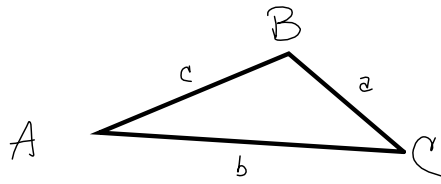


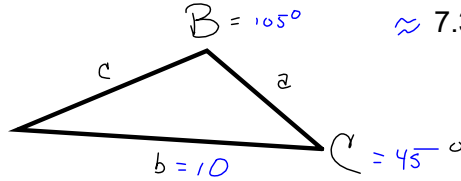
§3.1 Law of Sines



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

FIND C

$30^\circ = A$



$$\frac{\sin 105^\circ}{10} = \frac{\sin 45^\circ}{c}$$

$$c = \frac{10 \sin 45^\circ}{\sin 105^\circ} \approx 7.320508075$$

ASA

Don't use rounded-off answers in subsequent calculations.

- A = 30°
- B = 105°
- C = 45°

$$180^\circ - 30^\circ - 45^\circ = 180^\circ - 75^\circ = 105^\circ = B$$

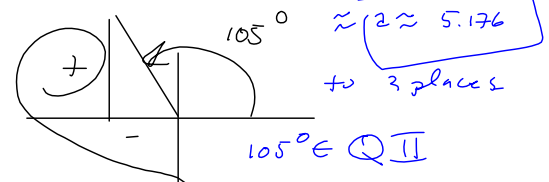
$$\frac{\sin B}{b} = \frac{\sin A}{a}$$

- a ≈ 5.176
- b = 10
- c ≈ 7.321

$$\frac{\sin(105^\circ)}{10} = \frac{\sin(30^\circ)}{a}$$

$$a = \frac{10 \sin(30^\circ)}{\sin(105^\circ)} = \frac{10 \cdot \frac{1}{2}}{\frac{\sqrt{2+\sqrt{3}}}{2}}$$

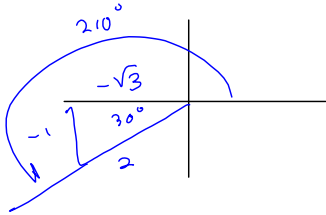
calculator ≈ 5.176380900 ≈ 2



2 · 105° = 210°

2 · $\frac{4}{2}$ = 210° = 4

$$\sin 105^\circ = \sin\left(\frac{210^\circ}{2}\right) = + \sqrt{\frac{1 - \cos(210^\circ)}{2}}$$



$$= \sqrt{\frac{1 - (-\frac{\sqrt{3}}{2})}{2}}$$

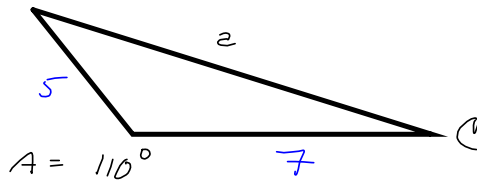
$$= \sqrt{\frac{1 + \frac{\sqrt{3}}{2}}{2}} = \sqrt{\frac{2 + \sqrt{3}}{4}} = \frac{\sqrt{2 + \sqrt{3}}}{2}$$

$$\frac{1 + \frac{\sqrt{3}}{2}}{2} = \frac{\frac{2}{2} + \frac{\sqrt{3}}{2}}{2} = \frac{2 + \sqrt{3}}{2} = \frac{2 + \sqrt{3}}{2} \cdot \frac{1}{2}$$

$$= \frac{10 \cdot \frac{1}{2}}{\frac{\sqrt{2 + \sqrt{3}}}{2}} = \frac{5}{\frac{\sqrt{2 + \sqrt{3}}}{2}} = \frac{5 \cdot 2}{\sqrt{2 + \sqrt{3}}}$$

$$= 5 \cdot \frac{2}{\sqrt{2 + \sqrt{3}}} = \frac{5 \cdot 2}{\sqrt{2 + \sqrt{3}}} = \frac{10}{\sqrt{2 + \sqrt{3}}}$$

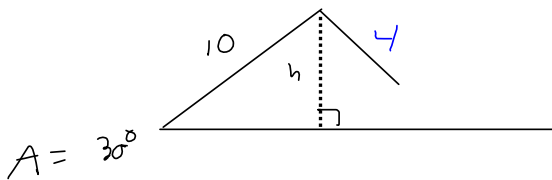
SAS



Too many unknowns to just use Law of Sines

$$\frac{\sin 110^\circ}{a} = \frac{\sin C}{5} = \frac{\sin B}{7}$$

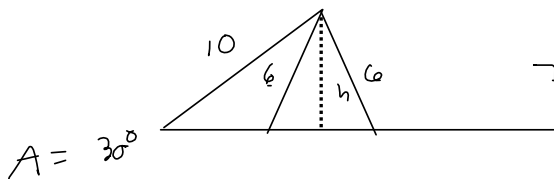
ASS May have 1, 2 or zero solutions



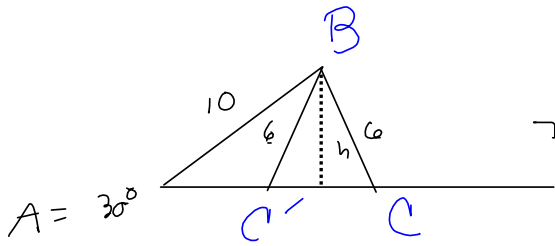
No SOLUTION

The height is $h = 10 \sin 30^\circ$

$$\frac{h}{10} = \sin 30^\circ \Rightarrow h = 10 \sin 30^\circ$$



2 Possibilities⁴



2 Possibilities ⁴

Look for angle C :

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

$$\frac{\sin 30^\circ}{6} = \frac{\sin C}{10} \Rightarrow \sin C = \frac{10 \sin 30^\circ}{6} = \frac{(5) (\frac{1}{2})}{3} = \frac{5}{6}$$

$$\frac{(\frac{5}{1} \cdot \frac{1}{2})}{3} = \frac{\frac{5}{2}}{3} = \frac{\frac{5}{2}}{\frac{3}{1}} = \frac{5}{2} \cdot \frac{1}{3} = \frac{5}{6}$$

$$\sin C = \frac{5}{6}$$

$$\sin^{-1}(\sin C) = \sin^{-1}(\frac{5}{6}) \approx 56.443^\circ$$

$$\sin^{-1}(\sin(210^\circ)) = -30^\circ$$

SOLN 1

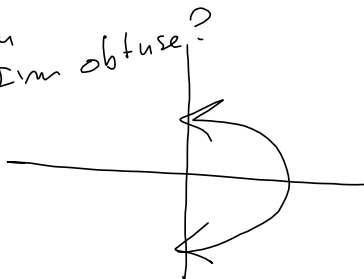


SOLN 2



Here's when you need to understand how $\arcsin(x) = \sin^{-1}(x)$ works

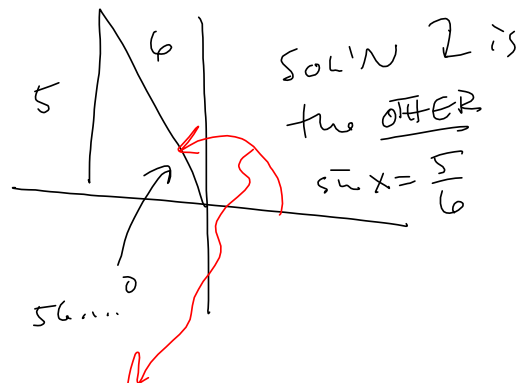
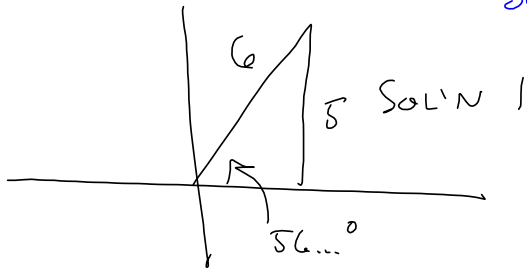
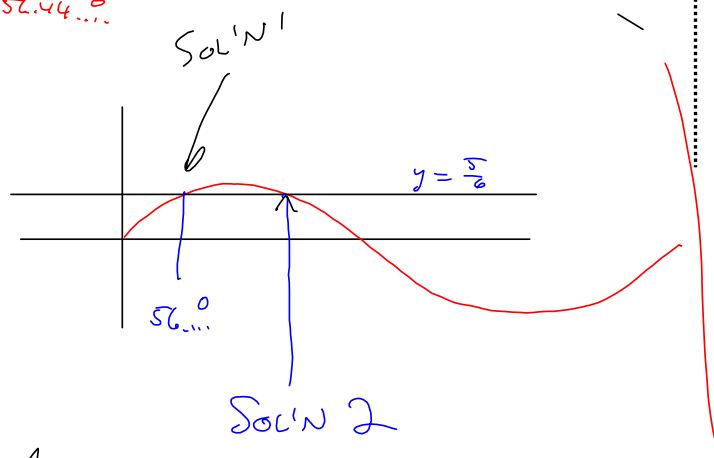
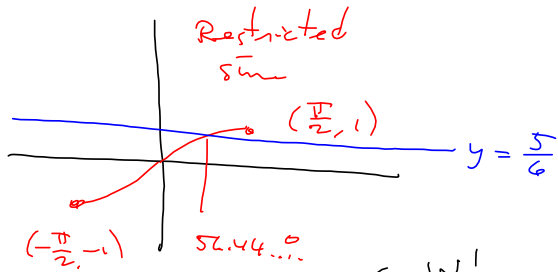
Are you saying I'm obtuse?



It only reports angles between $-90^\circ = -\frac{\pi}{2}$ &

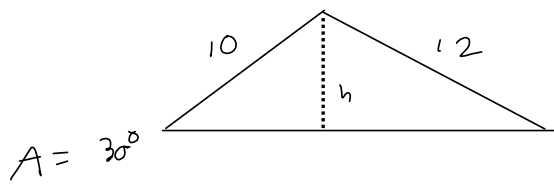
$$90^\circ = \frac{\pi}{2}$$

But SOLN 2 is OBTUSE



SOL'N 2 is $180^\circ - \text{SOL'N 1}$

$= 180^\circ - 56\dots^\circ$



ONE
Possibility

There's also another one-possibility situation, when $\text{SIDE } 2 = h$ & we have a right triangle. & we don't NEED Law of Sines.