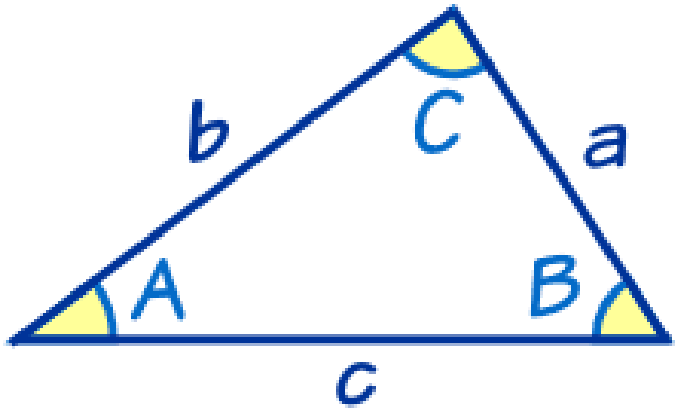
Cosine Law

Given ΔABC:



To find the missing 3rd side:

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

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

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

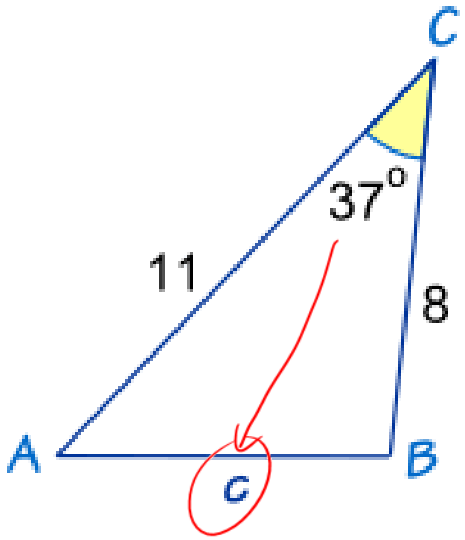
To find an angle if you have all 3 sides:

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

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

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

Solve ΔABC:



$\angle A = 46^\circ$ $\quad a = 8$

$\angle B = 97^\circ$ $\quad b = 11$

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

① side c

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

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

$c^2 = 44.44$

$c = 6.7$

② $\angle A$

$\frac{\sin A}{8} = \frac{\sin 37}{6.7}$

$A = \sin^{-1}\left(\frac{8\sin 37}{6.7}\right)$

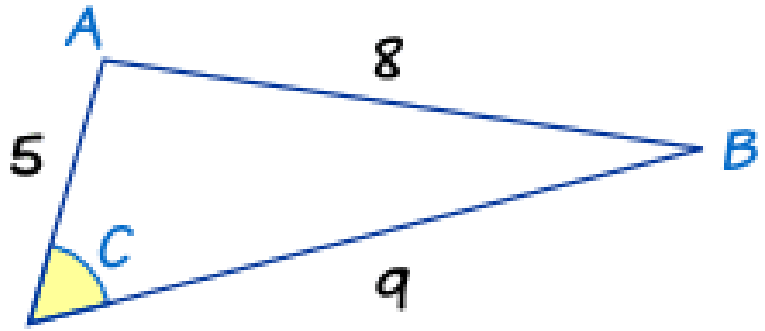
$A = 46^\circ$

③ $\angle B$

$= 180 - 46 - 37$

$= 97^\circ$

Solve ΔABC:



$\angle A = 84^\circ \quad a = 9$

$\angle B = 34^\circ \quad b = 5$

$\angle C = 62^\circ \quad c = 8$

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

$$\cos A = \frac{9^2 - 5^2 - 8^2}{-2(5)(8)}$$

$$\cos A = \frac{-8}{-80}$$

$$A = \cos^{-1}\left(\frac{8}{80}\right) = 84^\circ$$

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

$$\cos B = \frac{5^2 - 9^2 - 8^2}{-2(9)(8)}$$

$$\cos B = \frac{-120}{-144}$$

$$B = \cos^{-1}\left(\frac{120}{144}\right)$$

$$B = 34^\circ$$

$\angle C = 180 - 84 - 34$

$= 62^\circ$

HW: pg 325

#1, 2, 3d, 5, 6, 7