Mathematics 11U

5.7 – Cosine Law

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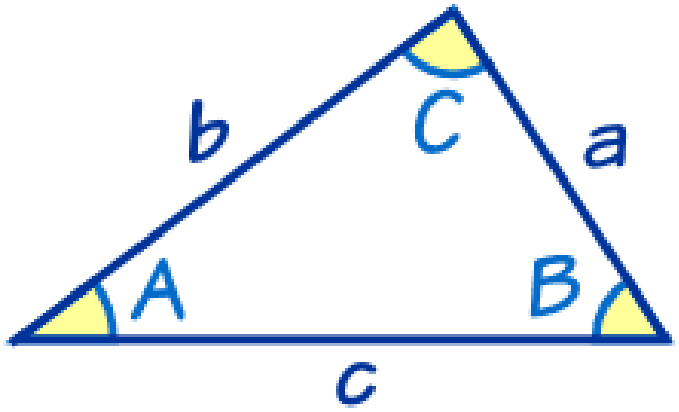
Given ΔABC:



To find the missing 3rd side:

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

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

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

If $A > 90°$,

$-2bc\cos A = +$

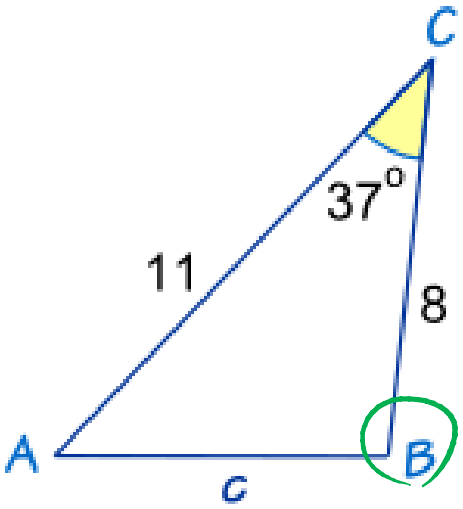
To find an angle if you have all 3 sides:

$$\cos C = \frac{c^2 - a^2 - b^2}{-2ab}$$

$$\cos B = \frac{b^2 - a^2 - c}{-2ac}$$

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

Solve ΔABC:



$\angle A = 47^\circ$ $\quad a = 8$

$\angle B = 96^\circ$ $\quad b = 11$

$\angle C = 37^\circ$ $\quad c = 6.7$

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

$c^2 = 8^2 + 11^2 - 2(8)(11)\cos 37$

$c^2 = 44.44$

$c = 6.66$

$c = 6.7$

$\cos B = \dfrac{b^2 - a^2 - c^2}{-2ac}$

$\cos B = \dfrac{11^2 - 8^2 - 6.7^2}{-2(8)(6.7)}$

$\cos B = \dfrac{12.11}{-107.2}$

$B = \cos^{-1}\left(\dfrac{12.11}{-107.2}\right) = 96^\circ$

$\angle A = 180$
-96
-37
47