HS MATH 3	5.2| Law of Sines
DATE: 4/4	

ESSENTIAL QUESTION(S): How do you use the law of sines to find a missing side length? How do you use law of sines to find a missing angle? How do you determine how many triangles exist with a SSA triangle?

REVIEW:

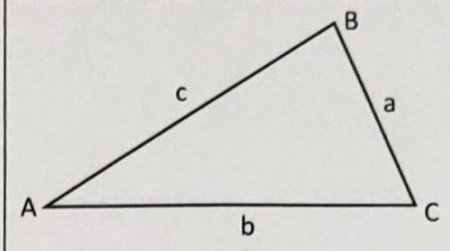
Here is a video for this section:

NOTES:

Law of Sines

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

used for non right Δ



Use the Law of Sines when:

- The measure of two angles and any side (AAS or ASA)
- The measure of two sides and one opposite angle (SSA)

Solve a triangle given two angles and a side.

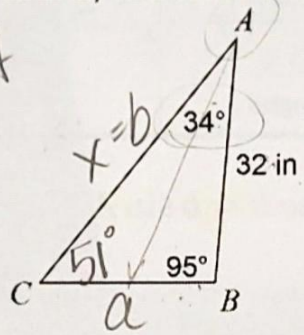
Example 1:

Using ΔABC, find $\overline{AC}$. Round the nearest tenth if necessary.

all 3 ∠'s in a triangle add up to 180°

find a side →

ASA



A = 34 B = 95 C = 51°

a = b = x C = 32

$\frac{\sin 95}{x} = \frac{\sin 51}{32}$

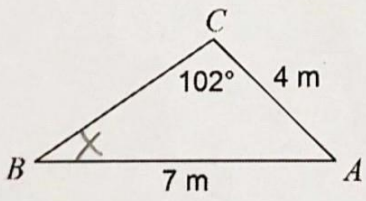
multiply the diagonal then divide by third #.

$x = 41.0$

Example 2:

Using ΔABC, find $m\angle B$. Round the nearest tenth if necessary.

Find an ∠ →



A = ? B = x C = 102

a = ? b = 4 C = 7

$\frac{\sin B}{4} = \frac{\sin 102}{7}$

$\sin B = 0.5589$

$B = 34°$

Example 3:

find it all →

Solve for all the missing parts of the triangle. In ΔDEF, $m\angle D = 108°, m\angle E = 56°, f = 9\ cm$.

D = 108° E = 56 F = 16°

d = 31.1 e = 27.1 f = 9

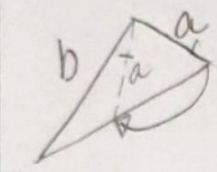
$\frac{\sin 108}{d} = \frac{\sin 16}{9}$

$d = 31.1$

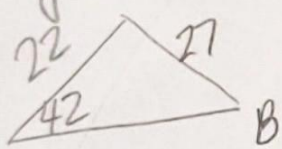
$\frac{\sin 56}{e} = \frac{\sin 16}{9}$

Ambiguous Case

given SSA



★ the ∠ they give you will be how you determine



Step by Step

① determine acute, right or obtuse.

② find $h = b\sin A$

③ put sides in order from least to greatest and label

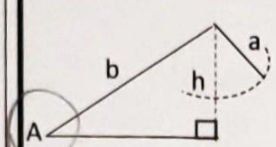
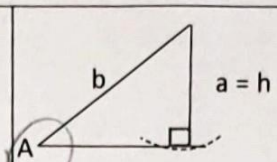
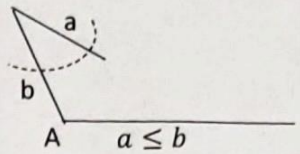
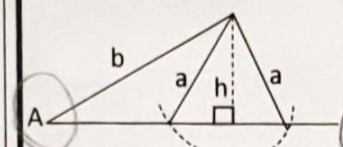
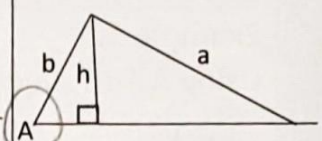
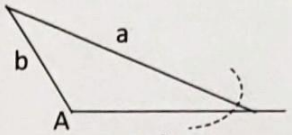
④ compare to chart

Try on your own:

1. ΔNPQ if $P = 42^\circ, Q = 65^\circ$, and $n = 5$.
2. ΔABC if $C = 100^\circ, B = 53^\circ$, and $b = 9$.
3. ΔABC if $A = 50^\circ, C = 67^\circ$, and $a = 2.5$.
5. ΔABC if $A = 42^\circ, B = 110^\circ$, and $c = 7$.
6. ΔTRS if $T = 94^\circ, R = 48^\circ$, and $t = 47$.
7. ΔPKH if $P = 155^\circ, K = 14^\circ$, and $p = 40$.

Possible Triangles in SSA Case

Consider a triangle in which a, b, and $m\angle A$ are given.

$\angle A$ is Acute		$\angle A$ is right or obtuse
 $a < h$ No triangle	 $a = h$ One triangle	 $a \le b$ no triangle
 $h < a < b$ two triangles	 $a \ge b$ one triangle	 $a > b$ one ~~solution~~ triangle

★You can use $h = b\sin A$ to find h in an acute angle.

Example 4:

Given the following SSA triangle, determine how many triangles exist. acute ①

a. $A = 42°, a = 27, b = 22$

② $h = 22\sin(42) = 14.7$

③ $14.7 < 22 < 27$ (h, b, a) one ④

b. $C = 132°, b = 7, c = 7$ obtuse

no triangle

Try on your own:

1. $A = 72°, c = 33, a = 7$
2. $A = 69°, c = 35, a = 34$
3. $C = 35°, b = 35, c = 23$
4. $A = 143°, c = 21, a = 26$
5. $A = 43°, c = 26, a = 9$
6. $C = 39°, b = 7, c = 23$