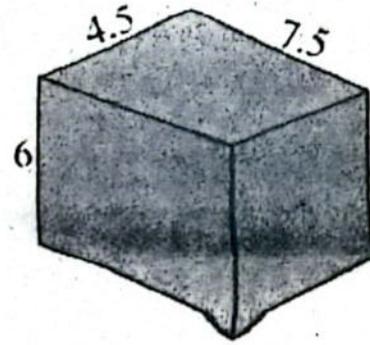
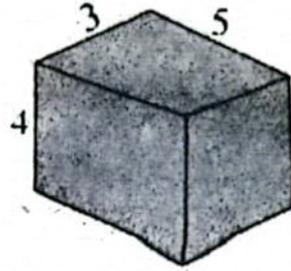




Exercise 9.1



1. Find whether the solids are similar. All lengths are in cm.



Sol: Small Cuboid Bigger Cuboid
 $4 \times 3 \times 5$ $6 \times 4.5 \times 7.5$

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The lengths of the sides are in correspondence.

4 is in correspondence with 6

$$\text{Ratio of 4 to 6} = \frac{4}{6} = \frac{2}{3}$$

3 is in correspondence with 4.5

$$\text{Ratio of 3 to 4.5} = \frac{30}{45} = \frac{2}{3}$$

5 is in correspondence with 7.5

$$\text{Ratio of 7 to 7.5} = \frac{5}{7.5} = \frac{2}{3}$$

The ratio between the sides is equal, hence both the cuboids are similar.

2. In triangle ABC , the sides are given as

$$m\overline{AB} = 6\text{ cm}, m\overline{BC} = 9\text{ cm}$$

and $m\overline{CA} = 12\text{ cm}$. In triangle DEF , the sides are

given as $m\overline{DE} = 10.5\text{ cm}$, $m\overline{EF} = 15.75\text{ cm}$, and $m\overline{FD} = 21\text{ cm}$.

Prove that the triangles are similar.

Sol: $\triangle ABC \approx \triangle DEF$

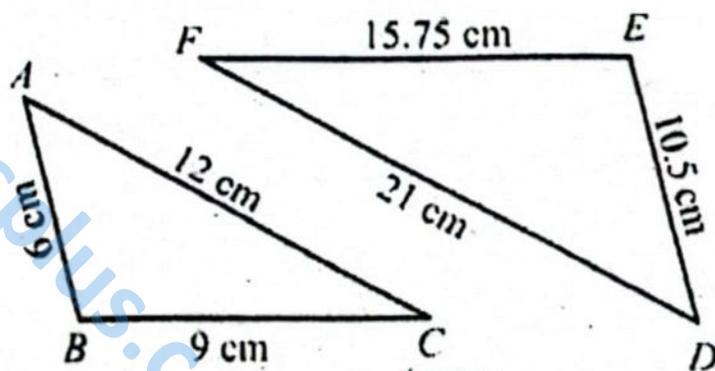
The correspondence is as follows

1. $AC \longleftrightarrow \overline{FD}$
2. $AB \longleftrightarrow \overline{ED}$ and
3. $\overline{BC} \longleftrightarrow EF$

$$\text{Ratio between 1}^{\text{st}} \text{ pair} = \frac{12}{21} = 0.571$$

$$\text{Ratio between 2}^{\text{nd}} \text{ pair} = \frac{6}{10.5} = 0.571$$

$$\text{Ratio between 3}^{\text{rd}} \text{ pair} = \frac{9}{15.75} = 0.571$$



Since the ratio between the correspondences is the same.

Hence the similarity between the two triangles is established.

3. In the given figure, $\triangle ABC \sim \triangle DEF$,

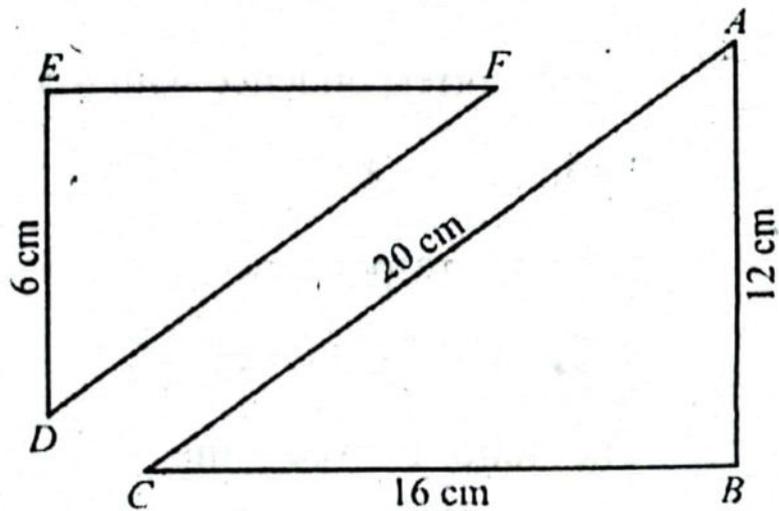
$$m \overline{AB} = 12 \text{ cm,}$$

$$m \overline{AC} = 20 \text{ cm and}$$

$$m \overline{BC} = 16 \text{ cm. In } \triangle EF,$$

$$m \overline{DE} = 6 \text{ cm. Find}$$

$$m \overline{DF} \text{ and } m \overline{EF}.$$



Sol: $\triangle DEF \approx \triangle ABC$. Find the sides e and d .

$$\frac{e}{6} = \frac{16}{12}$$

$$\therefore e = \frac{16 \times 6^2}{12} = 8 \text{ cm}$$

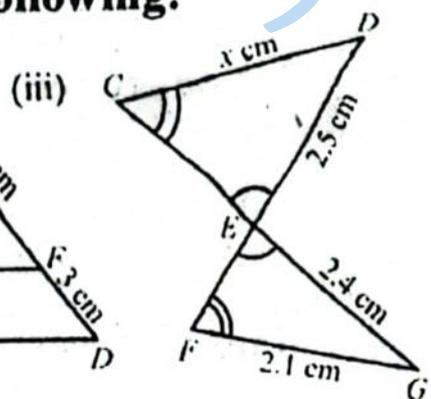
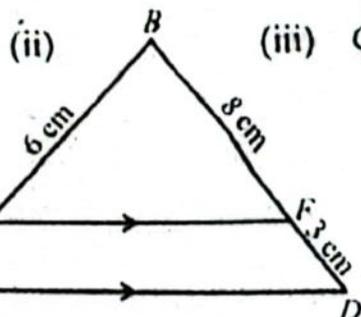
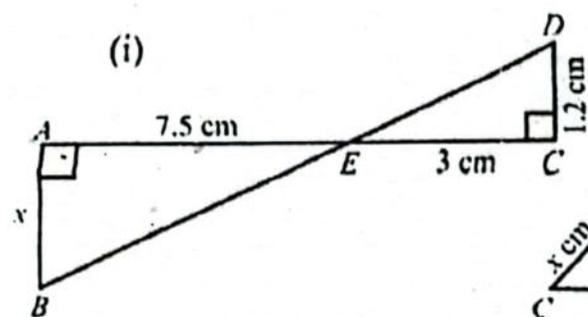
$$\therefore DF = 8 \text{ cm}$$

$$\frac{d}{6} = \frac{12}{16}$$

$$d = \frac{12 \times 6^3}{16 \times 2} = \frac{9}{2} = 4.5 \text{ cm}$$

$$\therefore EF = 4.5 \text{ cm.}$$

4. Find the value of x in each of the following:



Sol: (i) $\frac{x}{1.2} = \frac{7.5}{3}$

$$\therefore x = \frac{7.5 \times 1.2}{3} = 3.0$$

(ii) $EF \parallel CD$

$$\therefore \frac{CE}{6} = \frac{DE}{8}$$

$$\frac{x}{6} = \frac{3}{8}$$

$$x = \frac{3}{8} \times 6 = \frac{9}{4} = 2.25$$

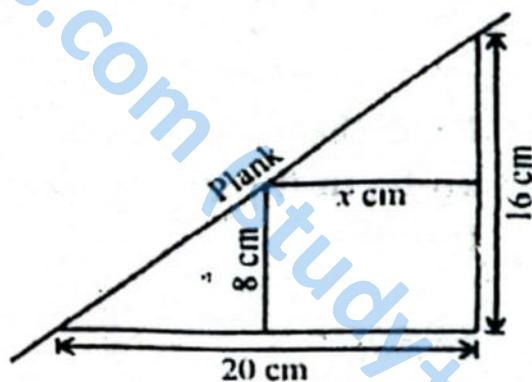
$$\therefore x = 2.25 \text{ cm}$$

(iii) $\frac{x}{21} = \frac{25}{24}$

$$\therefore x = \frac{21 \times 25}{24}$$

$$= 21.875$$

5. A plank is placed straight upstairs that is 20 cm wide and 16 cm deep. A rectangular box of height 8 cm and width x cm is placed on a stair under the plank. Find the value of x .



Sol: Δs AED and FTB are similar.

$$\therefore \frac{20 - x}{8} = \frac{x}{8}$$

$$8x = 160 - 8x$$

$$8x + 8x = 160$$

$$16x = 160$$

$$x = 10 \text{ cm}$$



6. A man who is 1.8 m tall casts a shadow of a 0.76m in length. If at the same time a telephone pole casts a 3m shadow, find the height of the pole.

Sol: $\Delta PQR \cong \Delta ABC$

$$m\angle A = m\angle P$$

$$m\angle B = m\angle Q = 90^\circ$$

$$BC = 3m$$

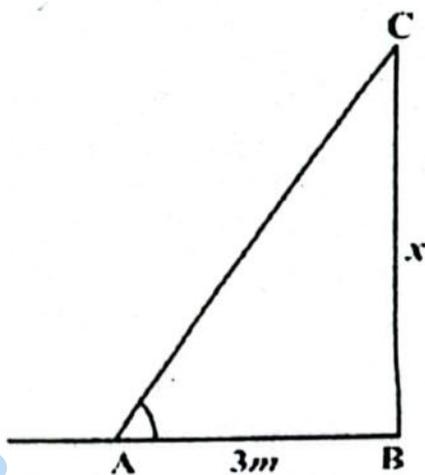
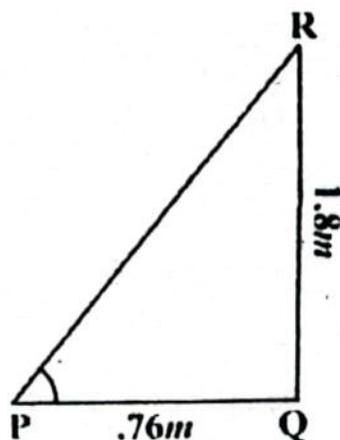
$$RQ = 1.8 m$$

$$PQ = .76 m$$

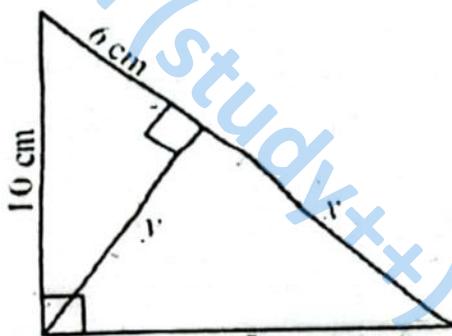
$$AB = x m$$

$$\frac{x}{3} = \frac{1.8}{.76}$$

$$\begin{aligned} \therefore x &= \frac{1.8 \times 3}{.76} \\ &= 7.105 m \end{aligned}$$



7. Find the values of x , y and z in the given figure.



Sol: ABC is a right angled Δ ABD is another right angled Δ .
In ΔABD

$$\overline{AD} = 6 \text{ cm}$$

$$AB = 10 \text{ cm}$$

$$(BD)^2 = (AB)^2 - (AD)^2 = 100 - 36 = 64$$

$$\therefore BD = y = 8 \text{ cm}$$

$$\Delta ABD \sim \Delta ABC$$



$$\angle ADB = \angle BAC = \text{Each } 90^\circ$$

$\angle B \sim \angle B$ Common third angle

$$\angle BAD = \angle C$$

$$\therefore AB \sim BC; AD \sim AC; BD \sim AD$$

$$\frac{AD}{AC} = \frac{BD}{AB}$$

$$\frac{8}{z} = \frac{6}{10}$$

$$\text{or } z = \frac{8 \times 10}{6} = \frac{80}{6}$$

$$= \frac{40}{3} = 13\frac{1}{3}$$

$$z^2 = x^2 + y^2$$

$$\frac{1600}{9} = x^2 + 64$$

$$x^2 = \frac{1600}{9} - 64$$

$$= \frac{1600 - 576}{9}$$

$$x^2 = \frac{1024}{9}$$

$$x = \frac{32}{3}$$

$$x = 10\frac{2}{3}$$

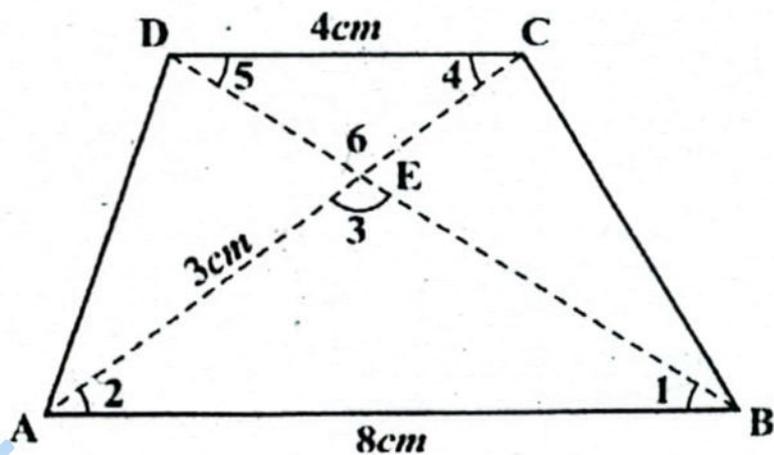
$$x = 10\frac{2}{3}, y = 8, z = 13\frac{1}{3}$$



8. Draw an isosceles trapezoid $ABCD$ where $\overline{AB} \parallel \overline{CD}$ and $m\overline{AB} > m\overline{CD}$. Draw diagonals \overline{AC} and \overline{BD} , intersecting at E . Prove that $\triangle ABE$ is similar to $\triangle CDE$. If $m\overline{AB} = 8$ cm, $m\overline{CD} = 4$ cm, and $m\overline{AE} = 3$ cm, find the length of \overline{CE} .

Sol:

1. Draw a line segment \overline{AB} equal to 8cm.
2. Draw another line segment CD equal to 4cm \parallel to AB at any distance.



3. Join BC and DA .

$ABCD$ is the required trapezium.

4. Join AC and BD diagonals crossing each other at E . Making angles $\angle 1$, $\angle 2$, $\angle 3$, $\angle 4$, $\angle 5$ and $\angle 6$ shown in the diagram.

Consider the $\triangle ABE$ and $\triangle CDE$:

$$\angle 3 = \angle 6 \quad \text{Vertically opposite angles.}$$

$$\angle 1 = \angle 5 \quad \text{Alternate angles}$$

$$\angle 2 = \angle 4 \quad \text{Alternate angles}$$

$$\triangle ABE \approx \triangle CDE \quad \dots(1)$$

$$\frac{AB}{AE} = \frac{CD}{CE} \quad \text{Sides facing equal angles of similar triangle}$$

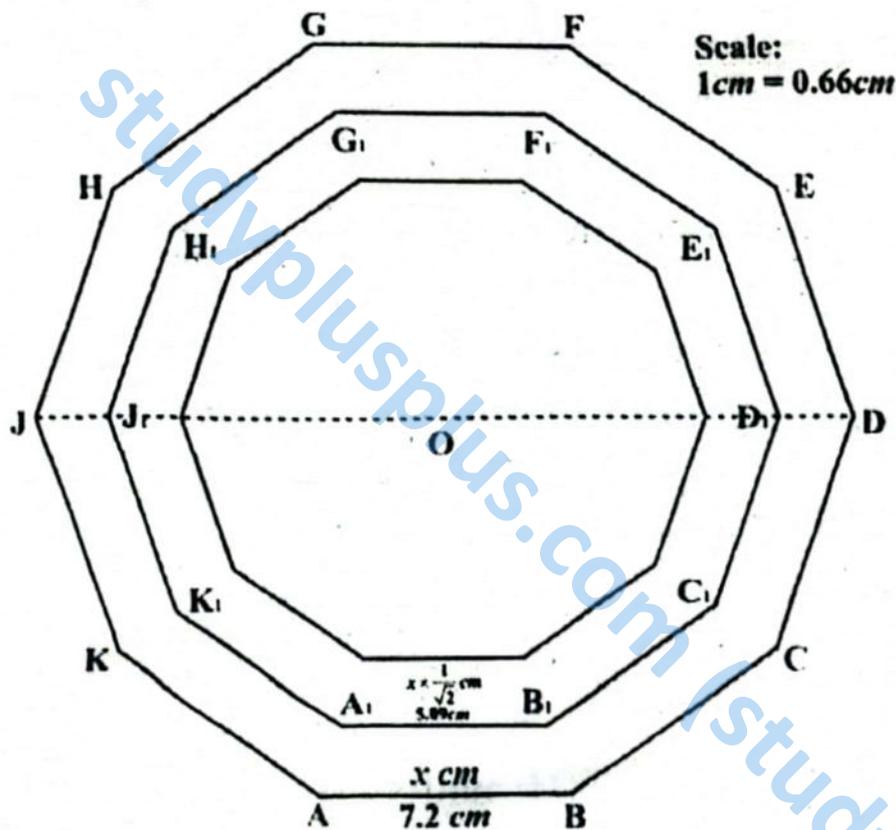
$$\frac{8}{AE} = \frac{4}{CE}$$

$$\therefore CE = \frac{4 \times AE}{8} = \frac{4 \times 3}{8} = \frac{3}{2} = 1.5 \dots (2)$$



9. A regular decagon has its side lengths decreased by a factor of $\frac{1}{\sqrt{2}}$. If the perimeter of the original decagon is 72cm. What is the side length of scaled decagon?

Sol: Parameter of the Decagon = 72 cm
 No. of sides of Decagon = 10



Length of each side = 7.2 cm, So $AB = 7.2$ cm

The outer Decagon is of the side length $7.2 \times \frac{1}{\sqrt{2}}$.

The inner decagon side = 5.09 cm

A scale 1 cm = .67 ml

$$\text{Side length } A_1B_1 = AB \times \frac{1}{\sqrt{2}} = 5.09 \text{ cm}$$