SM 3H

Date: 2/22/24 **Section:** 7.1

Objective: I can use the law of sines to find angles and sides of triangles.

Starter: (Round answers to the nearest tenth.)

1. Solve for x.

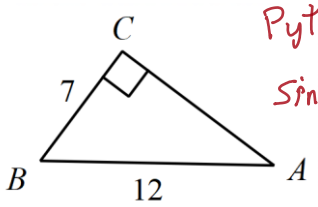
$$\frac{2}{6}=\frac{3}{x+7}$$

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

$9 = x+7$

$x = 2$

2. Find the measure of the angle indicated.



Pythag Thm = side

$\sin^{-1}\left(\frac{o}{h}\right)=\theta$

$\sin A = \frac{7}{12}$

When do you use sine, cosine, and tangent to solve for a missing side or angle of a triangle?

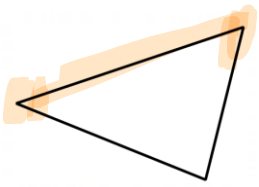
What happens if the triangle is an oblique triangle? oblique means not right triangle

An oblique triangle is a triangle without a right angle. To solve an oblique triangle, we must know three pieces of information, at least one of which must be the length of a side. (Three angles define an infinite number of triangles).

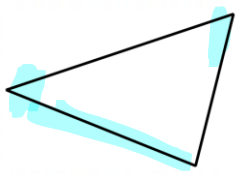
A. Law of Sines –

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

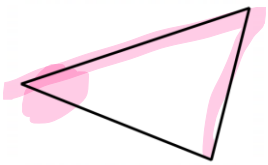
ASA triangle

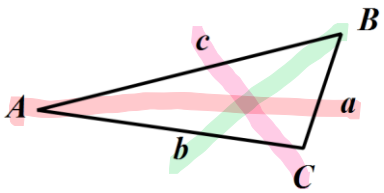


AAS triangle



SSA triangle (ambiguous case)





Law of sines:

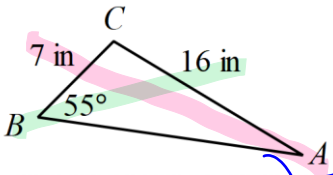
$\frac{a}{\sin A}=\frac{b}{\sin B}=\frac{c}{\sin C}$ – to find sides

or

$\frac{\sin A}{a}=\frac{\sin B}{b}=\frac{\sin C}{c}$ – to find angles

Examples: Identify the type of triangle. Then find each measurement indicated using law of sines. Round your answers to the nearest tenth.

1. Find $m\angle A$ SSA



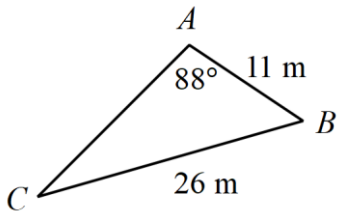
$m\angle A = 21.0°$

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

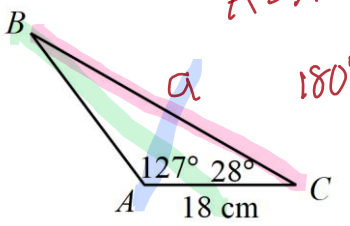
$\sin A = \frac{7\sin 55°}{16}$

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

2. Find $m\angle C$ SSA



3. Find BC ASA

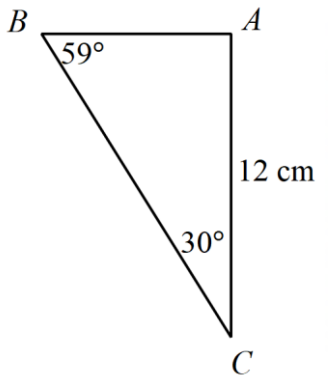


$180° - 127° - 28° = 25°$

$\left(\frac{a}{\sin 127°} = \frac{18}{\sin 25°}\right)\sin 127°$

$a \approx 34.0$ cm

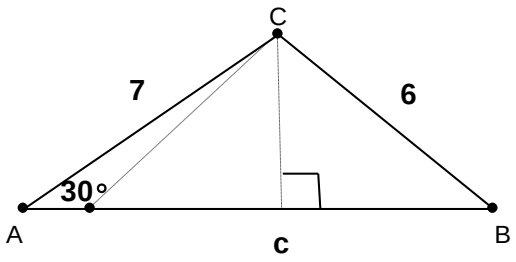
4. Find AB

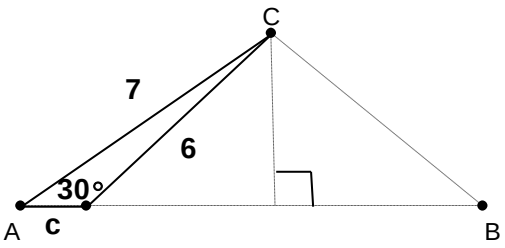


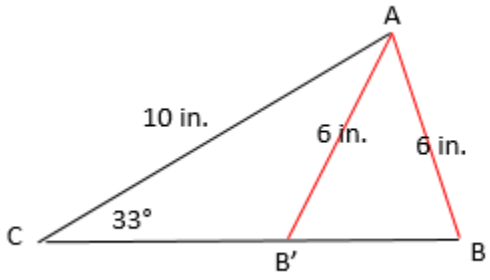
If the picture is not draw for an SSA triangle, you do not know how the triangle is put together.

SSA (The Ambiguous Case): If you know two sides and a non-included angle (an angle that is not between the sides), there may be zero, one, or two possible triangles that fit the given measurements.

Solve $\triangle ABC$ given that a = 6, b = 7, and $\angle A = 30°$. Two triangles are possible with the given information.







To determine if there is a 2nd valid angle:

1. See if you are given two sides and the angle not in between (SSA). This is the situation that may have 2 possible answers.
2. Find the value of the unknown angle.
3. No triangle: error

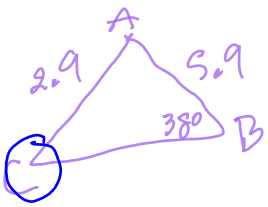
One triangle: found angle < given angle

Two triangles: found > given angle

******When using law of sines, you must _____!!!!!!!!**

Examples: SSA

a) $B = 38°, b = 2.9, c = 5.9$

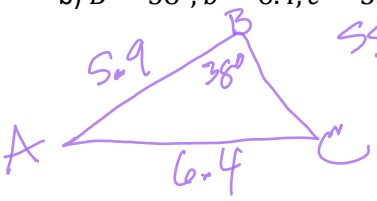


$\left(\frac{\sin C}{5.9} = \frac{\sin 38°}{2.9}\right)5.9$

$\sin^{-1}\left(\frac{5.9 \sin 38°}{2.9}\right) = C$

no triangle

b) $B = 38°, b = 6.4, c = 5.9$



SSA

$34.58° < 38°$ so only 1 triangle

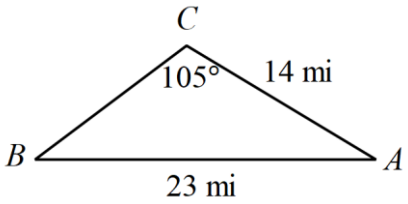
$\left(\frac{\sin C}{5.9} = \frac{\sin 38°}{6.4}\right)5.9$

$\sin^{-1}\left(\frac{5.9 \sin 38°}{6.4}\right) = C$

$C \approx 34.58°$

Examples: Solve each triangle. Round your answers to the nearest tenth. Hint: Draw the triangle and identify the type of triangle.

1.



$m\angle A =$ 39.0° $a =$ 15.0 mi

$m\angle B =$ 36.0° $b =$ 14 mi

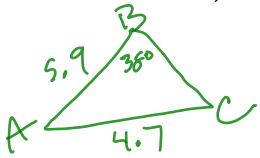
$m\angle C =$ 105° $c =$ 23 mi

$\left(\frac{\sin B}{14} = \frac{\sin 105°}{23}\right)14$

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

$\left(\frac{a}{\sin 39.0°} = \frac{23}{\sin 105°}\right)\sin 39.0°$

2. $B = 38°, b = 4.7, c = 5.9$



SSA

$50.6° > 38°$ so 2 △

$m\angle A =$ 91.4° / 12.6° $a =$ 7.6 / 1.7

$m\angle B =$ 38° $b =$ 4.7

$m\angle C =$ 50.6° / 129.4° $c =$ 5.9

$\left(\frac{\sin C}{5.9} = \frac{\sin 38°}{4.7}\right)5.9$

$\sin^{-1}\left(\frac{5.9 \sin 38°}{4.7}\right)$

$\left(\frac{a}{\sin 91.4°} = \frac{4.7}{\sin 38°}\right)\sin 91.4°$

2nd △

$180° - 50.6° =$

$180° - 38° - 129.4°$

$\left(\frac{a}{\sin 12.6°} = \frac{4.7}{\sin 38°}\right)\sin 12.6$

3. $m\angle B = 61°, m\angle C = 108°, a = 5$ yd

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

$m\angle B =$ _____ b = _____

$m\angle C =$ _____ c = _____

4. $m\angle C = 36°, b = 19$ m, $c = 20$ m

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

$m\angle B =$ _____ b = _____

$m\angle C =$ _____ c = _____

Steps for solving Application Problems

1) Read the problem
2) Define a variable
3) Write an equation
4) Solve the equation
5) Check your answer

Complementary angles— add 90°

Supplementary angles— add 180°

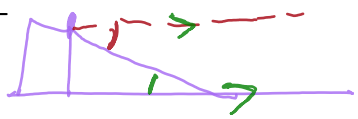
How to solve if have 2 sides and a right angle— Pythag thm

Triangle sum theorem— add 180°

Angle of elevation—

inside

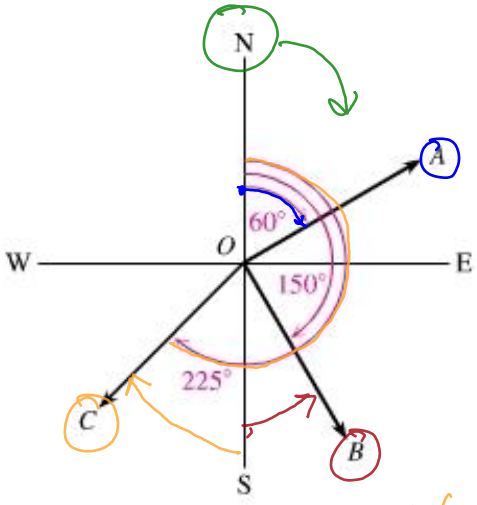
Angle of depression—



outside

Line of sight—

Bearing: The measure of an angle that describes the direction of a ray is called the bearing. Bearing is the clockwise angle from due north.



Another way to express bearing is to describe the acute angle that the ray makes with a ray pointing due north or south. For example:

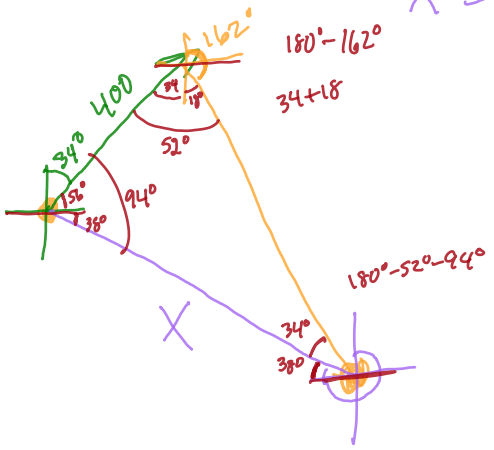
N60°E is a bearing of 60° east of north
S30°E is a bearing of 30° east of south — N 150° E
S45°W is a bearing of 45° west of south

N 225° E

default N34°E

Example: During an important NATO exercise, an F-14 Tomcat left the carrier Nimitz on a course with a bearing of 34° and flew 400 miles. Then the F-14 flew for some distance on a course with a bearing of 162°. Finally, the plane flew back to its starting point on a course with a bearing of 308°. What distance did the plane fly on the final leg of the journey? Round to the nearest tenth of a mile.

X = distance of final leg



$$\left(\frac{X}{\sin 52^\circ} = \frac{400}{\sin 34^\circ}\right) \sin 52^\circ$$

$X \approx 563.7$ mi