

Lesson 6 The Cosine Law

Use Cosine Law when given:

1. three sides of the triangle (SSS)
2. two sides and the included angle (SAS)

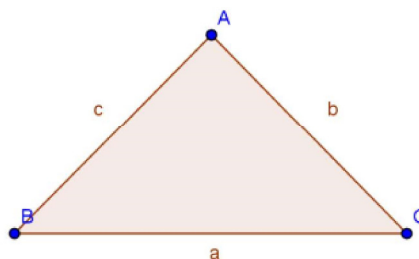
The Cosine Law

In any $\triangle ABC$,

$$a^2 = b^2 + c^2 - 2bc \cos A$$

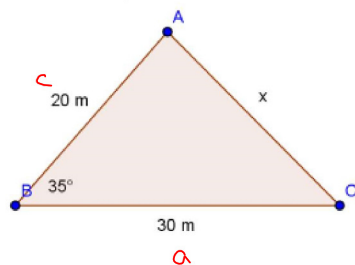
$$b^2 = a^2 + c^2 - 2ac \cos B$$

$$c^2 = a^2 + b^2 - 2ab \cos C$$



Examples – Given two sides and the included angle (angle between them)

1. Solve for x , correct to 2 decimal places.



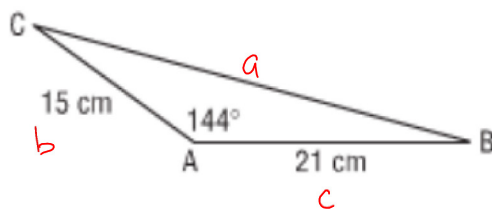
$$x^2 = a^2 + c^2 - 2ac \cos B$$

$$x^2 = 30^2 + 20^2 - 2(30)(20) \cos 35^\circ$$

$$x = \sqrt{\text{ans}}$$

$$x = 17.80 \text{ m}$$

2. Determine the length of BC to the nearest tenth of a centimetre.



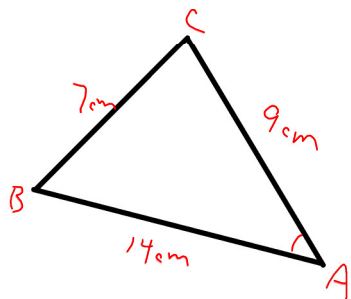
$$a^2 = 15^2 + 21^2 - 2(15)(21) \cos 144^\circ$$

$$a = \sqrt{\text{ans}}$$

$$a = 34.3 \text{ cm}$$

Examples – Given three sides

1. In $\triangle ABC$ side $a = 7$ cm, $b = 9$ cm, and $c = 14$ cm. Determine $\angle A$ to the nearest tenth of a degree.



or use

$$\cos A = \frac{b^2 + c^2 - a^2}{2bc}$$

$$7^2 = 9^2 + 14^2 - 2(9)(14) \cos A$$

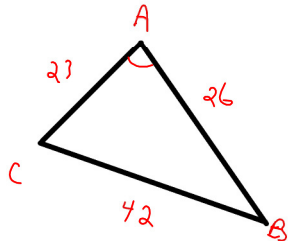
$$\frac{(7^2 - 9^2 - 14^2)}{(-2(9)(14))} = \cos A$$

$$0.904\dots = \cos A$$

$$A = \cos^{-1}(\text{ans})$$

$$A = 25.2^\circ$$

2. A triangle has sides of 23, 26, and 42. Determine the largest angle of the triangle.



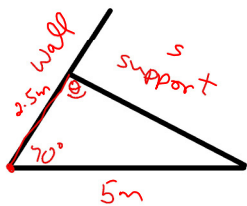
$$42^2 = 23^2 + 26^2 - 2(23)(26) \cos A$$

$$\frac{(42^2 - 23^2 - 26^2)}{(-2(23)(26))} = \cos A$$

$$\cos A = -0.467\dots$$

$$A = 117.865^\circ$$

3. A retaining wall is leaning at an angle of 70° to the horizontal. A rigid support is to be placed 5.0 m from the base of the wall and it will be attached to the wall 2.5 m from its base. Determine the length of the support to the nearest tenth of a metre and the measure of the angle between the support and the wall to the nearest degree.



$$s^2 = 5^2 + (2.5)^2 - 2(5)(2.5) \cos 70^\circ$$

$$s = \sqrt{\text{ans}}$$

$$s = 4.764\dots$$

$$s = 4.8\text{m}$$

use this

$$\frac{4.764\dots}{\sin 70^\circ} = \frac{5}{\sin \theta}$$

$$\sin \theta = \frac{5 \sin 70^\circ}{4.764\dots}$$

$$\theta = \sin^{-1}(\text{ans})$$

$$\theta = 80^\circ$$

Maze
and/or

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7a, e, f, g, h