

2.4 The Cosine Law

Recall that we were able to use the **sine law** when:

- 2 angles and 1 side are known
- 1 angle and 2 sides are known (NOTE: one known side must be opposite the angle)

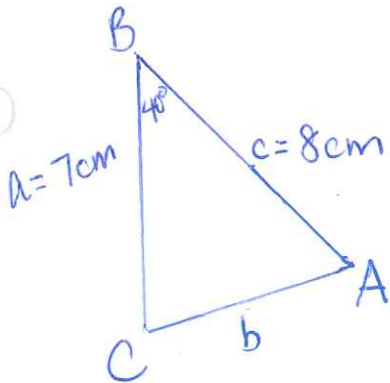
Similarly, we are able to use the **cosine law** when:

- 2 sides and 1 angle are known (NOTE: the angle must be contained between the sides)
- 3 sides are known

The cosine law states that, for $\triangle ABC$, with sides a , b , and c opposite to their respective angles:

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

Example: In $\triangle ABC$, $\angle B = 40^\circ$, $a = 7\text{cm}$, and $c = 8\text{cm}$. Determine the value of b .

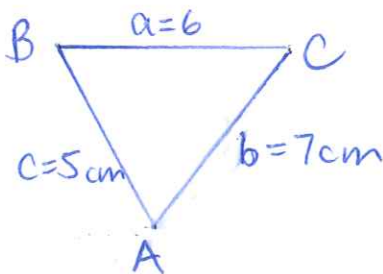


$$b^2 = 7^2 + 8^2 - 2(7)(8)\cos 40^\circ$$

$$b^2 = 27.20302237$$

$$b = 5.2\text{cm}$$

Example: In $\triangle ABC$, $a = 6\text{cm}$, $b = 7\text{cm}$ and $c = 5\text{cm}$. Determine the value of $\angle B$.



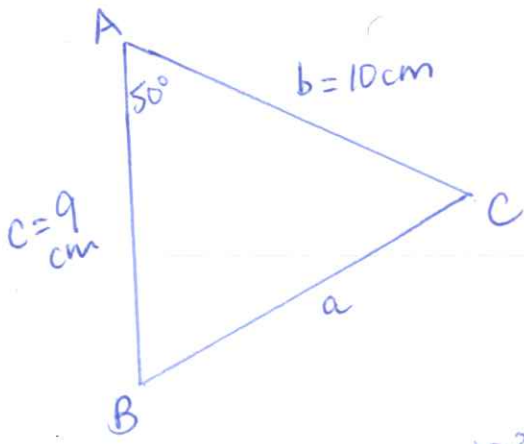
$$7^2 = 5^2 + 6^2 - 2(5)(6)\cos B$$

$$\cos B = 0.2$$

$$\angle B = 78.5^\circ$$

→ find all unknowns!

Example: Solve $\triangle ABC$, where $\angle A = 50^\circ$, $b = 10\text{cm}$, and $c = 9\text{cm}$.



$$a^2 = 9^2 + 10^2 - 2(9)(10)\cos 50^\circ$$

$$a^2 = 65.29823$$

$$a = 8.08\text{cm}$$

use unrounded
a values here!

$$10^2 = 9^2 + a^2 - 2(9)a\cos B$$

$$\cos B = 0.3183$$

$$B = 71.4^\circ$$

$$\angle C = 180^\circ - A - B$$

$$\angle C = 58.6^\circ$$