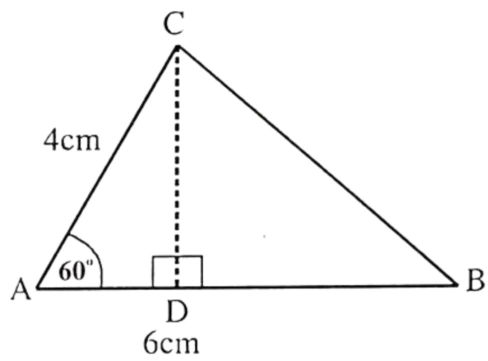
EXRCISE 8.2

Q. 1 In a ΔABC calculate $m\overline{BC}$

When $m\overline{AB} = 6cm$, $m\overline{AC} = 4cm$ and $m\angle A = 60°$

Solution:



Given: In a ΔABC, $m\overline{AB} = 6cm$, $m\overline{AC} = 4cm$ and $m\angle A = 60°$

To find: $m\overline{BC} = ?$

Calculations:

In acute angled triangle ABC, by theorem 2

$$\left(m\overline{BC}\right)^2 = \left(m\overline{AC}\right)^2 + \left(m\overline{AB}\right)^2 - 2\left(m\overline{AB}\right)\left(m\overline{AD}\right) \text{.......... (i)}$$

In right angle ΔACD

$$\cos 60° = \frac{m\overline{AD}}{m\overline{AC}}$$

$$\frac{1}{\not{2}} = \frac{m\overline{AD}}{\not{4}\ 2}$$

$$\boxed{m\overline{AD} = 2cm}$$

Putting the corresponding values in equation (i), we get

$$\left(m\overline{BC}\right)^2 = (4cm)^2 + (6cm)^2 - 2(6cm)(2cm)$$

$$\left(m\overline{BC}\right)^2 = 16cm^2 + 36\ cm^2 - 24\ cm^2$$

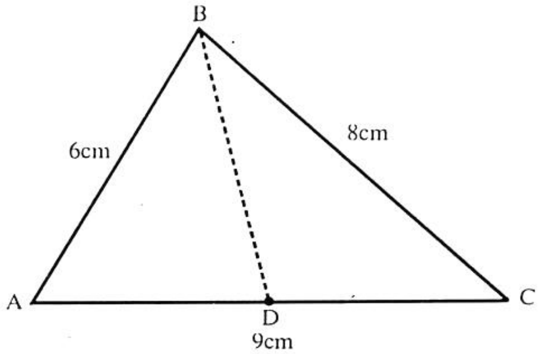
$$\left(m\overline{BC}\right)^2 = 28\ cm^2$$

$$\sqrt{\left(m\overline{BC}\right)^2} = \sqrt{28cm^2}$$

$$m\overline{BC} = 5.29\ cm$$

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

Solution:



Given:

In a ABC,

$m\overline{AB} = 6cm$

$m\overline{BC} = 8cm$

$m\overline{AC} = 9cm$

To Find: Length of median i.e. $m\overline{BD} = ?$

Calculations:

By Apollonius' theorem

In a ABC

$$(m\overline{AB})^2 + (m\overline{BC})^2 = 2(m\overline{AD})^2 + 2(m\overline{BD})^2 \text{ ....(i)}$$

As $m\overline{AD} = \frac{1}{2} m\overline{AC}$

$$m\overline{AD} = \frac{1}{2}(9cm) = 4.5cm$$

Now, putting the corresponding value in equation (i)

$$(6cm)^2 + (8cm)^2 \quad 2(4.5cm)^2 + 2(m\overline{BD})^2$$

$$36cm^2 + 64cm^2 \quad 2(20.25cm^2) + 2(m\overline{BD})^2$$

$$100cm^2 + 40.5cm^2 = 2(m\overline{BD})^2$$

$$100cm^2 - 40.5cm^2 = 2(m\overline{BD})^2$$

$$59.5cm^2 = 2(m\overline{BD})^2$$

$$\frac{59.5cm^2}{2} = (m\overline{BD})^2$$

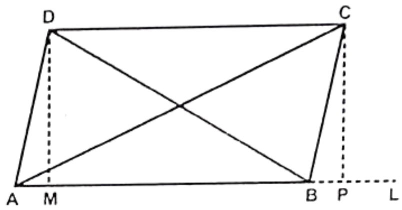
$$29.75cm^2 = (m\overline{BD})^2$$

By taking square root

$$\sqrt{(m\overline{BD})^2} = \sqrt{29.75cm^2}$$

$$\boxed{m\overline{BD} = 5.45cm}$$

Q.3 In a Parallelogram ABCD prove that $(m\overline{AC})^2 + (m\overline{BD})^2 = 2\ (m\overline{AB})^2 + (m\overline{BC})^2$



Given: ABCD is a Parallelogram.

To Prove: $(m\overline{AC})^2 + (m\overline{BD})^2 = 2\ (m\overline{AB})^2 + (m\overline{BC})^2$

Construction:

Extend $\overline{AB}$ beyond B. Draw $\overline{DM} \perp \overline{AB}$ and $\overline{CP} \perp \overline{AB}$ extended.

Proof:

Statements	**Reasons**
In $\Delta ABC, \angle ABC$ is obtuse	
$(m\overline{AC})^2 + (m\overline{AB})^2 + (m\overline{BC})^2 = 2(m\overline{AB})(m\overline{BP})$ ....(i)	By theorem 1
In $\Delta ABD, \angle BAD$ is acute	
$(m\overline{BD})^2 = (m\overline{AB})^2 + (m\overline{AD})^2 - 2(m\overline{AB})(m\overline{AM})$	By theorem 2
$= (m\overline{AB})^2 + (m\overline{BC})^2 - 2(m\overline{AB})(m\overline{BP})$ ...(ii)	AMD ≅ BPC i.e $m\overline{AM} = m\overline{BP}$
$(m\overline{AC})^2 + (m\overline{BD})^2 = 2(m\overline{AB})^2 + 2(m\overline{BC})^2$	By adding (i) and (ii)
$(m\overline{AC})^2 + (m\overline{BD})^2 = 2\ (m\overline{AB})^2 + (m\overline{BC})^2$	