

3-3.2-31

EE24BTECH11064 - Harshil Rathan

Question:

A triangle ABC can be constructed $\angle B = 60^\circ$, $\angle C = 45^\circ$ and $AB + BC + CA = 12\text{cm}$.

Solution:

Find $\angle A$

$$\angle A + \angle B + \angle C = 180^\circ \quad (0.1)$$

$$\angle A = 75^\circ \quad (0.2)$$

Applying law of Sines,

$$\frac{AB}{\sin 75^\circ} + \frac{BC}{\sin 60^\circ} + \frac{CA}{\sin 45^\circ} = K \quad (0.3)$$

It is given that

$$AB + BC + CA = 12 \quad (0.4)$$

$$AB = K \sin 75^\circ \quad (0.5)$$

$$BC = K \sin 60^\circ \quad (0.6)$$

$$CA = K \sin 45^\circ \quad (0.7)$$

$$K\left(\frac{\sqrt{6} + \sqrt{2}}{4}\right) + K\left(\frac{\sqrt{3}}{2}\right) + K\left(\frac{1}{\sqrt{2}}\right) = 12 \quad (0.8)$$

$$K = \frac{48}{\sqrt{6} + 2\sqrt{2} + 2\sqrt{3}} \quad (0.9)$$

Possible values of AB BC CA are,

$$AB = \frac{48}{\sqrt{6} + 2\sqrt{2} + 2\sqrt{3}} \left(\frac{\sqrt{6} + \sqrt{2}}{4}\right) \quad (0.10)$$

$$BC = \frac{48}{\sqrt{6} + 2\sqrt{2} + 2\sqrt{3}} \left(\frac{\sqrt{3}}{2}\right) \quad (0.11)$$

$$CA = \frac{48}{\sqrt{6} + 2\sqrt{2} + 2\sqrt{3}} \left(\frac{1}{\sqrt{2}}\right) \quad (0.12)$$

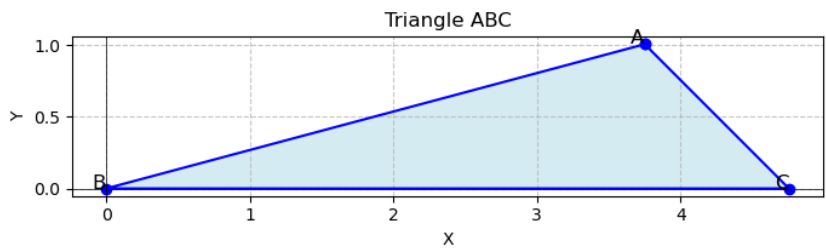


Fig. 0.1