

Thursday, March 28, 2019
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Name: KEY

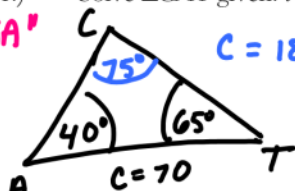
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Precalculus - Section 6.1C - Law of Sines
Practice Problems

For Problems #1 – 10, draw and label a triangle with the given information. Solve for any unknown measures. Round answers to the nearest hundredth.

(Hint: keep in mind... are there 0, 1, or 2 triangles which fit the specified criteria??)

1.) Solve $\triangle CAT$ given: $c = 70, A = 40^\circ, T = 65^\circ$

"ASA"  $C = 180^\circ - 40^\circ - 65^\circ$
 $C = 75^\circ$

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

$$\frac{a}{\sin 40^\circ} = \frac{70}{\sin 75^\circ}$$

$$a \sin 75^\circ = \frac{70 \sin 40^\circ}{\sin 75^\circ}$$

$$a \approx 46.58$$

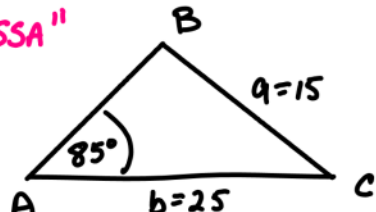
$$\frac{t}{\sin T} = \frac{c}{\sin C}$$

$$\frac{t}{\sin 65^\circ} = \frac{70}{\sin 75^\circ}$$

$$t \sin 75^\circ = \frac{70 \sin 65^\circ}{\sin 75^\circ}$$

$$t \approx 65.68$$

2.) Solve $\triangle ABC$ given: $a = 15, A = 85^\circ, b = 25$

"SSA" 

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

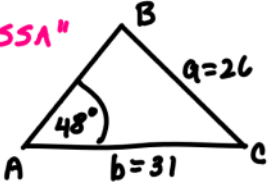
$$\frac{15}{\sin 85^\circ} = \frac{25}{\sin B}$$

$$25 \sin 85^\circ = \sin B$$

$$15 \approx 1.66$$

$\sin B \approx 1.66$
no solution

3.) Solve $\triangle ABC$ given: $a = 26, A = 48^\circ, b = 31$

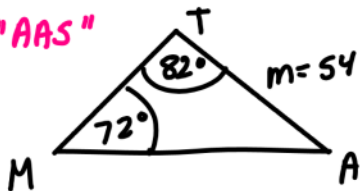
"SSA" 

1st Triangle: $B \approx 62.38^\circ$
 $C \approx 69.62^\circ$
 $C \approx 32.80$

2nd Triangle: $B \approx 117.62^\circ$
 $C \approx 14.38^\circ$
 $C \approx 8.69$

* See work below

4.) Solve $\triangle MAT$ given: $m = 54, M = 72^\circ, T = 82^\circ$

"AAS" 

$$A = 180^\circ - T - M$$

$$A = 180^\circ - 82^\circ - 72^\circ$$

$$A = 26^\circ$$

$$\frac{m}{\sin M} = \frac{t}{\sin T}$$

$$\frac{54}{\sin 72^\circ} = \frac{t}{\sin 82^\circ}$$

$$t = \frac{54 \sin 82^\circ}{\sin 72^\circ}$$

$$t \approx 56.23$$

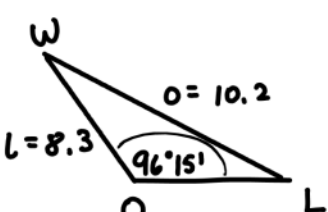
$$\frac{m}{\sin M} = \frac{a}{\sin A}$$

$$\frac{54}{\sin 72^\circ} = \frac{a}{\sin 26^\circ}$$

$$a = \frac{54 \sin 26^\circ}{\sin 72^\circ}$$

$$a \approx 24.89$$

5.) Solve $\triangle OWL$ given: $O = 96^\circ 15', o = 10.2, l = 8.3$

"SSA" 

↑ given obtuse \angle (0 or 1 solution)

$$\frac{o}{\sin O} = \frac{l}{\sin L}$$

$$\frac{10.2}{\sin 96^\circ 15'} = \frac{8.3}{\sin L}$$

$$8.3 \sin 96^\circ 15' = \sin L$$

$$\frac{8.3 \sin 96^\circ 15'}{10.2} = \sin L$$

$$\sin^{-1}\left(\frac{8.3 \sin 96^\circ 15'}{10.2}\right) = L$$

$$L \approx 53.99^\circ$$

$$W = 180^\circ - O - L$$

$$W = 180^\circ - 96^\circ 15' - 53.99^\circ = 29.76^\circ$$

$$\frac{o}{\sin O} = \frac{w}{\sin W}$$

$$\frac{10.2}{\sin 96^\circ 15'} = \frac{w}{\sin 29.76^\circ}$$

$$w = \frac{10.2 \sin 29.76^\circ}{\sin 96^\circ 15'}$$

$$w \approx 5.09$$

6.) Solve $\triangle ABC$ given: $a = 5, A = 125^\circ, b = 12$

SSA
obtuse (1 or 0 solution)

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

$$\frac{5}{\sin 125^\circ} = \frac{12}{\sin B}$$

$$12 \sin 125^\circ = \sin B \cdot 5$$

$$R \approx 1.97$$

$$\sin^{-1}\left(\frac{12 \sin 125^\circ}{5}\right) = B$$

no solution

7.) Solve $\triangle PIG$ given: $p = 61.37, g = 72.8, G = 18.2^\circ$

"SSA" acute
(0, 1, or 2 Δ s)

$$\frac{g}{\sin G} = \frac{p}{\sin P}$$

$$\frac{72.8}{\sin 18.2^\circ} = \frac{61.37}{\sin P}$$

$$\sin P = \frac{61.37 \sin 18.2^\circ}{72.8}$$

$P \approx 15.27^\circ$

* work for 2nd Δ below

$$I = 180^\circ - P - G$$

$$I = 180^\circ - 15.27^\circ - 18.2^\circ$$

$I = 146.53^\circ$

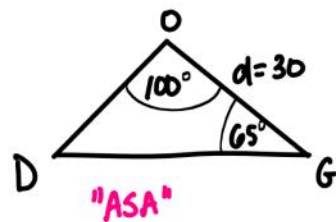
$$\frac{g}{\sin G} = \frac{p}{\sin I}$$

$$\frac{72.8}{\sin 18.2^\circ} = \frac{p}{\sin 146.53^\circ}$$

$$i = \frac{72.8 \sin 146.53^\circ}{\sin 18.2^\circ}$$

$i \approx 128.55$

8.) Solve $\triangle DOG$ given: $d = 30, O = 100^\circ, G = 65^\circ$



$$D = 180^\circ - O - G$$

$$D = 180^\circ - 100^\circ - 65^\circ$$

$D = 15^\circ$

$$\frac{d}{\sin D} = \frac{o}{\sin O}$$

$$\frac{30}{\sin 15^\circ} = \frac{o}{\sin 100^\circ}$$

$$o = \frac{30 \sin 100^\circ}{\sin 15^\circ}$$

$o \approx 114.15$

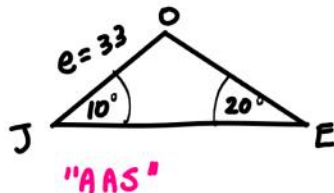
$$\frac{d}{\sin D} = \frac{g}{\sin G}$$

$$\frac{30}{\sin 15^\circ} = \frac{g}{\sin 65^\circ}$$

$$g = \frac{30 \sin 65^\circ}{\sin 15^\circ}$$

$g \approx 105.05$

9.) Solve $\triangle JOE$ given: $e = 33, E = 20^\circ, J = 10^\circ$



$$O = 180^\circ - J - E$$

$$O = 180^\circ - 10^\circ - 20^\circ$$

$O = 150^\circ$

$$\frac{e}{\sin E} = \frac{o}{\sin O}$$

$$\frac{33}{\sin 20^\circ} = \frac{o}{\sin 150^\circ}$$

$$o = \frac{33 \sin 150^\circ}{\sin 20^\circ}$$

$o \approx 48.24$

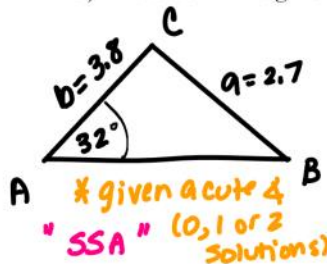
$$\frac{e}{\sin E} = \frac{j}{\sin J}$$

$$\frac{33}{\sin 20^\circ} = \frac{j}{\sin 10^\circ}$$

$$j = \frac{33 \sin 10^\circ}{\sin 20^\circ}$$

$j \approx 16.75$

10.) Solve $\triangle ABC$ given: $a = 2.7, A = 32^\circ, b = 3.8$



1st Triangle:

$$B \approx 48.23^\circ$$

$$C \approx 99.7^\circ$$

$$c \approx 5.02$$

2nd Triangle

$$B \approx 131.77^\circ$$

$$C \approx 16.23^\circ$$

$$c \approx 1.42$$

* See work below

For Problems #11 - 12, find the area of a triangle with the given measures.

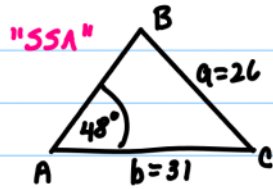
11.) Find the area of $\triangle DEF$ with $D = 100^\circ 45', e = 18.2, f = 25$.

$$A = \frac{1}{2} e f \sin D \quad A = \frac{1}{2} (18.2)(25) \sin 100^\circ 45' = 223.51 \text{ Sq units}$$

12.) Find the area of $\triangle QED$ with $Q = 15.7^\circ, e = 100, d = 125$.

$$A = \frac{1}{2} (100)(125) \sin 15.7^\circ = 1691.25 \text{ Sq units}$$

3.) Solve $\triangle ABC$ given: $a = 26$, $A = 48^\circ$, $b = 31$



1ST TRIANGLE: $\frac{a}{\sin A} = \frac{b}{\sin B}$

$$\frac{26}{\sin 48^\circ} = \frac{31}{\sin B}$$

$$\frac{31 \sin 48^\circ}{26} = \sin B$$

$26 \approx .886$

$$\sin^{-1}\left(\frac{31 \sin 48^\circ}{26}\right) = B$$

$$B \approx 62.38^\circ$$

$$C = 180^\circ - A - B$$

$$C = 180^\circ - 48^\circ - 62.38^\circ$$

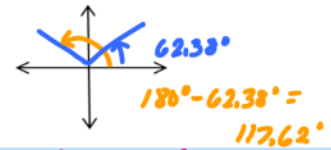
$$C \approx 69.62^\circ$$

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

$$\frac{26}{\sin 48^\circ} = \frac{c}{\sin 69.62^\circ}$$

$$\frac{26 \sin 69.62^\circ}{\sin 48^\circ} = c$$

$$c \approx 32.80$$



2ND TRIANGLE

$$B \approx 117.62^\circ$$

$$C = 180^\circ - A - B$$

$$C = 180^\circ - 48^\circ - 117.62^\circ$$

$$C \approx 14.38^\circ$$

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

$$\frac{26}{\sin 48^\circ} = \frac{c}{\sin 14.38^\circ}$$

$$\frac{26 \sin 14.38^\circ}{\sin 48^\circ} = c$$

$$c \approx 8.69$$

7) $P \approx 15.27^\circ$

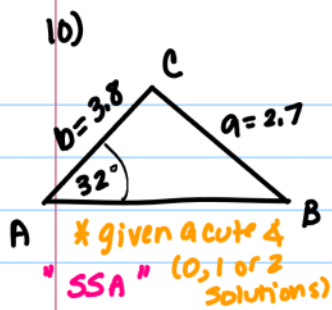
$$P_2 = 180^\circ - 15.27^\circ = 164.73^\circ$$

$$I = 180^\circ - P - G$$

$$= 180^\circ - 164.73^\circ - 18.2^\circ$$

$$= -2.93^\circ \quad \text{2nd } \triangle \text{ not possible}$$





1st Δ

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

$$\frac{2.7}{\sin 32^\circ} = \frac{3.8}{\sin B}$$

$$\sin B = \frac{3.8 \sin 32^\circ}{2.7}$$

$$B \approx 48.23^\circ$$

$$C = 180^\circ - A - B$$

$$C = 180^\circ - 32^\circ - 48.23^\circ$$

$$C \approx 99.7^\circ$$

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

$$\frac{2.7}{\sin 32^\circ} = \frac{c}{\sin 99.7^\circ}$$

$$c = \frac{2.7 \sin 99.7^\circ}{\sin 32^\circ}$$

$$c \approx 5.02$$

2nd Δ



$$B = 180^\circ - 48.23^\circ$$

$$B = 131.77^\circ$$

$$C = 180^\circ - A - B$$

$$C = 180^\circ - 32^\circ - 131.77^\circ$$

$$C = 16.23^\circ$$

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

$$\frac{2.7}{\sin 32^\circ} = \frac{c}{\sin 16.23^\circ}$$

$$c = \frac{2.7 \sin 16.23^\circ}{\sin 32^\circ}$$

$$c \approx 1.42$$