3.02 Law of Sines – Ambiguous Case Notes **Name:** _____

Remember: Law of Sines $\frac{sinA}{a} = \frac{sinB}{b} = \frac{sinC}{c}$

In some cases, you'll be given a consecutive angle, side, and side (ASS). For these problems you have what's called **The Ambiguous Case**- meaning: you don't know how many triangle solutions you'll have. There **could be no triangle, one triangle, or even two triangles** that work for your given measurements.

Here's what you do:

-Find your first missing angle (solution 1) using Law of Sines

-Check it to see if it makes sense

- given angle + solution 1 ≥ 180° means **NO TRIANGLE**

- given angle + solution 1 < 180° means at least **1 TRIANGLE**

-If you have 1 triangle, you may have two. Find your second possible angle.

-180° – solution 1 = second possible angle

- Check it to see if it makes sense

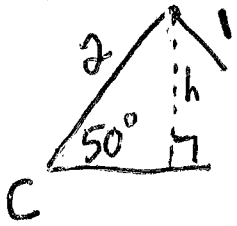
- given angle + solution 2 ≥ 180° means this solution is no good; only **1 TRIANGLE**; solve

- given angle + solution 2 < 180° means **2 TRIANGLES**; make sure you solve both

Just remember: if you're given ASS, the problem is going to be a pain in the _____. ☺

Examples:

1. $a = 2, c = 1, C = 50°$



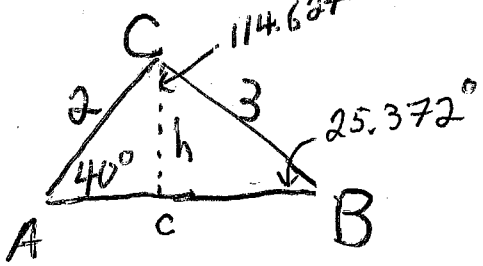
$\sin 50 = \frac{h}{2}$

$h = 2\sin 50$

$h = 1.532$

No triangle

2. $a = 3, b = 2, A = 40°$



$\sin 40 = \frac{h}{2}$

$h = 1.286$

$\frac{2}{\sin B} = \frac{3}{\sin 40}$

$\frac{3\sin B}{3} = \frac{2\sin 40}{3}$

$\sin B = \frac{2\sin 40}{3}$

$\sin B = .4285$

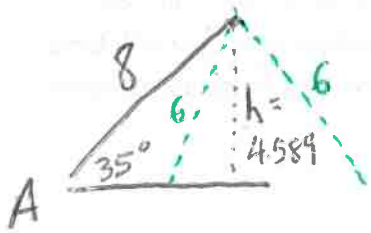
$B = \sin^{-1}(0.4285) = 25.372°$

$\frac{c}{\sin 114.627} = \frac{3}{\sin 40}$

$c = \frac{3\sin 114.627}{\sin 40}$

$c = 4.242$

3. $a = 6, b = 8, A = 35°$



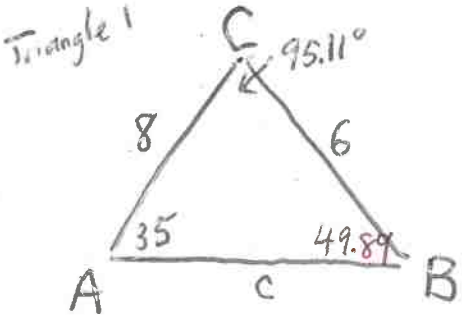
$\sin 35 = \frac{h}{8}$

$h = 8\sin 35$

$h = 4.589$

2 triangles

Triangle 1



$\frac{8}{\sin B} = \frac{6}{\sin 35}$

$6\sin B = 8\sin 35$

$\sin B = \frac{8\sin 35}{6}$

$\sin B = 0.7647$

$B = \sin^{-1}(0.7647)$

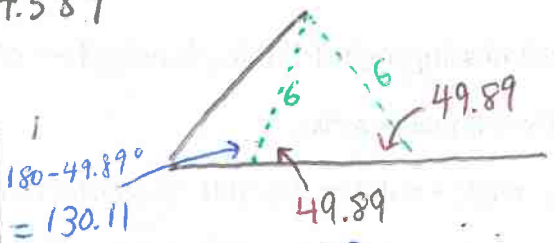
$B = 49.89°$

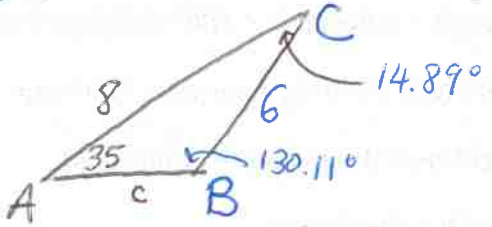
$\frac{c}{\sin 95.11} = \frac{6}{\sin 35}$

$c = \frac{6\sin 95.11}{\sin 35}$

$c = 10.419$

i





$\frac{c}{\sin 14.89} = \frac{6}{\sin 35}$

$c = \frac{6\sin 14.89}{\sin 35}$

$c = 2.688$

APC 3.02 Law of Sines – Ambiguous Case Practice **Date:** _____

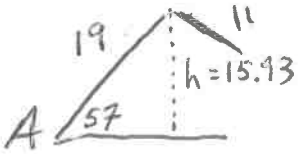
a) Determine the number of solutions for triangle ABC. b) **If there is only 1 solution**, solve the triangle.

1. A = 57°, a = 11, b = 19

a) 0 Triangles

$\sin 57 = \frac{h}{19}$

$h = 15.93$



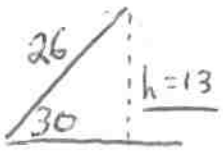
2. A = 30°, a = 13, b = 26

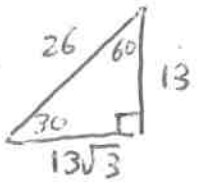
a) 1 Triangles

1 Right triangle.

$\sin 30 = \frac{h}{26}$

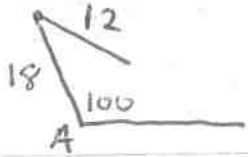
$h = 13$





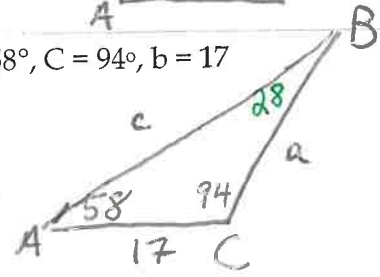
3. A = 100°, b = 18, a = 12

a) 0 Triangles



4. A = 58°, C = 94°, b = 17

a) 1 Triangles

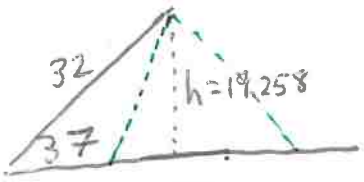


$\frac{a}{\sin 58} = \frac{17}{\sin 28} \rightarrow a = \frac{17 \sin 58}{\sin 28}$ $a = 30.709$

$\frac{c}{\sin 94} = \frac{17}{\sin 28} \rightarrow c = \frac{17 \sin 94}{\sin 28}$ $c = 36.123$

5. A = 37°, a = 27, b = 32

a) 2 Triangles

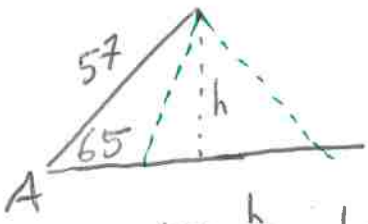


$\sin 37 = \frac{h}{32}$

$h = 32 \sin 37 = 19.258$

6. A = 65°, a = 55, b = 57

a) 2 Triangles



$\sin 65 = \frac{h}{57}$ $h = 57 \sin 65 = 51.659$