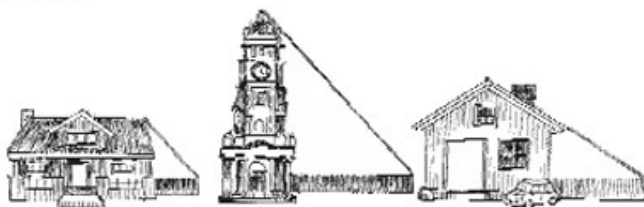


**Case Study 1**

Digvijay is trying to find the average height of a tower near his house. He is using the properties of similar triangles. The height of Digvijay's house is 20 m when Digvijay's house casts a shadow 10 m long on the ground. At the same time, the tower casts a shadow 50 m long on the ground and the house of Anshul casts 20 m shadow on the ground.



Q1. The height of the tower is:

- a. 10 m
- b. 20 m
- c. 50 m
- d. 100 m

Q2. When Digvijay's house casts a shadow of 18 cm, the length of the shadow of the tower is:

- a. 18 m
- b. 20 m
- c. 90 m
- d. 100 m

Q3. The height of Anshul's house is:

- a. 20 m
- b. 40 m
- c. 50 m
- d. 100 m

Q4. When the tower casts a shadow of 40 m, same time the length of the shadow of Anshul's house is:

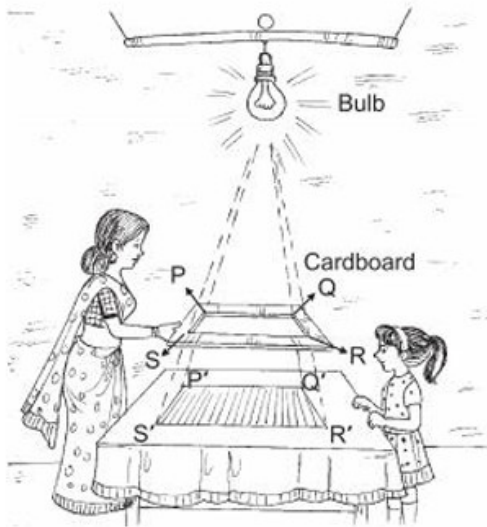
- a. 16 m
- b. 40 m
- c. 100 m
- d. None of these

Q5. Which of the following similarity criterion does not exist?

- a. AA
- b. SAS
- c. SSS
- d. RHS

Case Study 2

Gaurav placed a light bulb at a point O on the ceiling and directly below it placed a table. He cuts a polygon, say a quadrilateral PQRS, from a plane cardboard and place this cardboard parallel to the ground between the lighted bulb and the table. Then a shadow of PQRS is cast on the table as P'Q'R'S'. Quadrilateral P'Q'R'S' is an enlargement of the quadrilateral PQRS with scale factor 1: 3. Given that PQ = 2.5 cm, QR 3.5 cm. RS 3.4 cm and PS = 3.1 cm; $\angle P = 115^\circ$, $\angle Q = 95^\circ$, $\angle R = 65^\circ$ and $\angle S = 85^\circ$.



Based on the given information, solve the following questions:

Q1. The length of R'S' is:

- a. 3.4 cm
- b. 10.2 cm
- c. 6.8 cm
- d. 9.5 cm

Q 2. The ratio of sides P'Q' and Q'R' is:

- a. 5:7
- b. 7:5
- c. 7:2
- d. 2:7

Q3. The measurement of $\angle Q'$ is:

- a. 115°
- b. 95°
- c. 65°
- d. 85°

Q4. The sum of the lengths $Q'R'$ and $P'S'$ is:

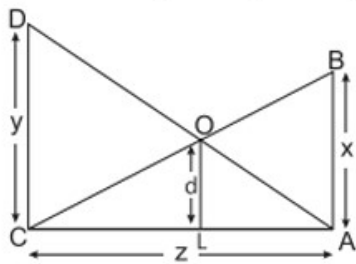
- a. 12.3 cm
- b. 6.7 cm
- c. 19.8 cm
- d. 9 cm

Q5. The sum of angles of quadrilateral $P'Q'R'S'$ is:

- a. 180°
- b. 270°
- c. 300°
- d. 360°

Case Study 3

Anika is studying in class X. She observe two poles DC and BA. The heights of these poles are x m and y m respectively as shown in figure:



These poles are z m apart and O is the point of intersection of the lines joining the top of each pole to the foot of opposite pole and the distance between point O and L is d . Few questions came to his mind while observing the poles.

Based on the above information, solve the following questions:

Q1. Which similarity criteria is applicable in $\triangle ACAB$ and CLO ?

Q2. If $x=y$, prove that $BC:DA = 1:1$.

Q3. If $CL = a$, then find a in terms of x , y and d .

OR

If $AL = b$, then find b in terms of x , y and d .

ANSWERS

CASE STUDY-1:

1. Let $CD = h$ m be the height of the tower.

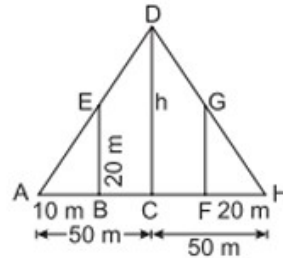
Let $BE = 20$ m be the height of Digvijay house and GF be the height of Anshul's house.

$$\triangle ACD \sim \triangle ABE$$

$$\therefore \frac{AC}{AB} = \frac{CD}{EB}$$

$$\Rightarrow \frac{50}{10} = \frac{h}{20}$$

$$\Rightarrow h = 100 \text{ m}$$



So, option (d) is correct.

2. Given $AB = 18$ m, let $AC = x$
In similar $\triangle ABE$ and $\triangle ACD$

$$\frac{AB}{AC} = \frac{BE}{CD} \Rightarrow \frac{18}{x} = \frac{20}{100}$$

$$\Rightarrow x = \frac{18 \times 100}{20} = 18 \times 5 = 90 \text{ m}$$

3. Let height of Anshul's house be $GF = h_1$

Since, $\triangle HFG \sim \triangle HCD$

$$\therefore \frac{HF}{HC} = \frac{FG}{CD} \Rightarrow \frac{20}{50} = \frac{h_1}{100}$$

$$h_1 = \frac{20 \times 100}{50} = 40 \text{ m}$$

So, option (b) is correct.

4. Given, $HC = 40$ cm

Let length of the shadow of Anshul's house be $HF = l$ m.

Since, $\triangle HFG \sim \triangle HCD$

$$\therefore \frac{HF}{HC} = \frac{FG}{CD}$$

$$\Rightarrow \frac{l}{40} = \frac{40}{100}$$

$$\Rightarrow l = \frac{40 \times 40}{100} = 16 \text{ m}$$

5. RHS similarity

Criterion does not exist.

So, option (d) is correct.

CASE STUDY-2:

1. Given, scale factor is 1:3.

$$R'S' = 3RS$$

$$R'S' = 3 \times 3.4 = 10.2 \text{ cm}$$

So, option (b) is correct.

2. Since, $P'Q' = 3PQ = 3 \times 2.5 = 7.5 \text{ cm}$

and $Q'R' = 3QR = 3 \times 3.5 = 10.5 \text{ cm}$

$$\therefore \frac{P'Q'}{Q'R'} = \frac{7.5}{10.5} = \frac{5}{7} \text{ or } 5:7$$

So, option (a) is correct.

3. Quadrilateral $P'Q'R'S'$ is similar to PQRS

$$\angle Q' = \angle Q = 95^\circ$$

So, option (b) is correct.

4. $Q'R' = 3QR = 3 \times 3.5 = 10.5 \text{ cm}$

and $P'S' = 3PS = 3 \times 3.1 = 9.3 \text{ cm}$

$$Q'R' + P'S' = 10.5 + 9.3 = 19.8 \text{ cm}$$

So, option (c) is correct.

5. Since, PQRS $\sim$ $P'Q'R'S'$

$$\angle P' = \angle P = 115^\circ$$

$$\angle Q' = \angle Q = 95^\circ$$

$$\angle R' = \angle R = 65^\circ$$

$$\text{and } \angle S' = \angle S = 85^\circ$$

$$\begin{aligned} \angle P' + \angle Q' + \angle R' + \angle S' &= 115^\circ + 95^\circ + 65^\circ + 85^\circ \\ &= 360^\circ \end{aligned}$$

i.e., the sum of angles of quadrilateral $P'Q'R'S'$ is 360° .

So, option (d) is correct.

CASE STUDY-3:

1. In $\triangle CAB$ and $\triangle CLO$, we have

$$\angle CAB = \angle CLO = 90^\circ$$

$$\angle C = \angle C \text{ (common)}$$

∴ By AA similarity criterion,

$$\triangle CAB \sim \triangle CLO$$

2. In $\triangle DCA$ and $\triangle BAC$,

$$DC = BA \quad [:: x = y \text{ (Given)}]$$

$$\angle DCA = \angle BAC \quad [\text{Each } 90^\circ]$$

$$CA = AC \quad [\text{Common}]$$

By SAS similarity criterion,

$$\triangle DCA \sim \triangle BAC$$

$$\therefore \frac{DA}{BC} = \frac{DC}{BA} = \frac{y}{x}$$

$$\Rightarrow \frac{BC}{DA} = \frac{x}{y} = \frac{x}{x} = 1$$

$$\therefore BC : DA = 1 : 1$$

proved.

3. $\triangle CAB \sim \triangle CLO$

$$\therefore \frac{CA}{CL} = \frac{AB}{LO} \Rightarrow \frac{z}{a} = \frac{x}{d} \Rightarrow a = \frac{zd}{x}$$

OR

In $\triangle ALO$ and $\triangle ACD$,

We have

$$\angle ALO = \angle ACD = 90^\circ$$

$$\angle A = \angle A \quad (\text{common})$$

∴ By AA similarity criterion,

$$\triangle ALO \sim \triangle ACD$$

$$\therefore \frac{AL}{AC} = \frac{OL}{DC} \Rightarrow \frac{b}{z} = \frac{d}{y} \Rightarrow b = \frac{zd}{y}$$