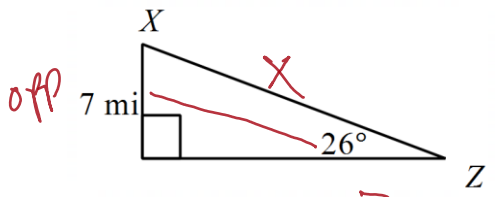
# 7.3

Date: 1/23/24

Objective: I can use law of sines to find angles and sides of any triangle.

**Starter:** (Round answers to the nearest tenth.)

1. Find the length of the hypotenuse.

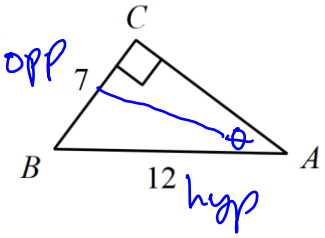



opp, x

$\sin 26^\circ = \frac{7}{x}$

$7\left(\frac{1}{\sin 26^\circ} = \frac{x}{7}\right)$

2. Find the measure of the angle A.




opp, hyp

$\sin^{-1}\left(\frac{7}{12}\right) = \theta$

$\theta \approx 35.7^\circ$

3. Solve for x.

$\frac{x}{8} = \frac{3}{7}$

4. Solve for x.

$\frac{2}{6} = \frac{3}{x+7}$ $(x+7)$

$\left(\frac{2x+14}{6} = 3\right)6$

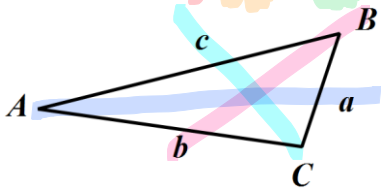
$2x+14 = 18$

$2x = 4$

$x = 2$

**A. Law of Sines –**

**Use when you have ASA, AAS, or SSA

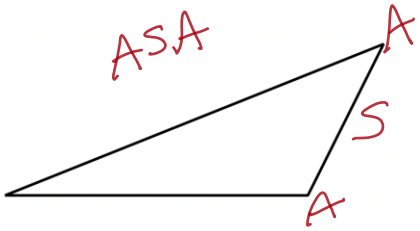


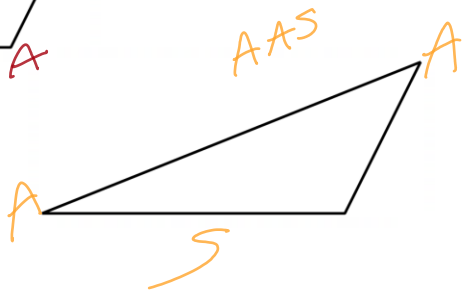

**Law of sines:**

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

**or**

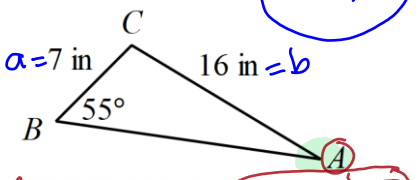
$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$




**Examples:** Find each measurement indicated. Round your answers to the nearest tenth.

1. Find $m\angle A$




SSA

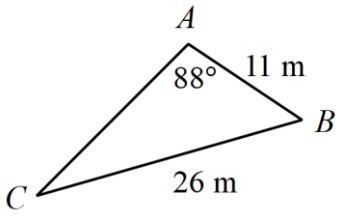
$\left(\frac{\sin A}{7} = \frac{\sin 55°}{16}\right)7$

$\sin^{-1}\left(\frac{7\sin 55°}{16}\right) = A$

calc $\sin^{-1}((7\sin(55°)) \div 16)$

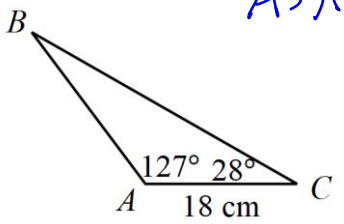
$A \approx 21.0°$

2. Find $m\angle C$



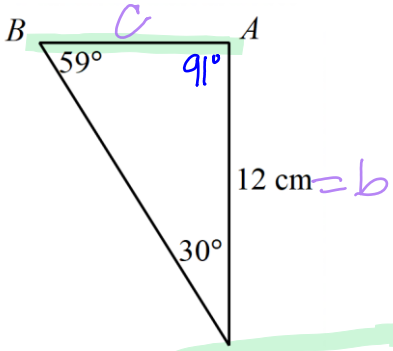

3. Find $BC$

ASA




4. Find $AB$

AAS

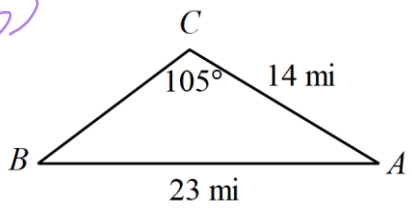



$\left(\frac{c}{\sin 30°} = \frac{12}{\sin 59°}\right)\sin 30°$

$c \approx 7.0$ cm

**Examples:** Solve each triangle. Round your answers to the nearest tenth.

5. ASS




$m\angle A =$ 39.0° $a =$ 19.0 mi

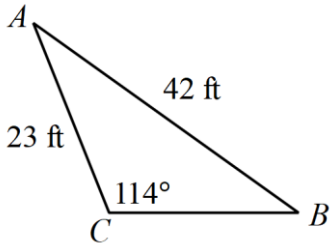
$m\angle B =$ 36.0° $b =$ 14 mi

$m\angle C =$ 105° $c =$ 23 mi

$\left(\frac{\sin B}{14} = \frac{\sin 105^\circ}{23}\right)14$ $\left(\frac{a}{\sin 39^\circ} = \frac{23}{\sin 105^\circ}\right)\sin 39^\circ$

$\sin^{-1}\left(\frac{14\sin 105^\circ}{23}\right) = B$

6.




$m\angle A =$ _____ $a =$ _____

$m\angle B =$ _____ $b =$ _____

$m\angle C =$ _____ $c =$ _____

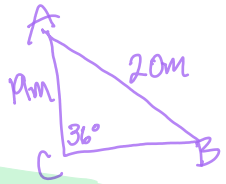
7. $m\angle B = 61^\circ, m\angle C = 108^\circ, a = 5$ yd

$m\angle A =$ _____ $a =$ _____

$m\angle B =$ _____ $b =$ _____

$m\angle C =$ _____ $c =$ _____

8. ASS $m\angle C = 36^\circ, b = 19$ m, $c = 20$ m




$m\angle A =$ 110.1° $a =$ 32.0 m

$m\angle B =$ 33.9° $b =$ 19m

$m\angle C =$ 36° $c =$ 20m

$\left(\frac{\sin B}{19} = \frac{\sin 36^\circ}{20}\right)19$

$\sin^{-1}\left(\frac{19\sin 36^\circ}{20}\right) = B$

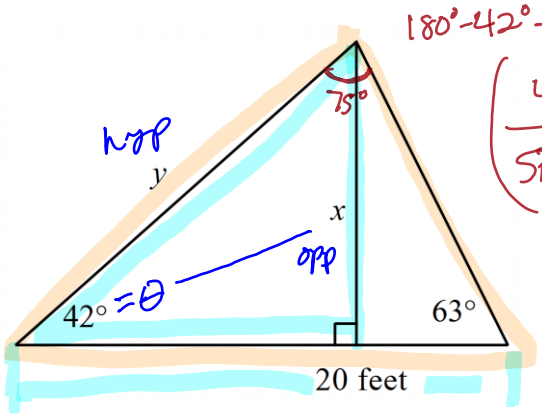
$\left(\frac{a}{\sin 110.1^\circ} = \frac{20}{\sin 36^\circ}\right)\sin 110.1^\circ$

Find the missing side lengths. Round to the nearest tenth.

① law of sines with big triangle

② use SOH CAH TOA on inside triangle

9.




$180°-42°-63°=75°$

$\left(\frac{y}{\sin 63°}=\frac{20}{\sin 75°}\right)\sin 63°$

$y \approx 18.4$ ft

$18.4\left(\sin 42°=\frac{x}{18.4}\right)$

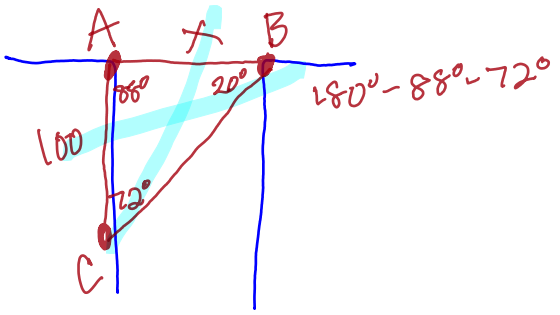
$x \approx 12.3$ ft

**Draw a diagram for the situation and put in all of the information you can. Then figure out how to answer the question. REMEMBER that answers have to have UNITS.**

Define variable

10. You need to build a bridge across a canyon. To find the distance AB across the canyon you measure 100 feet along the side of the canyon from Point A to Point C. $\angle A = 88°$ and $\angle C = 72°$. To the nearest foot, how long will the bridge be?

$x$ = distance of bridge




$180°-88°-72°$

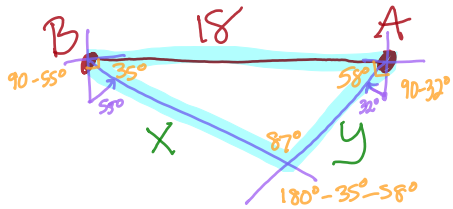
$\left(\frac{x}{\sin 72°}=\frac{100}{\sin 20°}\right)\sin 72°$

$x \approx 278$ ft

11. Two fire-lookout stations are 18 miles apart, with station B directly west of station A. Both stations spot a fire. The bearing of the fire from station A is S 32° W and the bearing of the fire from station B is S 55°E. How far, to the nearest tenth of a mile, is the fire from each lookout station?

$x$ = distance from fire to station B

$y$ = distance from fire to station A




$\left(\frac{y}{\sin 35°}=\frac{18}{\sin 87°}\right)\sin 35°$

$y \approx 10.3$ mi

$\left(\frac{x}{\sin 58°}=\frac{18}{\sin 87°}\right)\sin 58°$

$x \approx 15.3$ mi