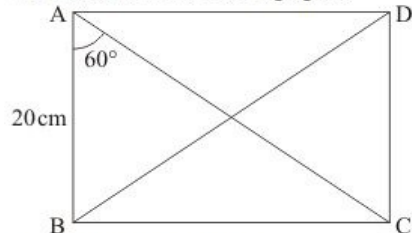




Trigonometric Ratios Ex 5.2 Q32

Answer :

We have drawn the following figure



Since $ABCD$ is a rectangle

Therefore,

$$\angle ABC = \angle BCD = 90^\circ$$

Now, consider $\triangle ABC$

We know that sum of all the angles of any triangle is 180°

Therefore,

$$\angle BAC + \angle ABC + \angle ACB = 180^\circ \dots\dots (1)$$

Now by substituting the values of known angles $\angle BAC$ and $\angle ABC$ in equation (1)

We get,

$$60^\circ + 90^\circ + \angle ACB = 180^\circ$$

$$\Rightarrow 150^\circ + \angle ACB = 180^\circ$$

$$\Rightarrow \angle ACB = 180^\circ - 150^\circ$$

$$\Rightarrow \angle ACB = 30^\circ$$

Now in $\triangle ABC$

We know that,

$$\cos A = \cos 60^\circ$$

$$\Rightarrow \frac{AB}{AC} = \cos 60^\circ \dots\dots (2)$$

Now we have,

$$AB = 20\text{cm and } \cos 60^\circ = \frac{1}{2}$$

Therefore by substituting above values in equation (2)

We get,

$$\cos A = \cos 60^\circ$$

$$\Rightarrow \frac{20}{AC} = \frac{1}{2}$$

Now by cross multiplying we get,

$$20 \times 2 = 1 \times AC$$

$$\Rightarrow 40 = AC$$

$$\Rightarrow AC = 40$$

Therefore,

$$\boxed{AC = 40 \text{ cm}} \dots\dots (3)$$

Now in $\triangle ABC$

We know that,

$$\sin A = \sin 60^\circ$$

$$\Rightarrow \frac{BC}{AC} = \sin 60^\circ \dots\dots (4)$$

Now we have from equation (3),

$$AC=40\text{cm and } \sin 60^\circ = \frac{\sqrt{3}}{2}$$

Therefore by substituting above values in equation (4)

We get,

$$\sin A = \sin 60^\circ$$

$$\Rightarrow \frac{BC}{40} = \frac{\sqrt{3}}{2}$$

Now by cross multiplying we get,

$$BC \times 2 = \sqrt{3} \times 40$$

$$\Rightarrow BC = \frac{\sqrt{3} \times 40}{2}$$

$$\Rightarrow BC = 20\sqrt{3}$$

Therefore,

$$\boxed{BC = 20\sqrt{3} \text{ m}} \dots\dots (5)$$

Since $ABCD$ is a rectangle

Therefore,

$$AB = CD = 20 \text{ cm} \dots\dots (6)$$

And

$$BC = AD = 20\sqrt{3} \text{ cm} \dots\dots (7)$$

Now in $\triangle BCD$

We know that,

$$\tan B = \frac{CD}{BC}$$

Now by substituting the values of sides from equation (6) and (7)

We get,

$$\Rightarrow \tan B = \frac{20}{20\sqrt{3}}$$

$$\Rightarrow \tan B = \frac{1}{\sqrt{3}}$$

Since

$$\tan 30^\circ = \frac{1}{\sqrt{3}}$$

Therefore, $\angle B = 30^\circ$

That is in $\triangle BCD$

$$\angle DBC = 30^\circ \dots\dots (8)$$

Now in $\triangle BCD$

We know that,

$$\cos B = \frac{BC}{BD}$$

From equation (7) and (8)

$$\Rightarrow \cos 30^\circ = \frac{20\sqrt{3}}{BD}$$

Since

$$\cos 30^\circ = \frac{\sqrt{3}}{2}$$

Therefore,

$$\frac{\sqrt{3}}{2} = \frac{20\sqrt{3}}{BD}$$

Now by cross multiplying we get,

$$\sqrt{3} \times BD = 20\sqrt{3} \times 2$$

$$\Rightarrow \sqrt{3} \times BD = 40\sqrt{3}$$

$$\Rightarrow BD = \frac{40\sqrt{3}}{\sqrt{3}}$$

$$\Rightarrow BD = 40$$

Therefore,

$$\boxed{BD = 40 \text{ cm}} \dots\dots (9)$$

Hence from equation (3), (5) and (9)

$$\boxed{AC = 40 \text{ cm}}, \boxed{BC = 20\sqrt{3} \text{ cm}}, \boxed{BD = 40 \text{ cm}}$$

***** END *****