



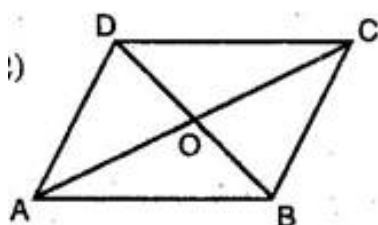
### Exercise 6.6

**(i)** In  $\triangle ADC$ ,  $\angle ADC$  is an obtuse angle.

$$\therefore AC^2 = AD^2 + DC^2 + 2DC \cdot DM$$

$$\Rightarrow AC^2 = AD^2 + \left(\frac{BC}{2}\right)^2 + 2 \cdot \frac{BC}{2} \cdot DM$$

$$\Rightarrow AC^2 = AD^2 + \left(\frac{BC}{2}\right)^2 + BC \cdot DM$$



$$\Rightarrow AC^2 = AD^2 + BC \cdot DM + \left(\frac{BC}{2}\right)^2 \dots\dots\dots(i)$$

**(ii)** In  $\triangle ABD$ ,  $\angle ADM$  is an acute angle.

$$AB^2 = AD^2 + BD^2 - 2BD \cdot DM$$

$$\Rightarrow AB^2 = AD^2 + \left(\frac{BC}{2}\right)^2 - 2 \cdot \frac{BC}{2} \cdot DM$$

$$\Rightarrow AB^2 = AD^2 - BC \cdot DM + \left(\frac{BC}{2}\right)^2 \dots\dots\dots(ii)$$

**(iii)** From eq. (i) and eq. (ii),

$$AB^2 + AC^2 = 2AD^2 + \frac{1}{2}BC^2$$

**6.** Prove that the sum of the squares of the diagonals of parallelogram is equal to the sum of the squares of its sides.

**Ans.** If AD is a median of  $\triangle ABC$ , then

$$AB^2 + AC^2 = 2AD^2 + \frac{1}{2}BC^2 \text{ [See Q.5 (iii)]}$$

Since the diagonals of a parallelogram bisect each other, therefore, BO and DO are medians of triangles ABC and ADC respectively.

$$\therefore AB^2 + BC^2 = 2BO^2 + \frac{1}{2}AC^2 \dots\dots\dots(i)$$

$$\text{And } AD^2 + CD^2 = 2DO^2 + \frac{1}{2}AC^2 \dots\dots\dots(ii)$$

Adding eq. (i) and (ii),

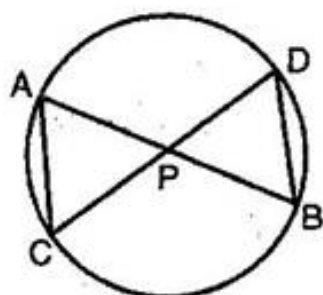
$$AB^2 + BC^2 + AD^2 + CD^2 = 2(BO^2 + DO^2) + AC^2$$

$$\Rightarrow AB^2 + BC^2 + AD^2 + CD^2 = 2\left(\frac{1}{4}BD^2 + \frac{1}{4}BD^2\right)$$

$$+ AC^2\left[DO = \frac{1}{2}BD\right]$$

$$\Rightarrow AB^2 + BC^2 + AD^2 + CD^2 = AC^2 + BD^2$$

7. In figure, two chords AB and CD intersect each other at the point P. Prove that:



(i)  $\triangle APC \sim \triangle DPB$

(ii)  $AP \cdot PB = CP \cdot DP$

**Ans. (i)** In the triangles APC and DPB,

$$\angle APC = \angle DPB \text{ [Vertically opposite angles]}$$

$$\angle CAP = \angle BDP \text{ [Angles in same segment of a circle are equal]}$$

$\therefore$  By AA-criterion of similarity,

$$\triangle APC \sim \triangle DPB$$

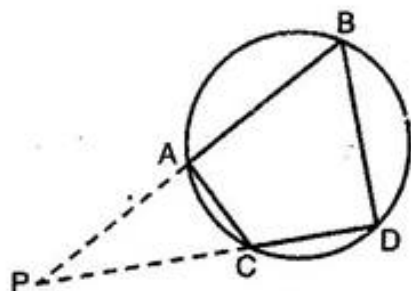
**(ii)** Since  $\triangle APC \sim \triangle DPB$

$$\therefore \frac{AP}{DP} = \frac{CP}{PB} \Rightarrow AP \times PB = CP \times DP$$

8. In figure, two chords AB and CD of a circle intersect each other at the point P (when produced) outside the circle. Prove that:

(i)  $\triangle PAC \sim \triangle PDB$

(ii)  $PA.PB = PC.PD$



**Ans. (i)** In the triangles PAC and PDB,

$$\angle APC = \angle DPB \text{ [Common]}$$

$$\angle CAP = \angle BDP \text{ [}\because \angle BAC = 180^\circ - \angle PAC \text{ and } \angle PDB = \angle CDB]$$

$$= 180^\circ - \angle BAC = 180^\circ - (180^\circ - \angle PAC) = \angle PAC]$$

$\therefore$  By AA-criterion of similarity,

$$\triangle APC \sim \triangle DPB$$

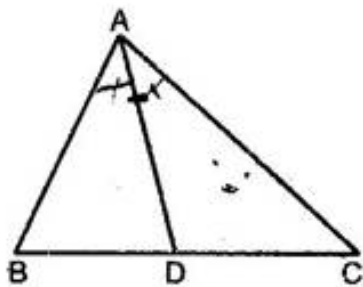
**(ii)** Since  $\triangle APC \sim \triangle DPB$

$$\therefore \frac{AP}{DP} = \frac{CP}{PB}$$

$$\Rightarrow PA.PB = PC.PD$$

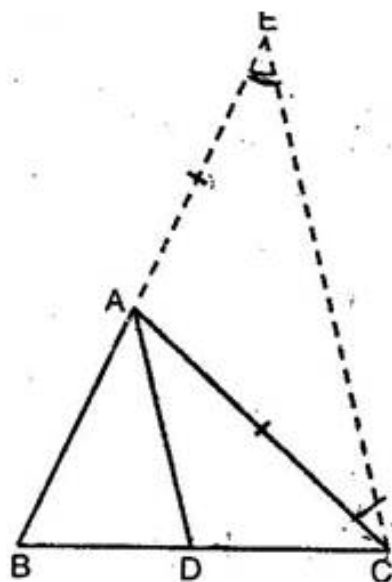
9. In figure, D is a point on side BC of  $\triangle ABC$

such that  $\frac{BD}{CD} = \frac{AB}{AC}$ . Prove that AD is the bisector of  $\angle BAC$ .



**Ans. Given:** ABC is a triangle and D is a point

on BC such that  $\frac{BD}{CD} = \frac{AB}{AC}$



**To prove:** AD is the internal bisector of  $\angle BAC$ .

**Construction:** Produce BA to E such that  $AE = AC$ . Join CE.

**Proof:** In  $\triangle AEC$ , since  $AE = AC$

$$\therefore \angle AEC = \angle ACE \dots\dots\dots(i)$$

[Angles opposite to equal side of a triangle are equal]

$$\text{Now, } \frac{BD}{CD} = \frac{AB}{AC} \text{ [Given]}$$

$$\Rightarrow \frac{BD}{CD} = \frac{AB}{AE} [\because AE = AC, \text{ by construction}]$$

$\therefore$  By converse of Basic Proportionality Theorem,

$$DA \parallel CE$$

Now, since CA is a transversal,

$$\therefore \angle BAD = \angle AEC \dots\dots\dots(ii) \text{ [Corresponding } \angle \text{ s]}$$

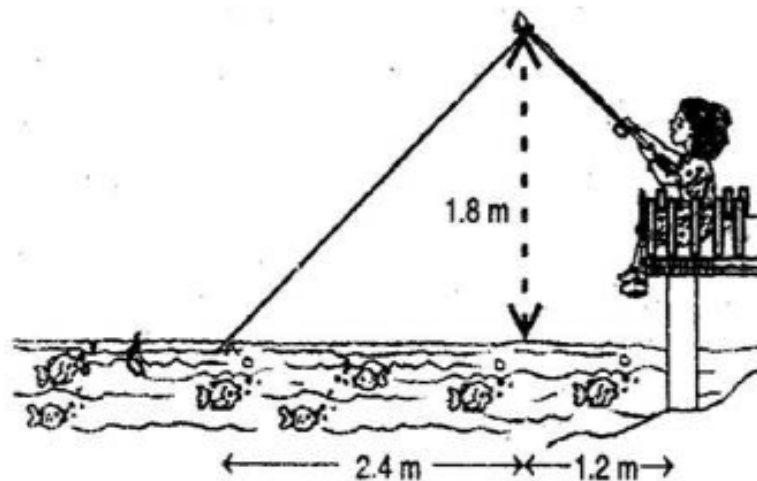
$$\text{And } \angle DAC = \angle ACE \dots\dots\dots(iii) \text{ [Alternate } \angle \text{ s]}$$

$$\text{Also } \angle AEC = \angle ACE \text{ [From eq. (i)]}$$

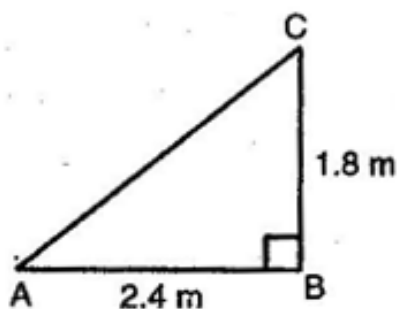
$$\text{Hence, } \angle BAD = \angle DAC \text{ [From eq. (ii) and (iii)]}$$

Thus, AD bisects  $\angle BAC$  internally.

**10.** Nazima is fly fishing in a stream. The tip of her fishing rod is 1.8 m above the surface of the water and the fly at the end of the string rests on the water 3.6 m away and 2.4 m from a point directly under the tip of the rod. Assuming that her string (from the tip of her rod to the fly) is taut, how much string does she have out (see figure)? If she pulls in the string at the rate of 5 cm per second, what will be the horizontal distance of the fly from her after 12 seconds?



**Ans. I.** To find: The length of AC.



By Pythagoras theorem,

$$AC^2 = (2.4)^2 + (1.8)^2$$

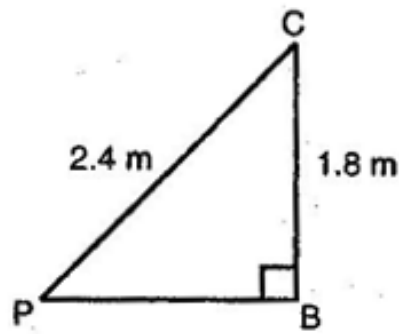
$$\Rightarrow AC^2 = 5.76 + 3.24 = 9.00$$

$$\Rightarrow AC = 3 \text{ m}$$

$\therefore$  Length of string she has out = 3 m

Length of the string pulled at the rate of 5 cm/sec in 12 seconds

Length of the string pulled at the rate of 5 cm/sec in 12 seconds



$$= (5 \times 12) \text{ cm} = 60 \text{ cm} = 0.60 \text{ m}$$

$$\therefore \text{Remaining string left out} = 3 - 0.6 = 2.4 \text{ m}$$

**II.** To find: The length of PB

$$PB^2 = PC^2 - BC^2$$

$$= (2.4)^2 - (1.8)^2$$

$$= 5.76 - 3.24 = 2.52$$

$$\Rightarrow PB = \sqrt{2.52} = 1.59 \text{ (approx.)}$$

Hence, the horizontal distance of the fly from Nazima after 12 seconds

$$= 1.59 + 1.2 = 2.79 \text{ m (approx.)}$$

\*\*\*\*\* END \*\*\*\*\*