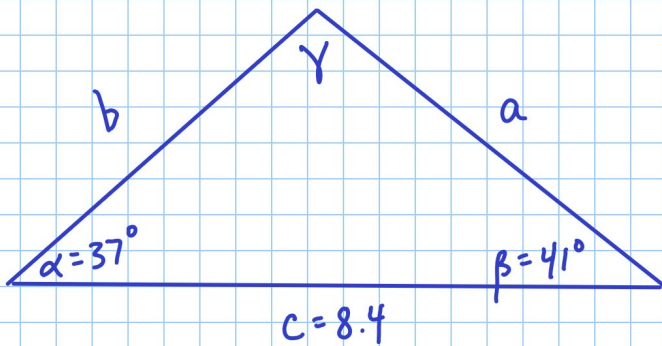


WARMUP:

Solve the triangle: $\alpha = 37^\circ$, $\beta = 41^\circ$, $c = 8.4$



$$\gamma = \underline{102^\circ}$$

$$a = \underline{5.2}$$

$$b = \underline{5.6}$$

$$\gamma = 180 - 37 - 41$$

$$\frac{\sin 102^\circ}{8.4} = \frac{\sin 37^\circ}{a}$$

$$\frac{\sin 102^\circ}{8.4} = \frac{\sin 41^\circ}{b}$$

$$a = \frac{8.4 \sin 37^\circ}{\sin 102^\circ} = 5.2$$

$$b = 5.6$$

Section 7.3 Law of Cosines

Use when SSS or SAS

For SAS:

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

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

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

For SSS:

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

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

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

ex: Solve the triangle:

$$a = 7.2$$

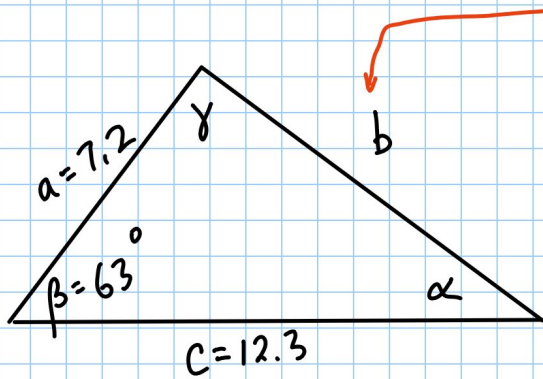
$$c = 12.3$$

$$\beta = 63^\circ$$

$$b = \underline{11.1}$$

$$\alpha = \underline{35.3^\circ}$$

$$\gamma = \underline{81.7^\circ}$$



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

$$b^2 = 7.2^2 + 12.3^2 - 2 \cdot 7.2 \cdot 12.3 \cos 63^\circ$$

$$b^2 = 122.72$$

$$b = 11.1$$

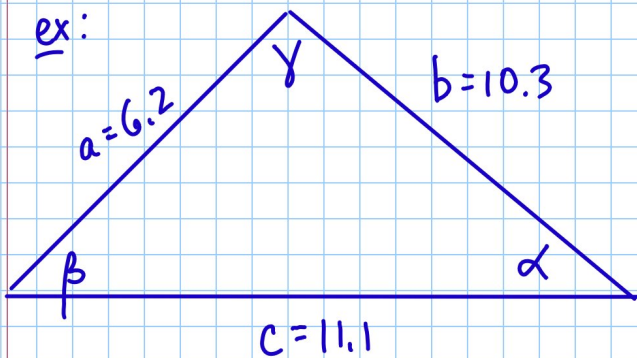
$$\frac{\sin \alpha}{7.2} = \frac{\sin 63^\circ}{11.1}$$

$$\sin \alpha = \frac{7.2 \sin 63^\circ}{11.1} = 0.5780$$

$$\alpha = \sin^{-1}(0.5780) = 35.3^\circ$$

$$\gamma = 180^\circ - 63^\circ - 35.3^\circ$$
$$\gamma = 81.7^\circ$$

ex:



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

$$= \frac{(6.2^2 + 11.1^2 - 10.3^2)}{(2 \cdot 6.2 \cdot 11.1)}$$

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

$$\cos \gamma = \frac{(6.2^2 + 10.3^2 - 11.1^2)}{(2 \cdot 6.2 \cdot 10.3)} = 0.1669$$

In SSS case, always find the biggest angle first.

$$\alpha = \underline{33.4^\circ}$$

$$\beta = \underline{66.2^\circ}$$

$$\gamma = \underline{80.4^\circ}$$

$$= 0.4037$$

$$\beta = \cos^{-1}(0.4037) = 66.2^\circ$$

$$\gamma = \cos^{-1} 0.1669 = 80.4^\circ$$

$$\alpha = 180 - 66.2 - 80.4 = 33.4^\circ$$

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11, 23, 25, 27, 33