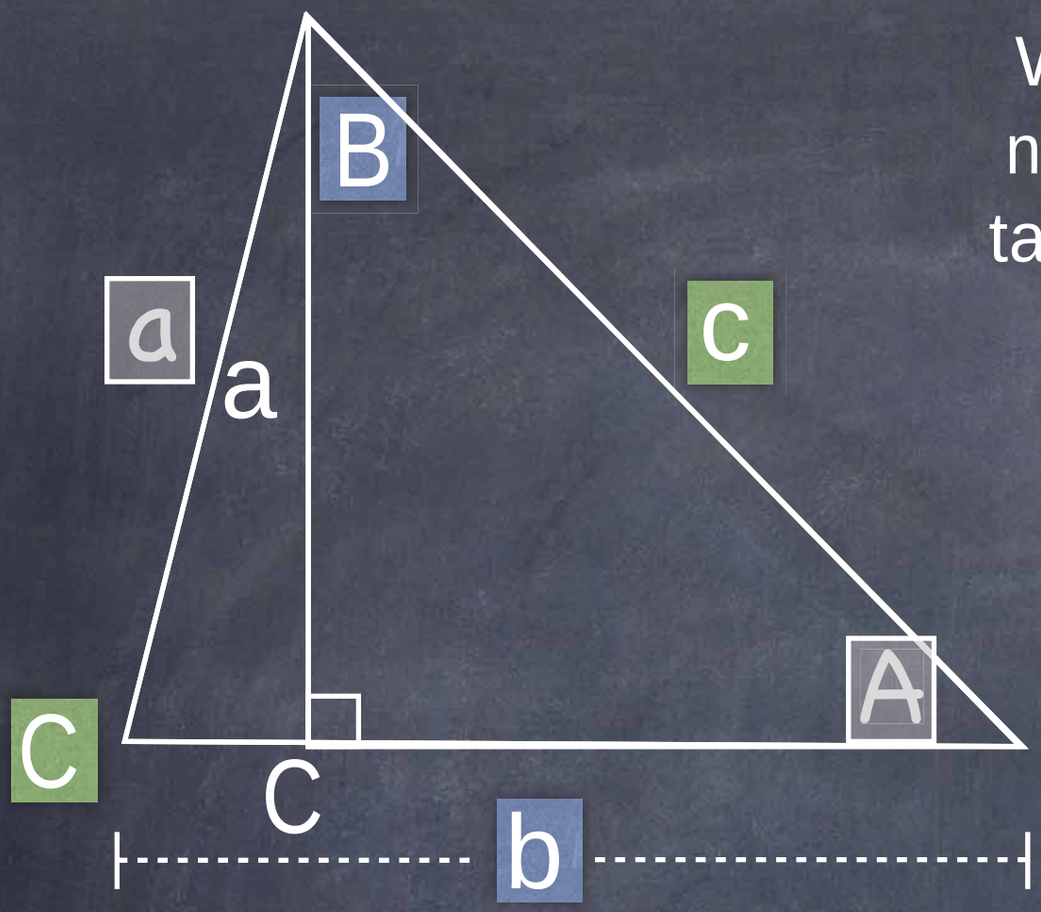
Law of Sines

More oblique triangles



When dealing with right triangles, we now know how to use sine, cosine, and tangent to find missing sides and angles

But what happens if it is not a right triangle?

We have two laws to address that. The first one is

Law of Sines

$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

Notice the alignment that the lower case letter represents the side opposite the angle with the upper case letter

It's as simple as this

Law of Sines

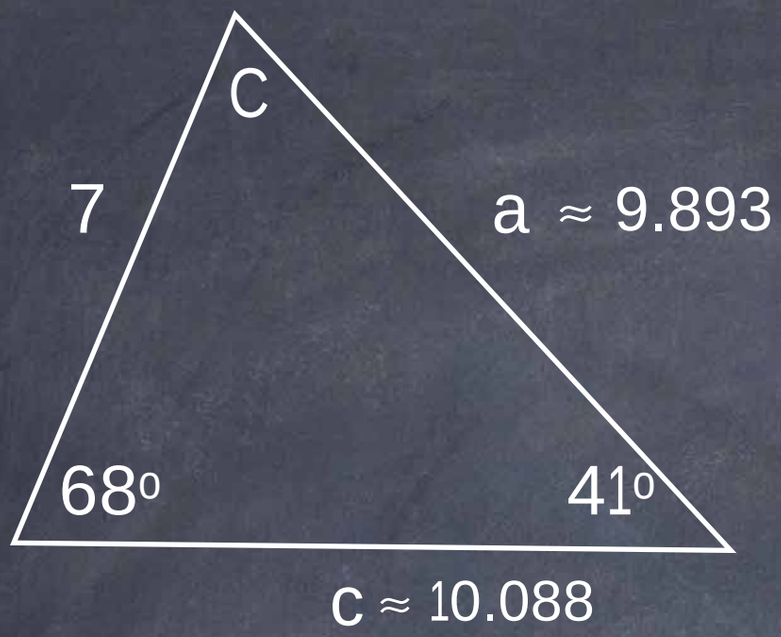
$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

As before, angle A is opposite side a, angle B is opposite side b, etc.

One other formula that comes with this law will be useful in finding the area of a triangle

$$Area = \frac{1}{2}ab\sin C \qquad Area = \frac{1}{2}bc\sin A$$

$$Area = \frac{1}{2}ac\sin B$$



$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

$$\frac{\sin 68°}{a} = \frac{\sin 41°}{7} = \frac{\sin 71°}{c}$$

use supplementary angles to find this

$$\frac{\sin 41°}{7} = \frac{\sin 71°}{c}$$

cross-multiply

$$\frac{\sin 68°}{a} = \frac{\sin 41°}{7}$$

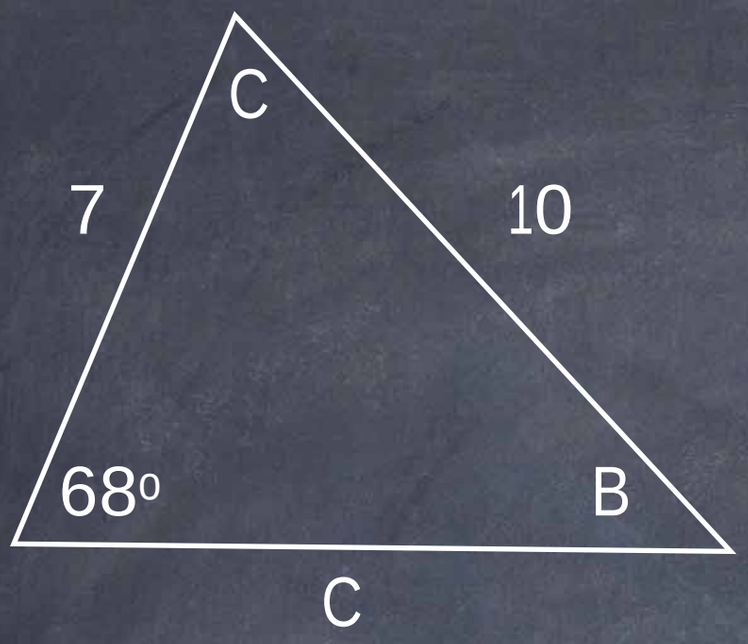
cross-multiply again

$$7 \sin 68° = a \sin 41°$$

$$\frac{7 \sin 71°}{\sin 41°} = \frac{c \cancel{\sin 41°}}{\cancel{\sin 41°}}$$

$$\frac{7 \sin 68°}{\sin 41°} = a \approx 9.893$$

$$\frac{7 \sin 71°}{\sin 41°} = c \approx 10.088$$



$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

$$\frac{\sin 68°}{10} = \frac{\sin B}{7} = \frac{\sin C}{c}$$

$$\frac{\sin 68°}{10} = \frac{\sin B}{7}$$

$$7\sin 68° = 10\sin B \quad \text{cross-multiply}$$

$$\frac{7\sin 68°}{10} = \sin B$$

$$m\angle B = \sin^{-1}\left(\frac{7\sin 68°}{10}\right)$$

$m\angle B = 40.468...°$ Store in the calculator

$m\angle C = 71.531...°$ Store in the calculator

$$\frac{\sin 68°}{10} = \frac{\sin C}{c}$$

$$c(\sin 68°) = 10\sin C$$

$$c = \frac{10\sin C}{\sin 68°}$$

$$c \approx 10.230$$