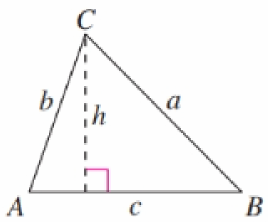
Law of Sines - Section 3.1

Oblique triangle —
NOT A RIGHT TRIANGLE

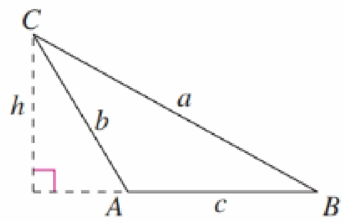
Law of Sines

If ABC is a triangle with sides a, b, and c, then

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



A is acute.



A is obtuse.

7. 0/3 points LarTrig10 3.1.026.

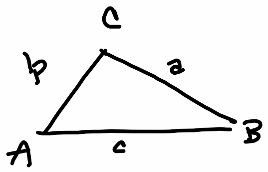
Use the Law of Sines to solve (if possible) the triangle. If two solutions exist, find both. Round your answers to two places. (If not possible, enter IMPOSSIBLE.)

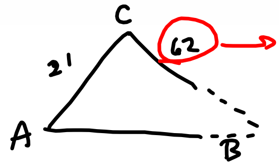
$A = 62°$, $a = 34$, $b = 21$

$B =$ ✗ 33.05 °

$C =$ ✗ 84.95 °

$c =$ ✗ 38.36





→ 34, says Jessica

2 sol'ns? No.

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

$$\frac{\sin B}{b} = \frac{\sin A}{a} \Longrightarrow \sin B = \frac{b \sin A}{a} = \frac{21 \sin 62^\circ}{34}$$

```
21sin(62)/34
           .5453499838
sin(Ans
           .0095180091
21sin(62)/34
           .5453499838
_
```

→ No! We want $\sin^{-1}(.545..) = \arcsin(.545..)$

```
21sin(62)/34
           .5453499838
sin⁻¹(Ans
           33.04858355
Ans+62-180
          -84.95141645
```

$\rightarrow C = 84.95\ldots$

$A = 62^\circ$
$B \approx 33.05^\circ$
$C \approx 84.95^\circ$
$a = 34$
$b = 21$
$c = 38.36 \rightarrow \approx$

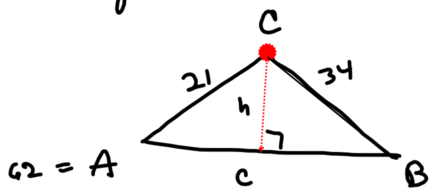
Need c: $\frac{c}{\sin C} = \frac{a}{\sin A} \Longrightarrow c = \frac{a \sin C}{\sin A}$

$= \frac{34 \sin(84.95\ldots^\circ)}{\sin(62^\circ)} \approx 38.35798991 \approx \boxed{38.36 \approx c}$

```
34sin(-Ans)/sin(62)
           38.35798991
```

$\approx c$

Unique Solution! why?




```
21sin(62
           18.54189945
```

height $= h$ &

$\frac{h}{21} = \sin 62^\circ$

$h = 21 \sin 62^\circ \approx 18.54189945$,

so, side a is long enough to reach side c.

Also $18.54\ldots > 21$, so only ONE sol'n.

ACUTE

$A = 52^0$

$B \approx 122.45^0$ → AND THIS is the obtuse B! we want $B \approx 57.55^0$ → Read question carefully for specified precision

$C \approx 70.45^0$

$a = 12.7$

$b = 13.6$

* $c \approx 70.45^0$ → Dillon says this is an angle! He's right!

→ NO. $\boxed{15.19 \approx c}$

$\sin C = \frac{c \sin A}{a}$ = NOT Ready yet. Need ANGLE C to get side c.

$C = 180^0 - (A+B) = 180^0 - 52^0 - 57.54936234...^0$

$\approx$

$\boxed{57.54936234^0 \approx B}$

```
Ans-180
    -122.4506377
Ans+180
     57.54936234
180-52-Ans
     70.45063766
```

$\approx C$

Now, we're still missing side c.

$c = \frac{a \sin C}{\sin A} \approx \boxed{15.18747059 \approx c}$

Unpossible!!!???

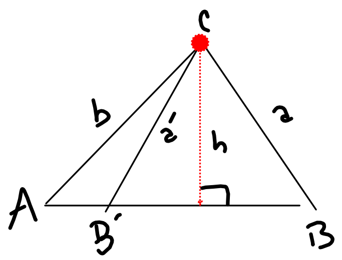
OBTUSE!

5. 0/3 points LarT

Use the Law of Sines to solve (if possible) the triangle. If two solutions exist, find both. Round your ar places. (If a triangle is not possible, enter IMPOSSIBLE in each corresponding answer blank.)

$A = 110°$, $a = 185$, $b = 280$

ASS can have 0, 1 or 2 possible solutions.



2 possibles.

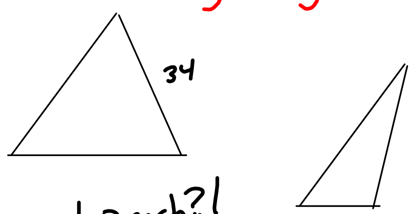
No. $\boxed{A = 110° > 90°}$ oblique.

NOTE: $\underline{a > h}$ & $\underline{a < b}$

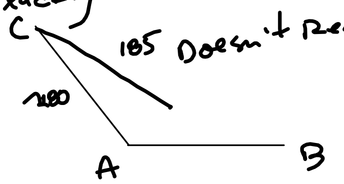
Long enough

Short enough for 2 configurations

Not the example I thought!



This also has exactly one sol'n

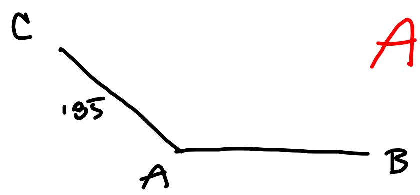


185 Doesn't Reach?!

$\frac{h}{b} = \sin A \Rightarrow h = b \sin A = 280 \sin 110° \approx 263.1139338$

< 280, so it's long enough (b is)

Messed-up b/c I didn't pick up on "A is obtuse" part.



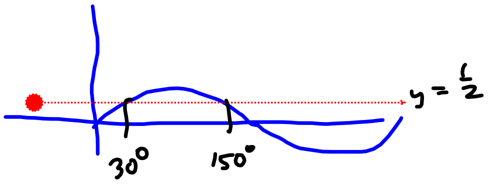
AT MOST ONE SOL'N FOR "ASS" when $A > 90°$ obtuse.

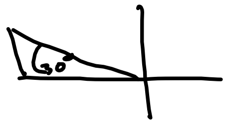
Use the Law of Sines to solve (if possible) the triangle. If two solutions exist, find both. Round your answers to two places. (If a triangle is not possible, enter IMPOSSIBLE in each corresponding answer blank.)

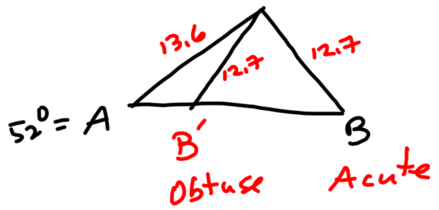
$A = 52°$, $a = 12.7$, $b = 13.6$

Case 1:		Case 2:	
$B =$	57.55 ° (smaller B-value)	$B =$	122.45 ° (larger B-value)
$C =$	70.45 °	$C =$	5.55 °
$c =$	15.19	$c =$	1.56

Note $\sin\theta = \frac{1}{2}$ in 2 spots between $0°$ & $180°$

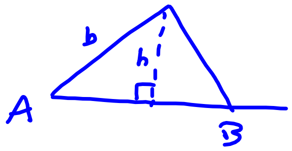






$B' = 180° - B$

$h = b\sin A$
$= 13.6\sin 52°$
$\approx 10.72.$

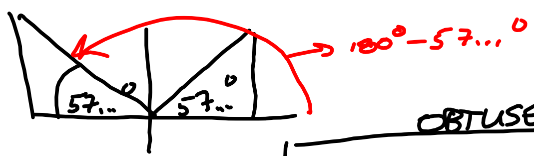


Now, $12.7 > 10.72$, so solution $\exists$. (exists)
& $12.7 < 13.6$, so 2 sol's $\exists$.

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

$\sin B = \frac{b\sin A}{a} = \frac{13.6\sin 52°}{12.7} \approx$ $\boxed{57.54936234° \approx B}$ ACUTE B

For OBTUSE B, subtract from 180°




```
13.6sin(52)/12.7
       .8438540354
sin-1(Ans
       57.54936234
Ans-180
      -122.4506377
```

$180° - B = \boxed{B' \approx 122.4506377}$ OBTUSE B

obtuse B

Etc.

ACUTE

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→ Read question carefully for specified precision

$C \approx 70.45^\circ$

→ Dillon says this is an angle! He's right!

$a = 12.7$

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$c \approx 70.45^\circ$ → NO! $\boxed{15.19 \approx c}$

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Ans+180
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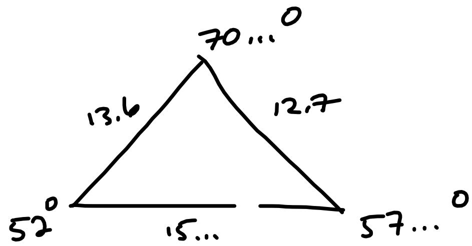
$\approx C$

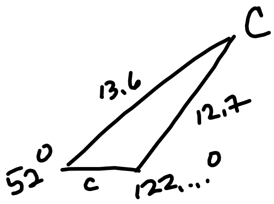
Now, we're still missing side c.

$c = \dfrac{a \sin C}{\sin A} \approx \boxed{15.18747059 \approx c}$

```
180-52-Ans
     70.45063766
12.7sin(Ans)/si▸
     15.18747059
```
$\approx c$



Now for "B is obtuse"



$180^\circ - B = B' \approx 122.4506377$

obtuse B

$C' = 180^\circ - A - B = 180^\circ - 52^\circ - 122...^\circ \approx \boxed{5.5493623^\circ \approx C'}$

$\frac{c}{\sin C} = \frac{a}{\sin A} \Longrightarrow c = \frac{a \sin C}{\sin A} \approx \frac{12.7 \sin C}{\sin 52^\circ} \approx 1.585521525$

$\boxed{c' \approx 1.59}$

$$\boxed{\begin{array}{l} A' = 52^\circ \\ B' \approx 122.45^\circ \\ C' \approx 5.55^\circ \\ a' = 12.7 \\ b' = 13.6 \\ c' \approx 1.59 \end{array}}$$