

Law of Sines

The LAW OF SINES is a powerful triangle tool that can be used to find missing **sides** or **angles** of ANY triangle. By matching up angles with their **opposite sides**, the rule is:

$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c} \text{ and can also be written } \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

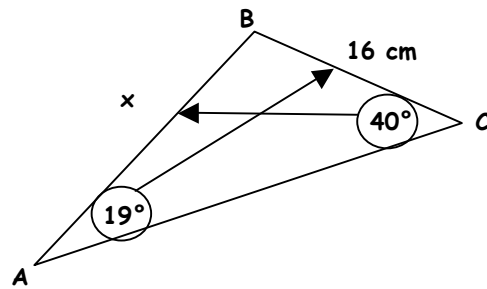
It is easiest to solve if you use the form that places the unknown in the numerator.

Example: Find the missing side x:

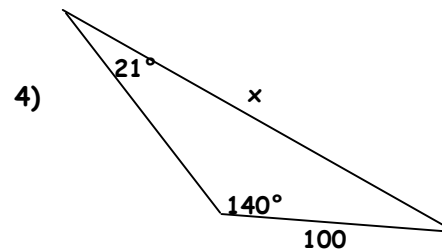
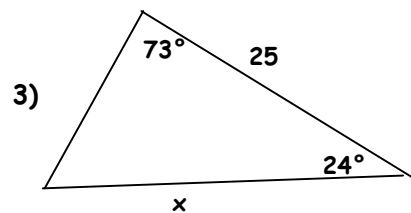
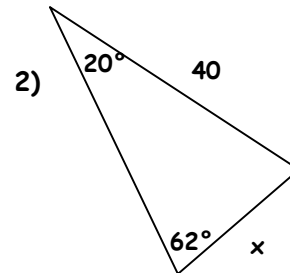
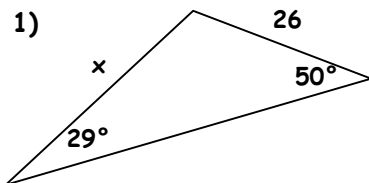
$$\frac{16}{\sin 19^\circ} = \frac{x}{\sin 40^\circ}$$

$$\frac{16 \sin 40^\circ}{\sin 19^\circ} = x$$

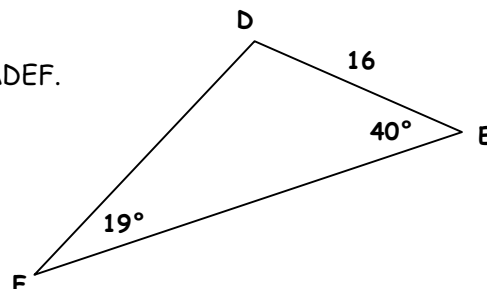
$$x = 31.56 \text{ cm}$$



Find the missing side x in each triangle:



5) Find the perimeter of $\triangle DEF$.



The LAW OF SINES can also be used to find missing angles.

Example: Find the missing angle x :

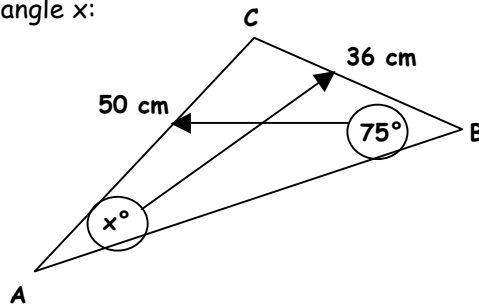
$$\frac{\sin x^\circ}{36} = \frac{\sin 75^\circ}{50}$$

$$\frac{\sin x^\circ}{36} = \frac{.966}{50}$$

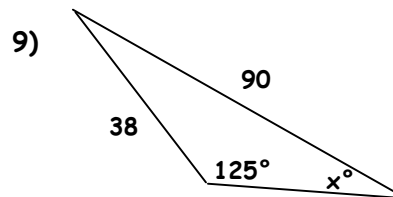
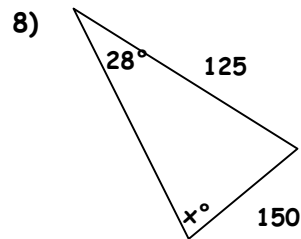
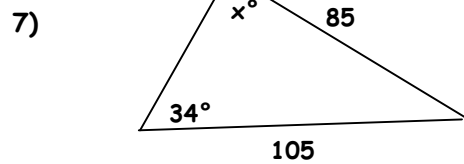
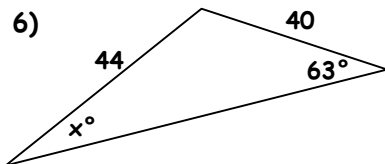
$$\sin x^\circ = \frac{36(\sin 75^\circ)}{50}$$

$$x = \sin^{-1} \left(\frac{36(\sin 75^\circ)}{50} \right)$$

$$x = 44^\circ$$



Find the missing angle x in each triangle:



*10) Find the missing side lengths and angles of $\triangle ABC$ by using the Law of Sines. **Hint:** What kind of triangle is ABC?

