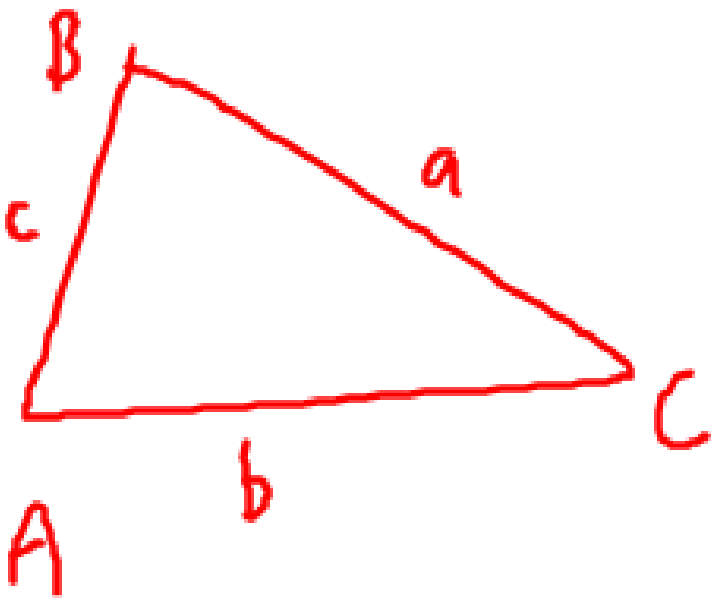
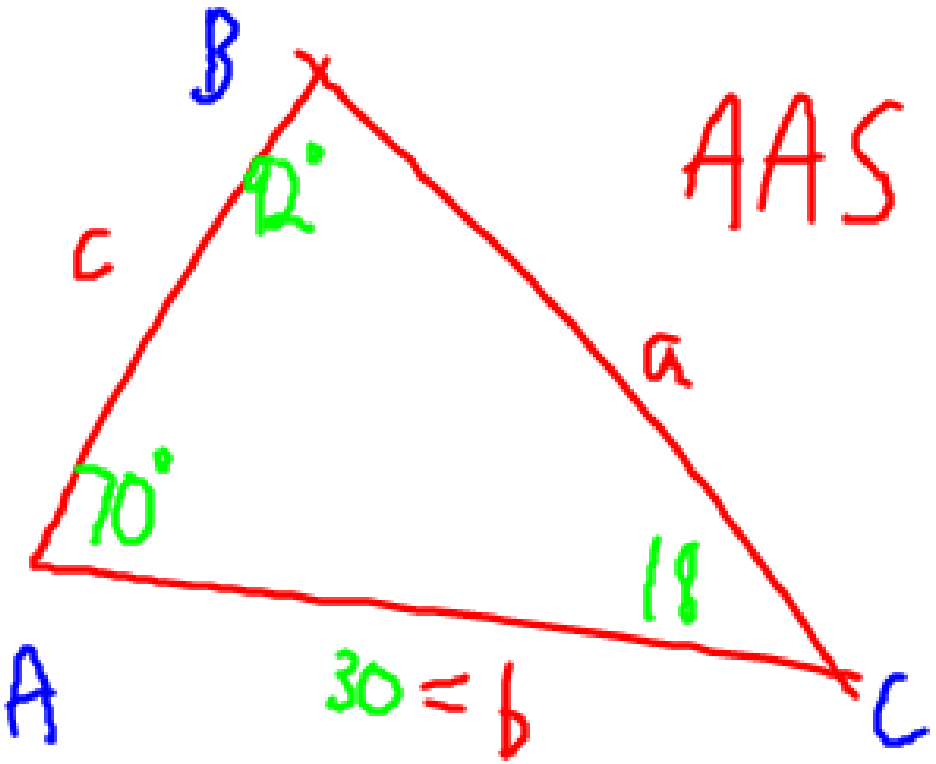
5.5 Law of Sines



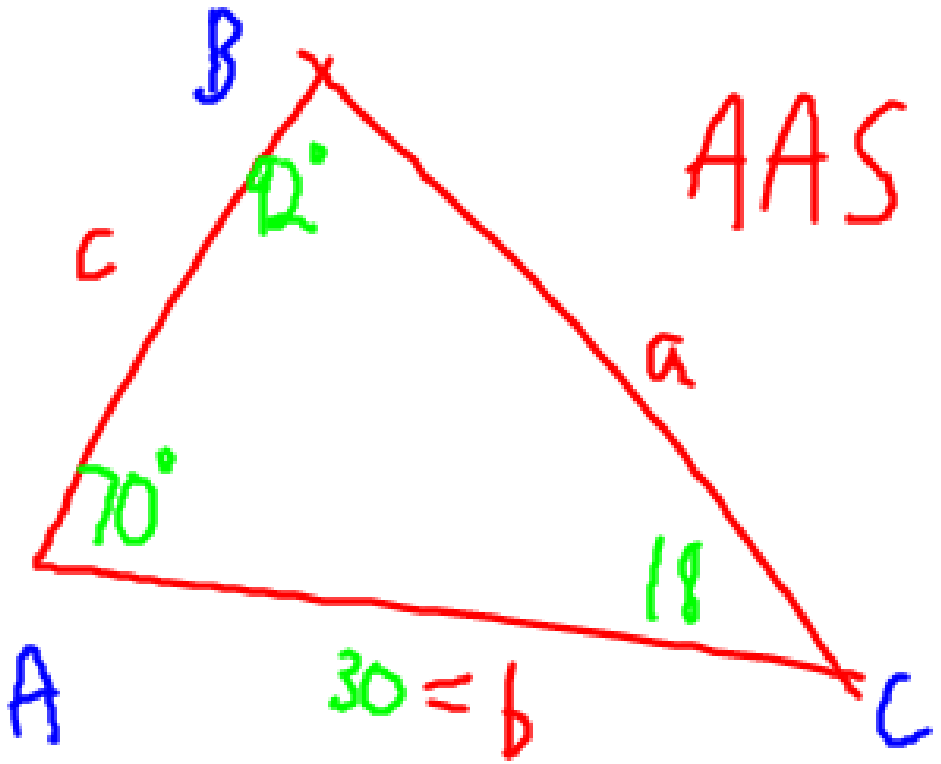
$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$



Find all missing sides and angles

$\_\_\_ = \_\_\_$

$\angle C = 18^\circ$
$a =$
$c =$



AAS

$$a = \frac{30 \sin 70}{\sin 92}$$

$$a \simeq 28.2$$

$\angle C = 18°$

$a =$

$c =$

$$\frac{\sin 92}{30} = \frac{\sin 70}{a}$$

$$a \sin 92 = 30 \sin 70$$

$$\frac{\sin 92}{30} = \frac{\sin 18}{c}$$

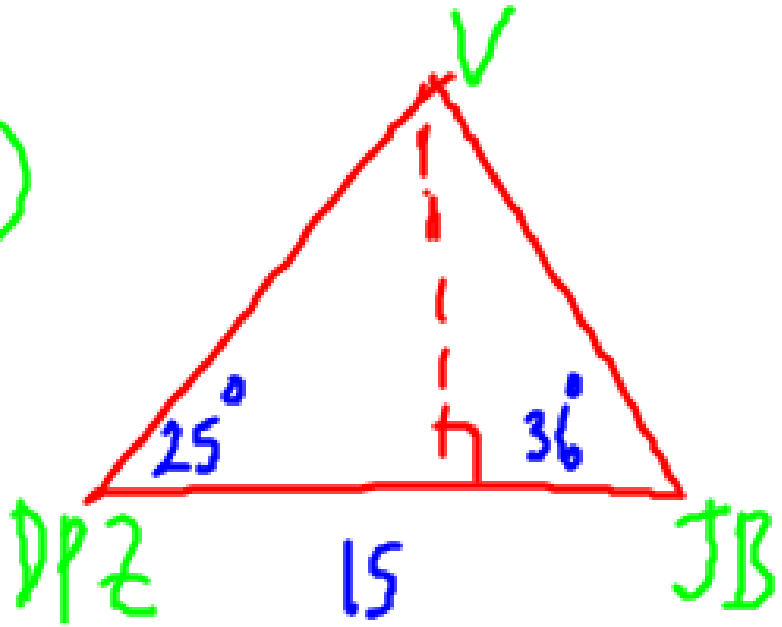
$$\frac{c \sin 92}{\sin 92} = \frac{30 \sin 18}{\sin 92}$$

$$c = \frac{30 \sin 18}{\sin 92} \approx 9.3$$

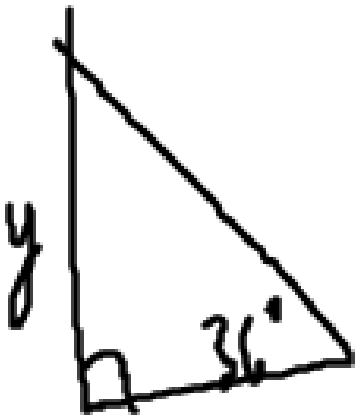
(2)

ASA

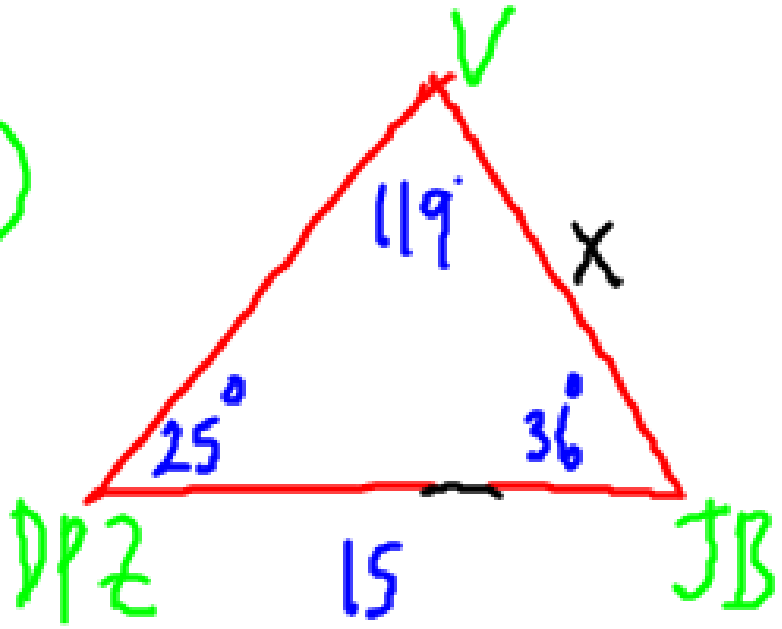
(3)



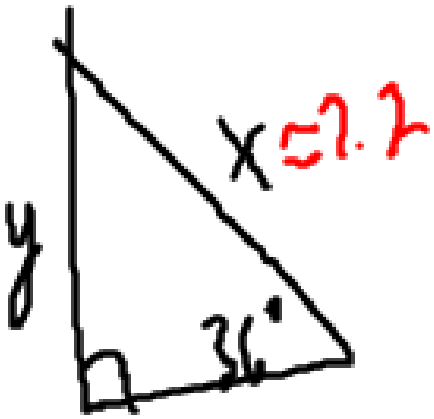
height of vent?



(3)



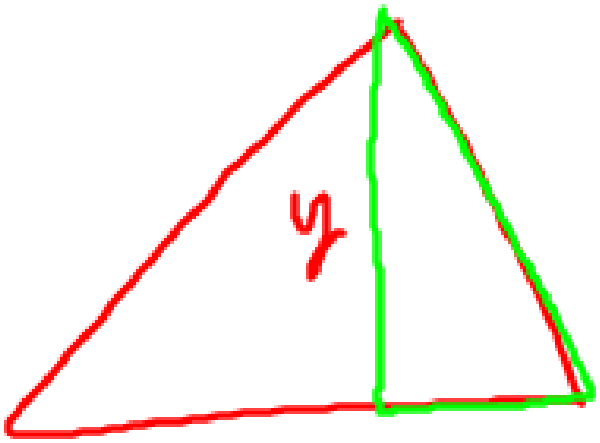
height of vent?

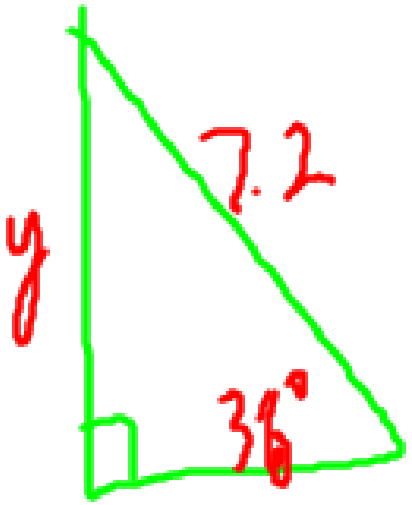


$$\frac{\sin 119}{15} = \frac{\sin 25}{x}$$

$$x = \frac{15 \sin 25}{\sin 119}$$

$$x \approx 7.2$$

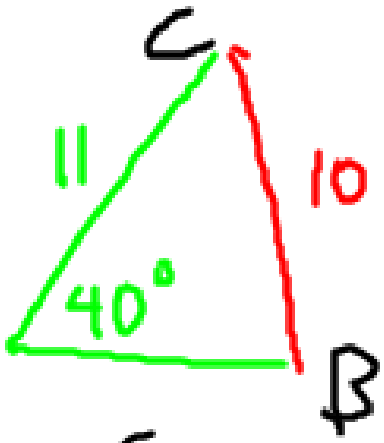




$$\frac{\sin 36^\circ}{1} = \frac{y}{7.2}$$

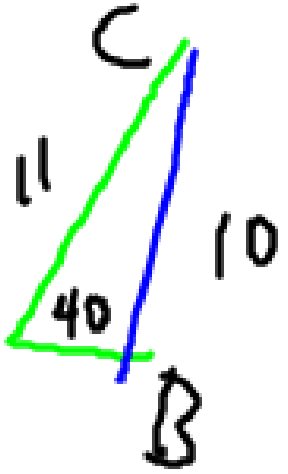
$$y = 7.2 \sin 36$$

$$y \approx 4.3 \text{ ft.}$$



SSA

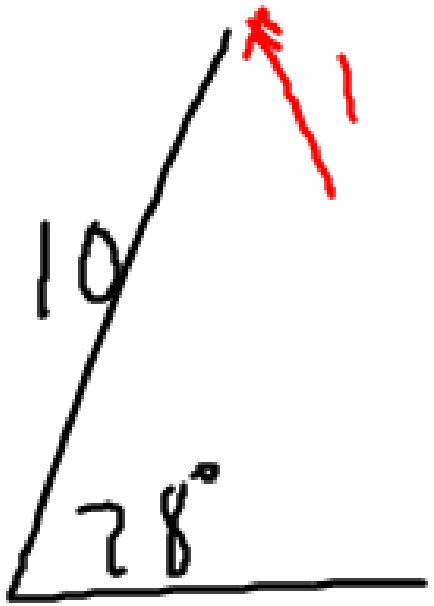
sometimes



2 △s

SSA

sometimes



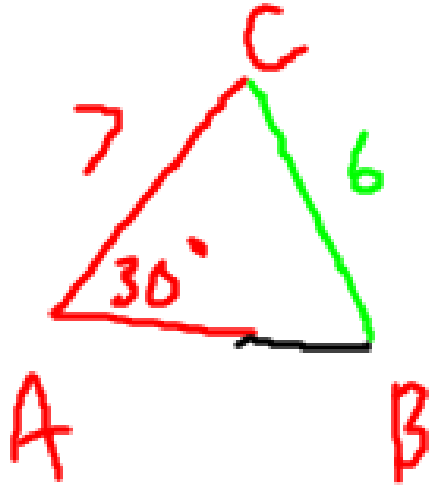
SSA

Sometimes

No △ possible

Law of Sines (SSA) Ambiguous Case

① $\angle A = 30^\circ$, $a = 6$, $b = 7$



$\triangle 1 \rightarrow \angle B, \angle C, c$

$$\frac{\sin 30}{6} = \frac{\sin B}{7}$$

$$\sin B = \frac{7 \sin 30}{6}$$

$\sin B \approx .5833$

$B = \sin^{-1}(.5833)$

$B \approx 35.7^\circ$

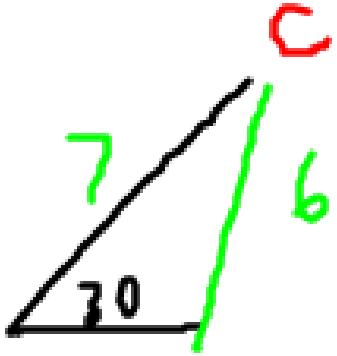
$$\angle C = 180 - 35.7 - 30 = 114.3^\circ$$

$$\frac{\sin 30}{6} = \frac{\sin 114.3}{c}$$

$$c = \frac{6 \sin 114.3}{\sin 30}$$

$$\boxed{c \approx 10.9}$$

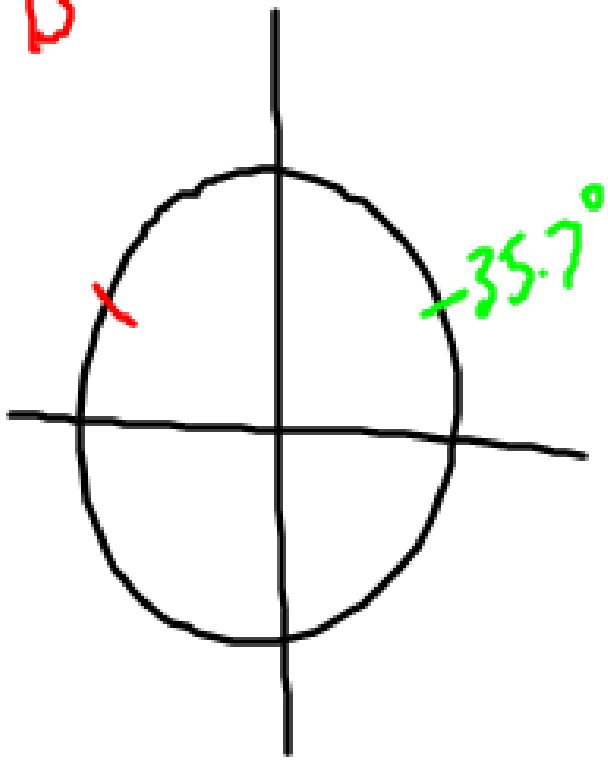
2nd Δ?



$$\frac{\sin 30}{6} = \frac{\sin B}{7}$$

$$B = \sin^{-1}(.5833)$$

$B = 35.7°$ ~~or~~



$B = 180 - 35.7 = 144.3°$

$$\angle C = 180 - 30 - 144.3 = 5.7^\circ$$

$$\frac{\sin 30}{6} = \frac{\sin 5.7^\circ}{c}$$

$$c \approx 1.2$$

If $\sin^{-1}(>1)$

$=$

→ No triangle possible

To find 2nd angle possible when using $\sin^{-1}(\,)$, subtract your answer from 180°.

If $A = \sin^{-1}(\,) = 20^\circ$, then

2nd possibility for $A = 180 - 20 = 160^\circ$

Then add obtuse possibility to angle given in original problem.

If < 180, 2nd $\triangle$ is possible.

If > 180, No 2nd $\triangle$ is possible.

Given $\angle A = 40°$.

If $\angle B$ obtuse $= 150$, no 2nd $\triangle$ since $40 + 150 > 180$

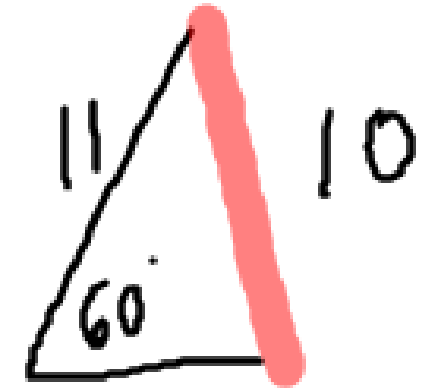
Given $\angle A = 40°$.

If $\angle B$ obtuse $= 110°$, then

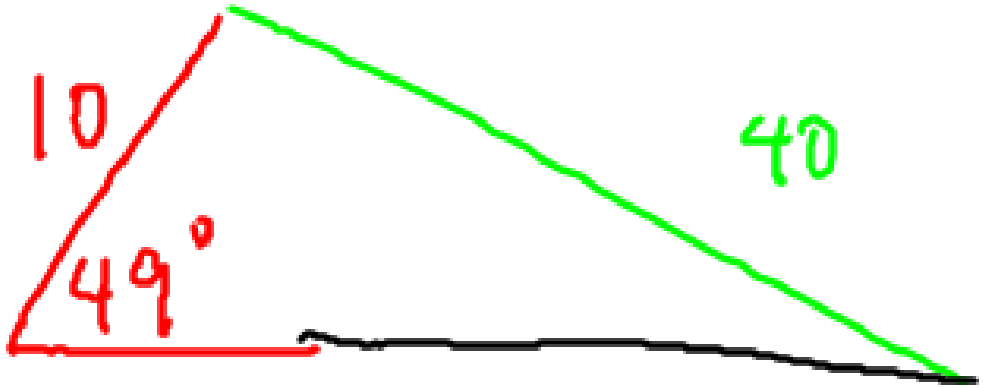
2nd $\triangle$ is possible since

$40 + 110 < 180°$.

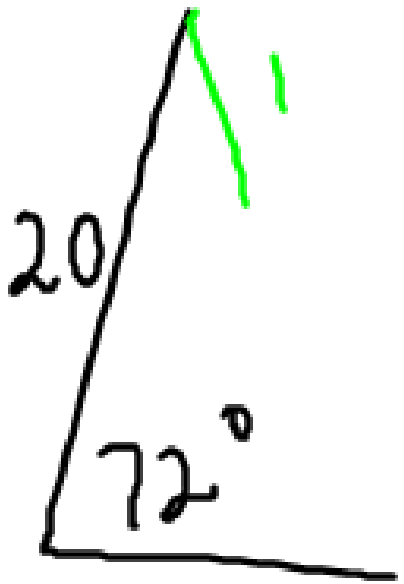
5.5 Law of Sines Day 2 SSA Ambiguous Case



SSA sometimes be 2 possible $\triangle$'s

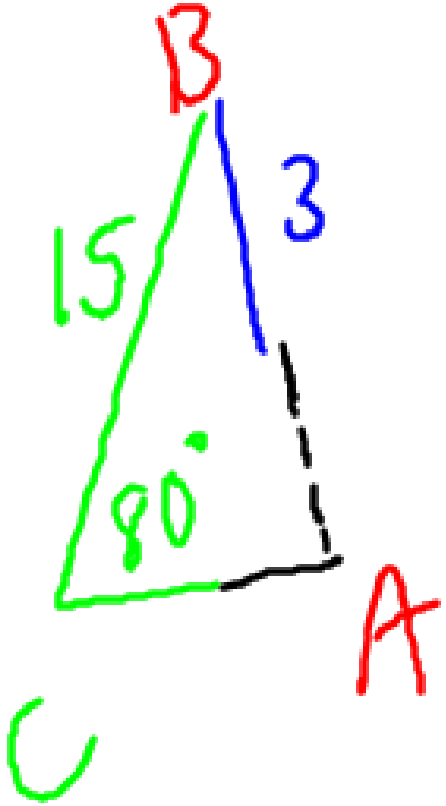


SSA → sometimes only 1 △ possible



SSA – No possible

① $\angle C = 80°$, $a = 15$, $c = 3$



$$\frac{\sin 80}{3} \neq \frac{\sin A}{15}$$

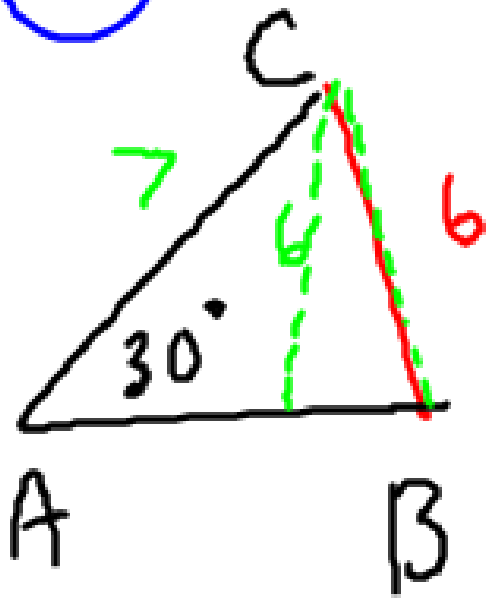
$$\sin A = \frac{15 \sin 80}{3}$$

$$\sin A = 4.92$$

since $\sin A > 1$

NO $\triangle$

② $\angle A = 30^\circ$, $a = 6$, $b = 7$



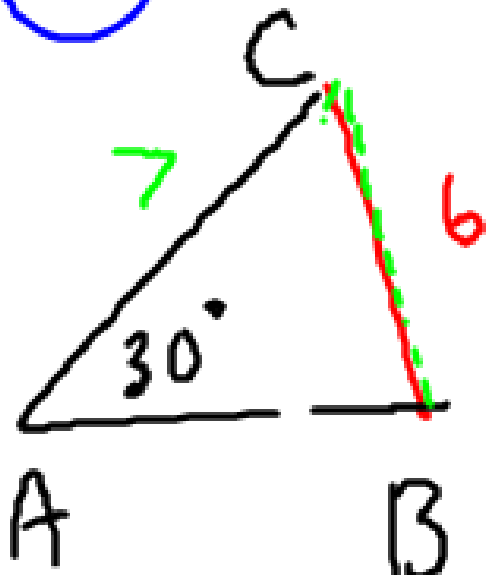
or

$\angle B$

$\angle C$

c

② $\angle A = 30^\circ$, $a = 6$, $b = 7$



$\frac{\sin 30}{6} = \frac{\sin B}{7}$

$\sin B = \frac{7 \sin 30}{6}$

$\sin B = .5833$

$B = \sin^{-1}(.5833) = 35.7^\circ$

$\angle B$ ✓

$\angle C$ ✓

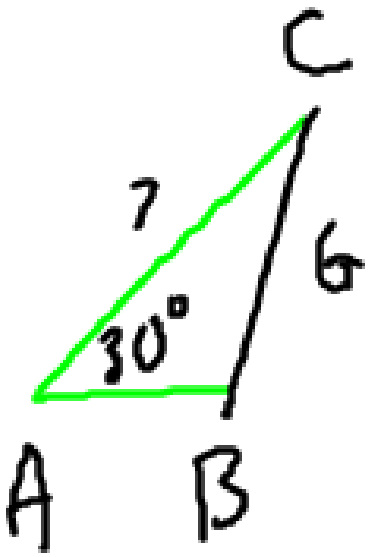
c ✓

$\angle C = 180 - 30 - 35.7 = 114.3^\circ$

$$\frac{\sin 30^\circ}{6} = \frac{\sin 114.3^\circ}{c}$$

$$c = \frac{6 \sin 114.3}{\sin 30}$$

$$c = 10.9$$



2nd Δ?

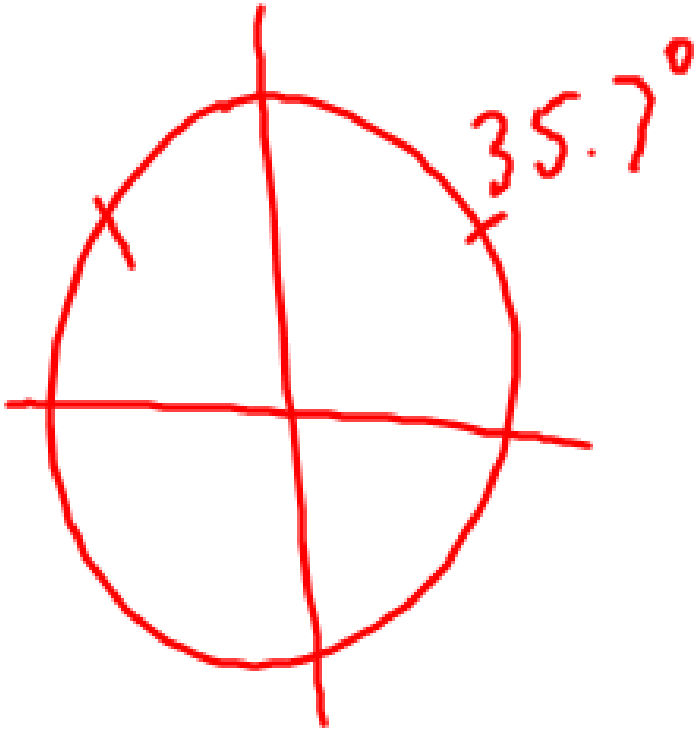
$B = \sin^{-1}(.5833)$

$B = 35.7^\circ$

or

$B = 180 - 35.7^\circ$

$B = 144.3^\circ$



$\angle C = 180 - 30 - 144.3 = 5.7°$

$$\frac{\sin 30}{6} = \frac{\sin 5.7}{c}$$

$$c \approx 1.2$$