

Ex. Solve each triangle

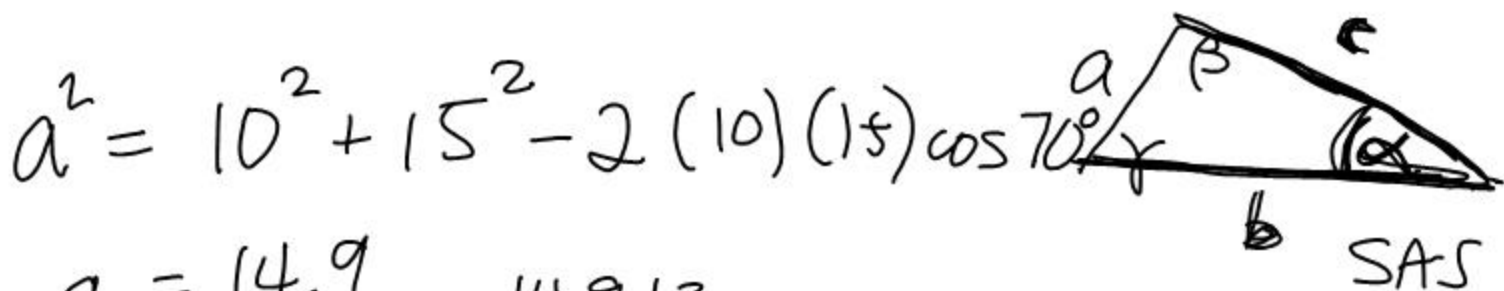
Cosine
Rule

• SAS

• SSS

① $\alpha = 70^\circ$, $b = 10$, $c = 15$

$$a^2 = 10^2 + 15^2 - 2(10)(15)\cos 70^\circ$$



$$\underline{a = 14.9} \quad 14.913$$

$$\frac{\sin \beta}{10} = \frac{\sin 70^\circ}{14.913}$$

$$\sin \beta = \frac{10 \sin 70^\circ}{14.913} \approx 0.6301$$

$$\underline{\underline{\beta = 39.1^\circ}}$$

$$\gamma = 180 - 70 - 39.1$$

$$\underline{\underline{\gamma = 70.9^\circ}}$$

Safety tip

Use the Sine Rule to find angles you know are acute. These angles don't come opposite the longest side.

Ex. $a = 8$ $b = 15$, $c = 19$

$$\cos \gamma = \frac{8^2 + 15^2 - 19^2}{2(8)(15)} = -0.3$$

$$\underline{\underline{\gamma = 107.5^\circ}}$$

$$\frac{\sin \alpha}{8} = \frac{\sin 107.46^\circ}{19}$$

$$\underline{\underline{\alpha = 23.7^\circ}}$$

$$\underline{\underline{\beta = 48.8^\circ}}$$

$$\text{Ex. } a=5, c=6, \alpha=40^\circ$$

$$\frac{\sin \gamma}{6} = \frac{\sin 40^\circ}{5}$$

$$\sin \gamma = \frac{6 \sin 40^\circ}{5} \approx 0.7713$$

$$\gamma \approx 50.5^\circ \quad \text{or} \quad 129.5^\circ \quad (129.525^\circ)$$

$\begin{array}{r} + 40 \\ \hline 169.5^\circ \end{array}$

Solution 1

$$\begin{array}{ll} a=5 & \alpha=40^\circ \\ b=7.8 & \beta=89.5^\circ \\ & \quad \quad 89.525^\circ \\ c=6 & \gamma=50.5^\circ \end{array}$$

Solution 2

$$\begin{array}{ll} a=5 & \alpha=40^\circ \\ b=1.4 & \beta=10.5^\circ \\ & \quad \quad 10.475^\circ \\ c=6 & \gamma=129.5^\circ \end{array}$$

$$\frac{\sin 89.525^\circ}{b} = \frac{\sin 40^\circ}{5}$$

$$b \sin 40^\circ = \frac{5 \sin 89.525^\circ}{\sin 40^\circ}$$



Ex $a = 10$, $\alpha = 65^\circ$, $\gamma = 100^\circ$

$$\frac{\sin 100^\circ}{c} = \frac{\sin 65^\circ}{10}$$

$$\underline{c = 10.9}$$

$$\beta = 180^\circ - 100^\circ - 65^\circ$$

$$\underline{\underline{\beta = 15^\circ}}$$

$$\frac{\sin 15^\circ}{b} = \frac{\sin 65^\circ}{10}$$

$$\underline{\underline{b = 2.9}}$$