the ratio of their surface area.
6. A tank has volume of 2700 cm^3 and surface area of 450 cm^2 . Find the surface area of a similar tank whose volume is 6400 cm^3
7. The heights of two similar cups are 10 cm and 15 cm resp. if the

larger cup has surface area of 108 cm^2 and a volume of 405 cm^3 .

Find the surface area and volume of a smaller cup

8. A cone has radius of 7 cm and vertical height of 30 cm. Find its;

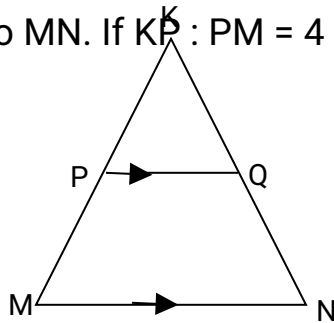
i) its volume

ii) the volume of another similar larger cone which has a linear scale factor of 2.

9. The heights of two similar jugs are 6 cm and 8 cm resp. if the capacity of the laeger jug is 252 cm^3 , find the capacity of the smaller jug

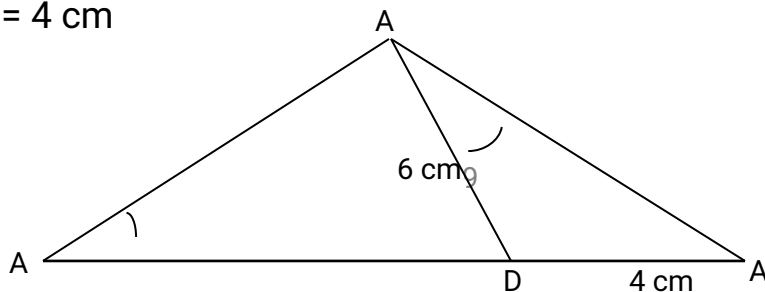
10. The areas of two similar triangles are 18 cm^2 and 32 cm^2 resp. if the height of the smaller triangle is 6 cm, find the height of the larger triangle.

11. In the figure below PQ is parallel to MN. If $KP : PM = 4 : 13$, $KN = 20.4 \text{ cm}$ and $PQ = 6.4 \text{ cm}$



Find the lengths of KQ and MN.

12. In the figure below $\angle BAC = \angle DBC$, $BC = 8 \text{ cm}$, $DB = 6 \text{ cm}$ and $DC = 4 \text{ cm}$



Find the length of AD and AB