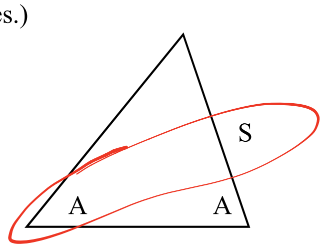
Page 59

Solving Triangles
12.1 – Law of Sines

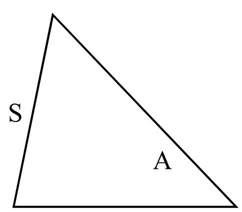
<u>Law of Sines</u>: Let ΔABC be any triangle with a, b, and c representing the measures of the sides opposite the angles with measures A, B, and C respectively. Then, the following is true.

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

<u>When Do I use Law of Sines?</u>
If you are given one of the following cases:
Case #1
AAS (two angles and a side opposite one of those angles.)



Case #2
ASS (two sides and an angle opposite one of those sides.)



<u>Ambiguous Case for Law of Sines</u>: When you are given ASS:

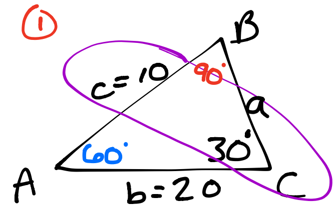
Use Law of Sines to find a missing angle. If the first angle you are trying to find doesn't exist, there is 0 solutions. If the angle is 90°, there is 1 solution. If the angle is acute, there might be 2 solutions.

Ex A: Determine the number of possible solutions. If a solution exists, solve the triangle. Round angle measures to the nearest minute and side measures to the nearest tenth.

#1) b = 20, C = 30°, c = 10

ASS

1



2

$$\frac{\sin 30°}{10}=\frac{\sin B}{20}$$

$$\frac{20\sin 30°}{10}=\sin B$$

$$\sin^{-1}\left(\frac{20\sin 30°}{10}\right)=B$$

$$90°=B$$

Since ASS and B=90°, here is One solution

3

$$m\angle A+90°+30°=180°$$

$$m\angle A+120°=180°$$

$$m\angle A=60°$$

4 Special

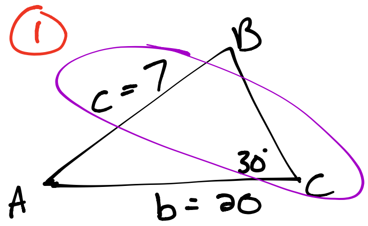
$$a=10\sqrt{3}$$

 Page 60

Solving Triangles
12.1 – Law of Sines

#3) b = 20, C = 30°, c = 7

ASS

① 

② $\frac{\sin 30°}{7} = \frac{\sin B}{20}$

$\frac{20 \sin 30°}{7} = \sin B$

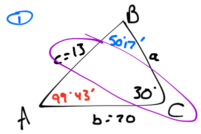
$\sin^{-1}\left(\frac{20 \sin 30°}{7}\right) = B$

Error = B

Since ASS and m∠B is error, there is <u>no</u> solution

#4) b = 20, C = 30°, c = 13

ASS

① 

② $\frac{\sin 30°}{13} = \frac{\sin B}{20}$

$\frac{20 \sin 30°}{13} = \sin B$

$\sin^{-1}\left(\frac{20 \sin 30°}{13}\right) = B$

$50°17' \approx B$

2 solutions because ASS, and m∠B is acute

③ $m\angle A + 30° + 50°17' = 180°$

$m\angle A + 80°17' = 180°$

$m\angle A = 99°43'$

④ $\frac{\sin 30°}{13} = \frac{\sin 99°43'}{a}$

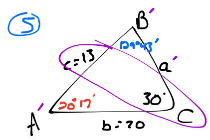
$a \cdot \sin 30° = 13 \sin 99°43'$

$a = \frac{13 \sin 99°43'}{\sin 30°}$

$a \approx 25.6$

Solution 1

Solution 2

⑤ 

⑥ $m\angle B' + m\angle B = 180°$

$m\angle B' + 50°17' = 180°$

$m\angle B' = 129°43'$

⑦ $m\angle A' + 129°43' + 30° = 180°$

$m\angle A' + 159°43' = 180°$

$m\angle A' = 20°17'$

⑧ $\frac{\sin 30°}{13} = \frac{\sin 20°17'}{a'}$

$a' \cdot \sin 30° = 13 \sin 20°17'$

$a' = \frac{13 \sin 20°17'}{\sin 30°}$

$a' \approx 9.0$

Skillz Review Important Note: $(\sin x)(\sin x) = (\sin x)^2 = \sin^2 x$		
$\frac{2}{3} + \frac{1}{4} =$	$\frac{2x}{3} + \frac{x}{4} =$	$\frac{2 \sin x}{3} + \frac{\sin x}{4} =$
$\left(\frac{2}{3}\right)^2 =$	$\left(\frac{2x}{3}\right)^2 =$	$\left(\frac{2 \sin x}{3}\right)^2 =$