

# CLASS 10 · HOTS · OLYMPIAD PREPARATION · SHORT NOTES

## Chapter 6: HOTS: Triangles (Class 10)

Topic-wise short notes with solved examples

Higher order thinking questions on similar triangles for Class 10: area ratios, the basic proportionality theorem, altitudes in right triangles and ladders and shadows, each with a full solution.

### 1 Solved HOTS questions

- Key facts: in similar triangles the sides are in the same ratio, and the **areas** are in the ratio of the **squares** of the sides. A line parallel to one side of a triangle divides the other two sides in the same ratio. In a right triangle with the right angle at  $B$ , the altitude  $BD$  on  $AC$  satisfies  $BD = \frac{AB \times BC}{AC}$ .

**Example 1.1** Triangle ABC is similar to triangle DEF. Their areas are 64 square cm and 121 square cm. If  $EF = 15.4$  cm, find  $BC$ .

SOLUTION

$$\frac{\text{area ABC}}{\text{area DEF}} = \left(\frac{BC}{EF}\right)^2 = \frac{64}{121}.$$

$$\frac{BC}{EF} = \frac{8}{11}, \text{ so } BC = \frac{8}{11} \times 15.4.$$

**11.2 cm**

**Example 1.2** In triangle ABC the angle at B is  $90^\circ$ ,  $AB = 6$  cm and  $BC = 8$  cm. BD is perpendicular to AC. Find BD.

SOLUTION

$$AC = \sqrt{36 + 64} = 10 \text{ cm.}$$

The area is  $\frac{1}{2} \times 6 \times 8 = 24$  and also  $\frac{1}{2} \times 10 \times BD$ .

$$BD = \frac{48}{10}.$$

**4.8 cm**

**Example 1.3** A 15 m ladder leans against a wall and reaches a height of 12 m. The top of the ladder slips down 3 m. How far does the foot of the ladder move away from the wall?

SOLUTION

Originally the foot is  $\sqrt{15^2 - 12^2} = 9$  m from the wall.

After slipping, the height is  $12 - 3 = 9$  m, so the foot is  $\sqrt{15^2 - 9^2} = 12$  m from the wall.

The foot moves  $12 - 9$ .

**3 m**

**Example 1.4** The diagonals of a trapezium ABCD, with AB parallel to DC, meet at O. If  $AB = 6$  cm and  $CD = 10$  cm, find the ratio of the areas of triangles AOB and COD.

**SOLUTION**

Triangles AOB and COD are similar (alternate angles are equal and the vertical angles at O are equal).

The ratio of areas is the square of the ratio of corresponding sides:  $\left(\frac{6}{10}\right)^2 = \frac{36}{100}$ .

**9 : 25**

**Example 1.5** In triangle ABC, DE is parallel to BC with D on AB and E on AC. If  $\frac{AD}{DB} = \frac{3}{5}$  and  $AC = 5.6$  cm, find  $AE$ .

**SOLUTION**

By the basic proportionality theorem  $\frac{AE}{EC} = \frac{3}{5}$ .

So  $AE = \frac{3}{8} \times AC = \frac{3}{8} \times 5.6$ .

**2.1 cm**