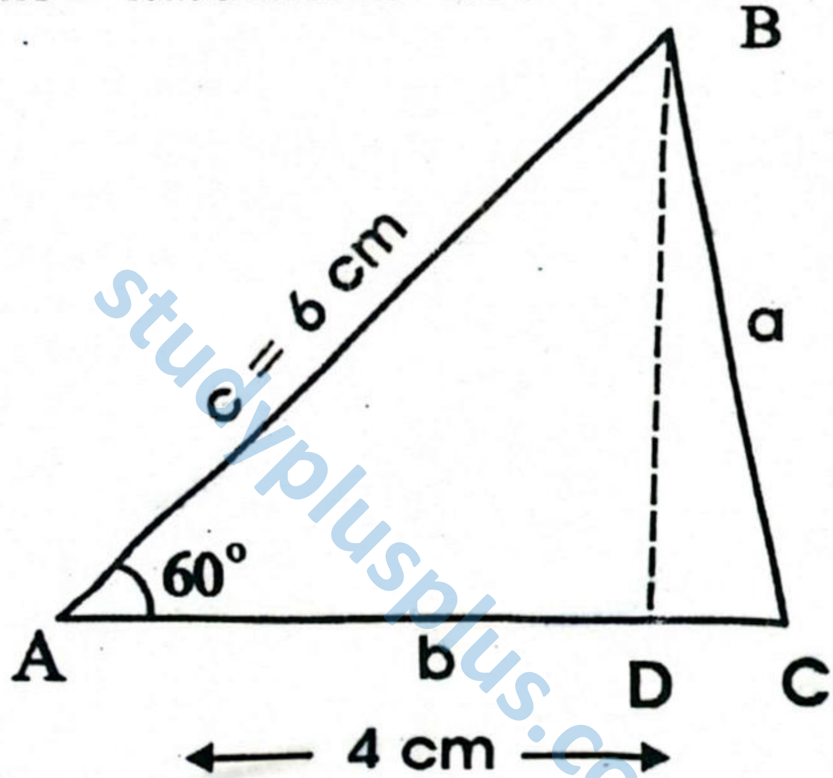
Exercise 8.2

Q.1 **In a ΔABC calculate $m\overline{BC}$ when $m\overline{AB} = 6cm$, $m\overline{AC} = 4cm$ and $m\angle A = 60°$.**



Calculation

$Let\ \overline{BD} \perp \overline{AC}$

$\frac{m\overline{AD}}{m\overline{AD}} = Cos\ 60°$

$m\overline{AD} = m\overline{AB}\ Cos\ 60°$

$= 6 \times \frac{1}{2}$

$m\overline{AD} = 3cm \ldots\ldots\ldots (i)$

Now in ΔABC, $m\angle a = 60^\circ$ (an acute angle)

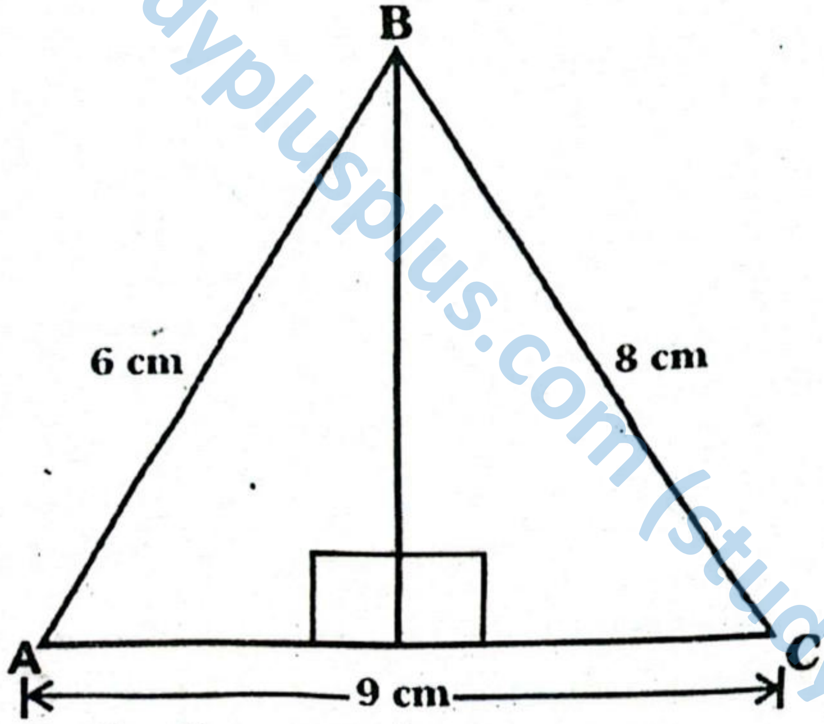
$$\text{Therefore, } a^2 = c^2 + b^2 - 2\overline{AD} \times \overline{AC}$$

(Theorem)

$$= (6)^2 + (4)^2 - 2(3)(4)$$
$$= 36 + 16 - 24$$
$$a^2 = 28$$
$$\therefore \quad a = \sqrt{28}$$
$$a = 5.29cm$$
$$m\,\overline{BC} = a = 5.29cm$$

Q.2 **In a ΔABC, $m\,\overline{AB} = 6cm$, $m\,\overline{BC} = 8cm$, $m\overline{AC}$ =9cm and D is the mid point of side $m\,\overline{AC}$. Find the length of the median $\overline{BD}$.**

Solution:



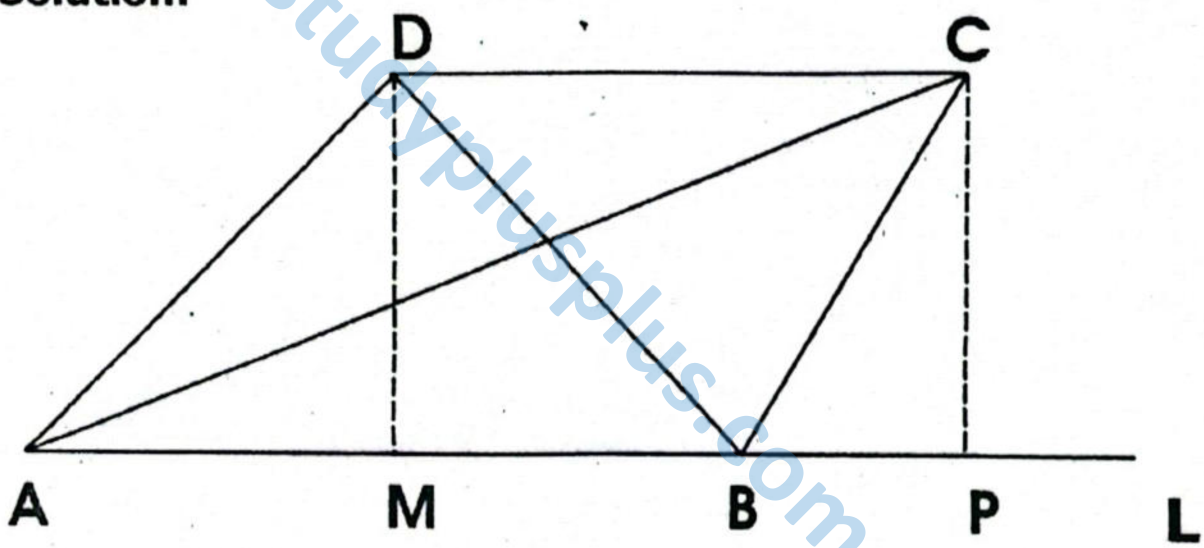
According to the figure, we have

$$m\,\overline{AD} = m\,\overline{DC}$$
$$m\,\overline{AC} = m\,\overline{AD} + m\,\overline{DC}$$
$$m\,\overline{AC} = m\,\overline{AD} + m\,\overline{AD}$$
$$9 = 2m\ \overline{AD}$$
$$2m\ \overline{AD} = 9$$
$$m\,\overline{AD} = \frac{9}{2} = 4.5\ cm$$

$$(\overline{AC})^2 + (\overline{BC})^2 = 2\,[(\overline{AD})^2 + 2(\overline{BD})^2]$$
$$36 + 64 = 2\,(4.5)^2 + 2(\overline{BD})^2$$
$$100 = 40.5 + 2(\overline{BD})^2$$
$$2(\overline{BD})^2 = 100 - 40.5$$
$$2(\overline{BD})^2 = 59.5$$
$$(\overline{BD})^2 = \frac{59.5}{2}$$
$$\overline{BD} = \sqrt{29.75} = 5.45\ cm$$

Q.3 In a parallelogram ABCD prove that
$(AC)^2 + (BD)^2 = 2[(AB)^2 + (BC)^2]$

Solution:



Given:
Figure Draw

(i) $\overline{AB} \parallel \overline{CD}$
(ii) *A is joined to C.*
(iii) *B is joined to D.*
(iv) $\overline{AB}$ *is extended towards B.*
(v) $\overline{CP} \perp \overline{AB}$ *extended.*
(vi) $\overline{DM} \perp \overline{AB}$

To prove: $(AC)^2 + (BD)^2 = (AD)^2 + (BC)^2 + \overline{AB} \times \overline{CD}$

Proof:

$$In\ \Delta ABC, \angle ABC\ is\ obtuse$$
$$\therefore AC^2 = AB^2 + BC^2 + 2\overline{AB} \times BP \quad (i)$$
$$In\ \Delta ABD\ \angle BAD\ is\ acute$$
$$\therefore BD^2 = AD^2 + AB^2 - 2AB \times AM \quad (ii)$$
$$Adding\ (i), (ii)$$
$$AC^2 + BD^2 = AB^2 + BC^2 + AD^2 + AB^2 + 2\overline{AB} \times BP$$
$$- 2\overline{AB} \times AM$$
$$= AD^2 + BC^2 + 2AB^2 + 2AB(BP - \overline{AM})$$
$$= AD^2 + BC^2 + 2AB[\overline{AB} + BP - AM]$$
$$AC^2 + BD^2 = AD^2 + BC^2 + 2\overline{AB} \times \overline{MP}$$
$$= AD^2 + BC^2 + 2\overline{AB} \times \overline{CD}$$