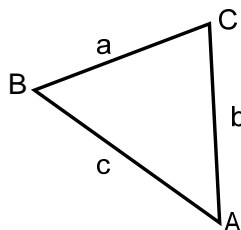


14.1 Law of Sines

Works for ANY triangle not just Right \triangle

For any $\triangle ABC$,

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

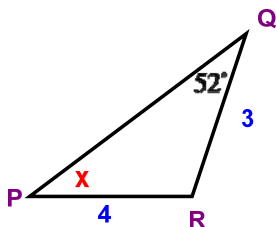


Law of Sines Examples

1. Given $\triangle PQR$; $\angle Q = 52^\circ$; $p = 3$; $q = 4$.

Find $\angle P$ to the nearest minute.

First, draw your triangle and label the parts.



$$\frac{\sin P}{p} = \frac{\sin Q}{q} = \frac{\sin R}{r}$$

To use Law of Sines you need an angle and its opposite side.

~~$$\frac{\sin P}{p} = \frac{\sin Q}{q} = \frac{\sin R}{r}$$~~

$$\frac{\sin x}{3} = \frac{\sin 52^\circ}{4}$$

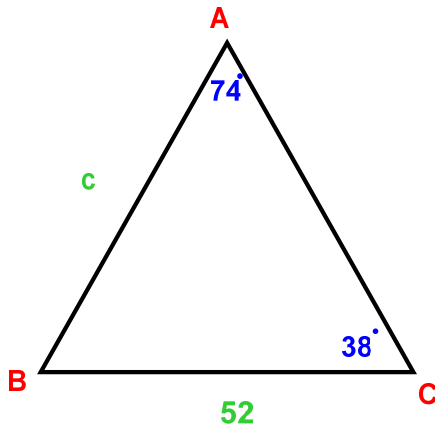
This is a proportion. Cross multiply and solve!

$$4 \sin x = 3 \sin 52$$

$$\sin x = \frac{3 \sin 52}{4}$$

$$\sin^{-1}\left(\frac{3 \sin 52}{4}\right) = x = 36^\circ 14'$$

2. Given $\triangle ABC$; $\angle A = 74^\circ$; $a = 52$; $\angle C = 38^\circ$. Find c .



Draw your triangle and label all parts

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

$$\frac{\sin 74^\circ}{52} = \frac{\sin 38^\circ}{c} \quad \text{Cross multiply and solve}$$

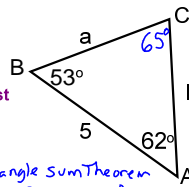
$$c \sin 74^\circ = 52 \sin 38^\circ$$

$$c = \frac{52 \sin 38^\circ}{\sin 74^\circ} = 33.3 \text{ units}$$

3. Solve $\triangle ABC$.

(that means find all the missing sides and angles)

In order to use Law of Sines, you must have an angle and its opposite side



Remember your Geometry!!!!!!!
 $53 + 62 = 115$ $180 - 115 = 65$

Triangle Sum Theorem
 $A + B + C = 180^\circ$

Do not use a rounded answer unless you must!

$$\frac{\sin 65^\circ}{5} = \frac{\sin 62^\circ}{a}$$

$$a \sin 65^\circ = 5 \sin 62^\circ$$

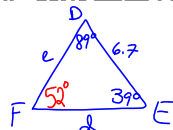
$$a = \frac{5 \sin 62^\circ}{\sin 65^\circ} \approx 4.9$$

$$\frac{\sin 65^\circ}{5} = \frac{\sin 53^\circ}{b}$$

$$b \sin 65^\circ = 5 \sin 53^\circ$$

$$b = \frac{5 \sin 53^\circ}{\sin 65^\circ} \approx 4.4$$

4. Solve $\triangle DEF$. Given $\angle D = 89^\circ$; $\angle E = 39^\circ$; $f = 6.7$.



$$m\angle F = 180^\circ - 89^\circ - 39^\circ = 52^\circ$$

$$\frac{\sin 52^\circ}{6.7} = \frac{\sin 89^\circ}{d}$$

$$\frac{d \sin 52^\circ}{\sin 52^\circ} = \frac{6.7 \sin 89^\circ}{\sin 52^\circ}$$

$$d \approx 8.5 \text{ units}$$

$$\frac{\sin 52^\circ}{6.7} = \frac{\sin 39^\circ}{e}$$

$$\frac{e \sin 52^\circ}{\sin 52^\circ} = \frac{6.7 \sin 39^\circ}{\sin 52^\circ}$$

$$e \approx 5.4 \text{ units}$$