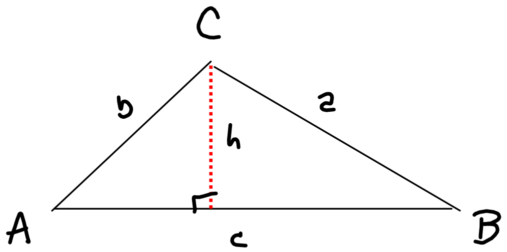
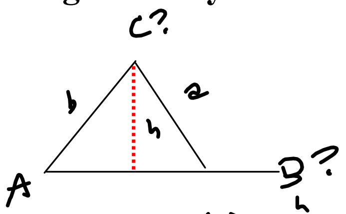


$\frac{\sin A}{a} = \frac{\sin B}{b}$: $\sin A = \frac{h}{b}$ & $\sin B = \frac{h}{a}$.

$\Rightarrow$ $b \sin A = h = a \sin B$ $\Rightarrow$

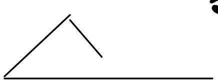
$\frac{\sin A}{a} = \frac{\sin B}{b}$

The only thing to worry about is being an ASS.



$\sin(A) = \frac{h}{a}$

zero solutions

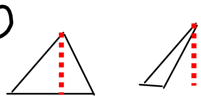


a is too short to form a triangle.

Ambiguous Case
$a < b$ & $a > h$
Not too long   Long enough

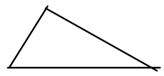
If $a > h$: ① $a < b$ ② $a > b$

①



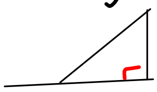
2 solutions

②



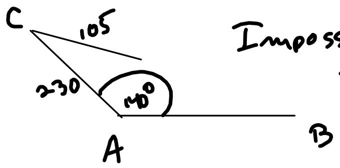
one solution

$a = h$ (rare)
You have a right triangle!



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

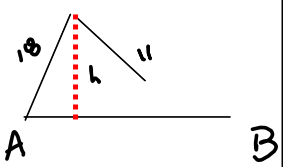
$A = 140°, \ a = 105, \ b = 230$

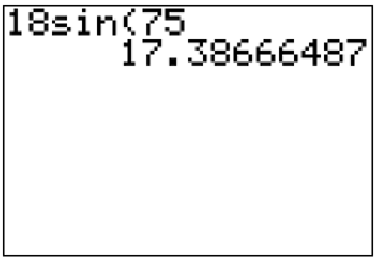


Impossible
a is too short!

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

$A = 75°, \ a = 11, \ b = 18$





$\frac{h}{18} = \sin A$

$h = 18 \sin A = 18 \sin 75° \approx 17.38666487 > 11 = a$?!

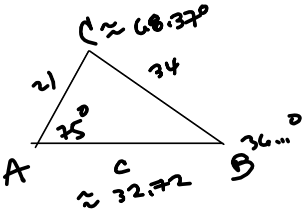
a's too short to form a triangle!

No Solution!

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

$A = 75°$, $a = 34$, $b = 21$

a is long enough, but too long for there to be 2 solutions.



Exactly one solution.

B is acute

```
18sin(75
      17.38666487
21sin(75)/34
      .5966012456
sin⁻¹(Ans
      36.62686564
```

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

$$\sin B = \frac{b \sin A}{a} = \frac{21 \sin 75^\circ}{34} \approx .5966012456$$

$$\rightarrow B = \sin^{-1}(.5966\ldots) \approx 36.62686564^\circ$$

$$\boxed{B \approx 36.63^\circ}$$

We get C by subtraction: $180° - 75° - 36.6\ldots° \approx \boxed{68.37 \approx C}$

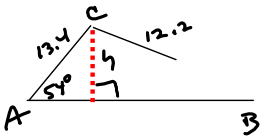
```
Ans+75-180
      -68.37313436
-Ans
       68.37313436
34sin(Ans)/sin(7
5)
       32.72148585
```

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

$$c = \frac{a \sin C}{\sin A} \approx \frac{34 \sin(68\ldots°)}{\sin(75°)} \approx \boxed{32.72 \approx c}$$

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

$A = 54°$, $a = 12.2$, $b = 13.4$



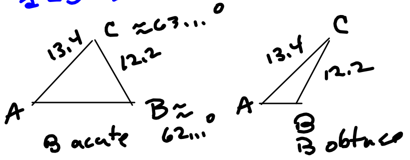
$\frac{h}{13.4} = \sin 54^\circ$

```
13.4sin(54
          10.84082772
```

$h = 13.4 \sin 54^\circ \approx 10.8$

$a > h$ ✓ has sol'n

$a < b$ 2 sol'ns



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

$\sin B = \frac{b \sin A}{a} = \frac{13.4 \sin(54^\circ)}{12.2} \approx .88\ldots$

$B \approx \arcsin(.88\ldots) \approx 62.69690255^\circ \approx B$

$\boxed{B \approx 62.70^\circ}$

```
13.4sin(54)/12.2
         .8885924364
sin⁻¹(Ans)
         62.69690255
Ans+54-180
        -63.30309745
Ans+54-180
```

$C = 180^\circ - A - B \approx 63.30309745^\circ$

$\approx \boxed{C \approx 63.30^\circ}$

```
Ans+54-180
        -63.30309745
-Ans
         63.30309745
12.2sin(Ans)/sin
(54)
         13.47243302
```

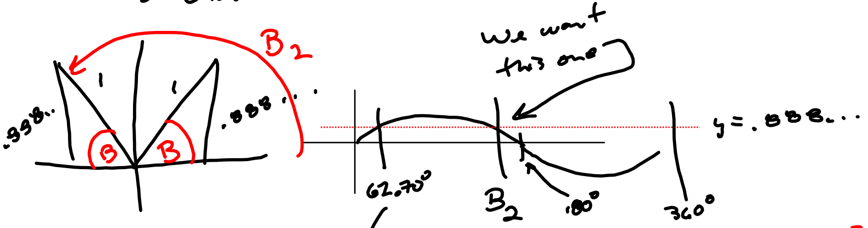
$\frac{c}{\sin C} = \frac{a}{\sin A}$

$c = \frac{a \sin C}{\sin A} \approx 13.47243302$

$\boxed{c \approx 13.47}$

Now find other triangle, where B is obtuse.

$\sin B \approx .8885924364$



B_2 = Obtuse solution $= 180^\circ - B$

$\approx \boxed{117.30^\circ \approx B_2 \text{ (obtuse)}}$

B Acute Sol'n.

```
13.4sin(54)/12.2
         .8885924364
180-62.69690255
         117.3030975
```

Still have $C = 180^\circ - A - B$ & $c = \frac{a \sin C}{\sin A}$ to do.

Area of an Oblique Triangle

The area of any triangle is one-half the product of the lengths of two sides times the sine of their included angle. That is,

$$\text{Area} = \frac{1}{2}bc \sin A = \frac{1}{2}ab \sin C = \frac{1}{2}ac \sin B.$$