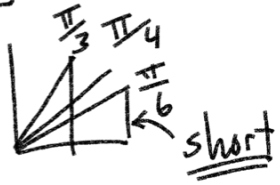
TTH-PT Pre-Calculus: Trigonometry

1.) $\sin\left(\frac{\pi}{6}\right) = \boxed{\frac{1}{2}}$

(y)




2.) $\cos\left(\frac{2\pi}{3}\right) = \boxed{-\frac{1}{2}}$

(X)

⊖

3.) $\tan\left(\frac{7\pi}{6}\right)$

$\tan\frac{7\pi}{6} = \frac{\sin\frac{7\pi}{6}}{\cos\frac{7\pi}{6}} = \frac{-\frac{1}{2}}{-\frac{\sqrt{3}}{2}} = \frac{1}{\sqrt{3}}\cdot\frac{\sqrt{3}}{\sqrt{3}}$

$= \boxed{\frac{\sqrt{3}}{3}}$

III $\frac{-y}{-x} = +$

4.) $\csc\left(\frac{3\pi}{4}\right)$

$\csc\left(\frac{3\pi}{4}\right) = \frac{1}{\sin\frac{3\pi}{4}} = \frac{1}{\frac{\sqrt{2}}{2}} = \frac{2}{\sqrt{2}}$

II y ⊕

$\frac{2}{\sqrt{2}}\cdot\frac{\sqrt{2}}{\sqrt{2}} = \frac{2\sqrt{2}}{2} = \boxed{\sqrt{2}}$

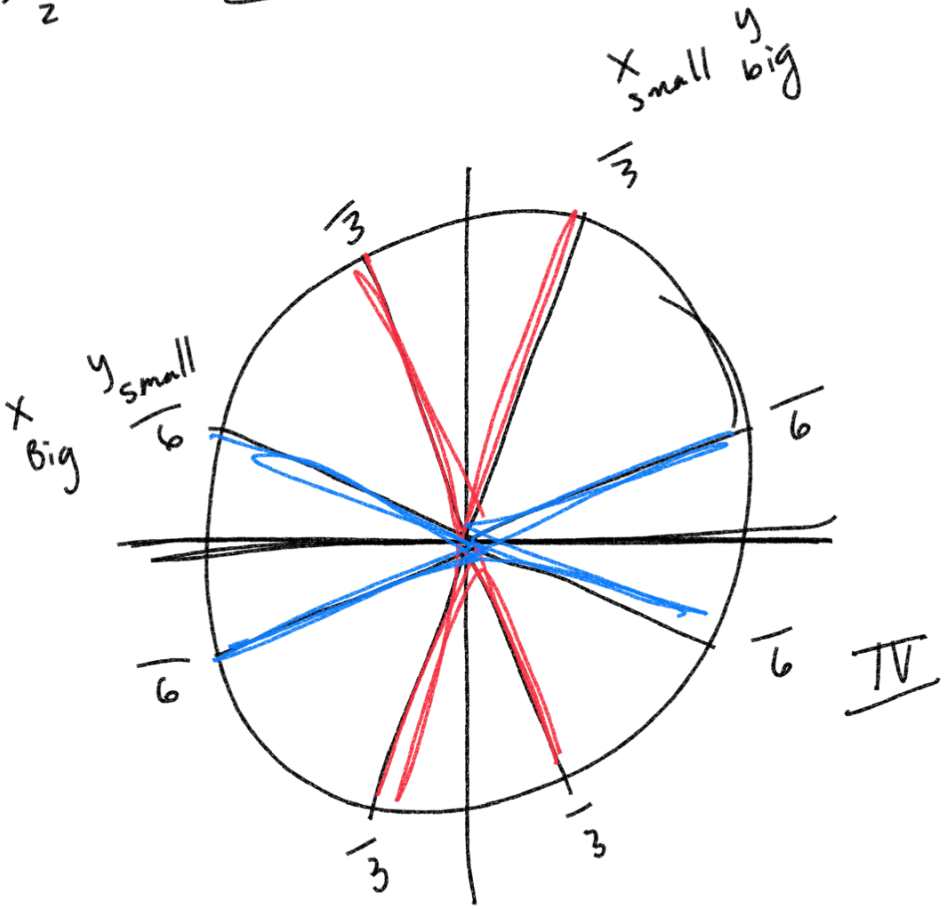
5.) $\sec\left(\frac{\pi}{2}\right)$

$\sec\frac{\pi}{2} = \frac{1}{\cos\frac{\pi}{2}} = \frac{1}{0} = \boxed{\text{undefined}}$

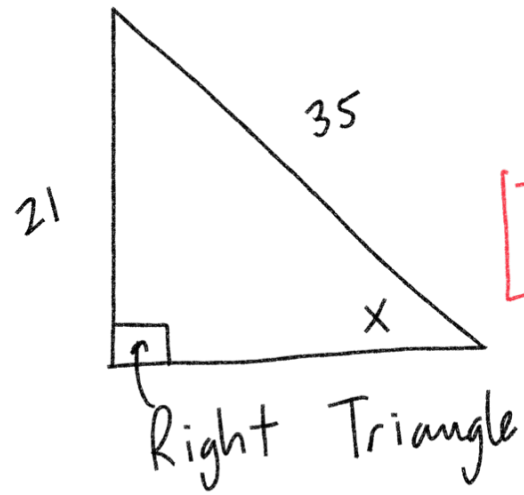
6.) $\cot\left(\frac{11\pi}{6}\right) = \frac{\cos\frac{11\pi}{6}}{\sin\frac{11\pi}{6}} = \frac{\frac{\sqrt{3}}{2}}{-\frac{1}{2}}$

$= \boxed{-\sqrt{3}}$

X



# Law of Sines

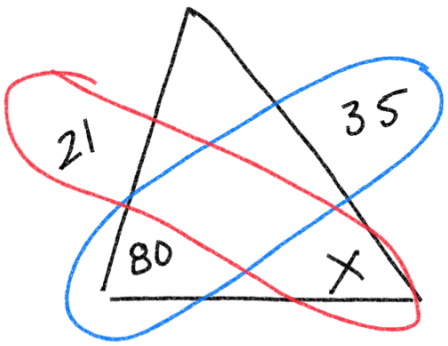



$$\sin X = \frac{21 \div 7}{35 \div 7} = \frac{3}{5}$$

$$\sin X = \frac{3}{5}$$

$$X = \sin^{-1}\left(\frac{3}{5}\right)$$

Right Triangles allow us to use trig ratios and Pythagorean Theorem




Law of Sines → Law of Proportions

$$\frac{\sin 80^\circ}{35} = \frac{\sin X}{21}$$

Solve by cross multiplying

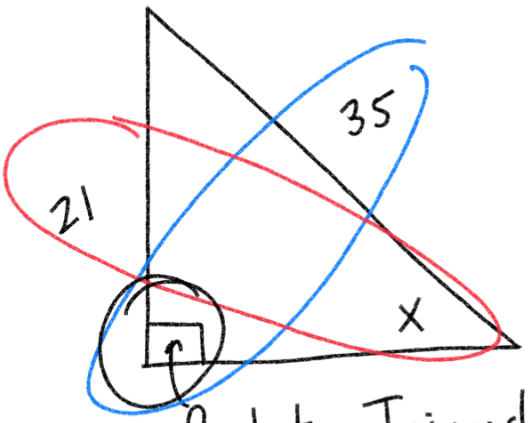
$$\frac{\text{sine angle}}{\text{opp side}} = \frac{\text{sine angle}}{\text{opp side}}$$

$$\frac{\sin 80^\circ}{35} \times \frac{\sin X}{21}$$

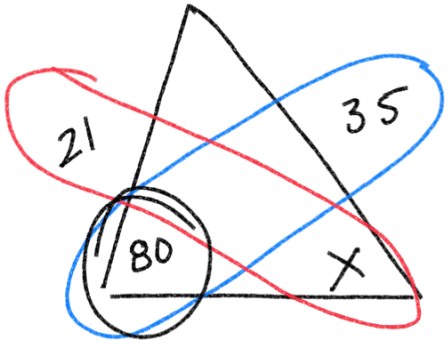
$$\frac{21(\sin 80^\circ)}{35} = \frac{35(\sin X)}{35}$$

$$\frac{3}{5}\sin 80^\circ = \sin X$$

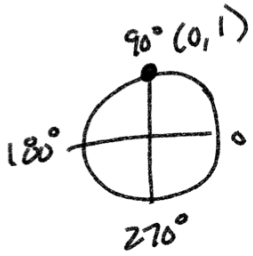
difference




Right Triangle




# Apply Law of Sines to Both




$$\frac{\sin 90^\circ}{35} = \frac{\sin X}{21}$$

$$\frac{35 \sin X}{35} = \frac{21 \sin 90}{35}$$

$\sin 90 = 1$

$$\Rightarrow \sin X = \frac{3}{5} \sin 90$$

$$\sin X = \frac{3}{5}$$

$$\frac{\sin 80^\circ}{35} = \frac{\sin X}{21}$$

$$\frac{35 \sin X}{35} = \frac{21 \sin 80^\circ}{35}$$

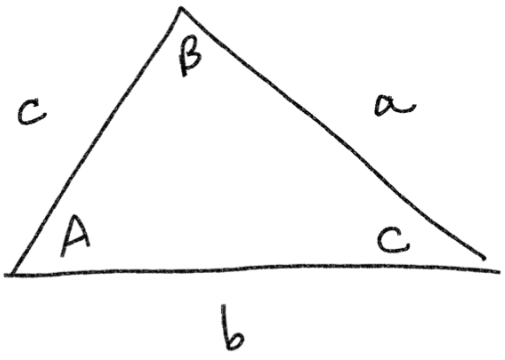
$$\sin X = \frac{3}{5} \sin 80^\circ$$

$$X = \sin^{-1}\left(\frac{3}{5} \sin 80^\circ\right)$$

$$\Downarrow$$

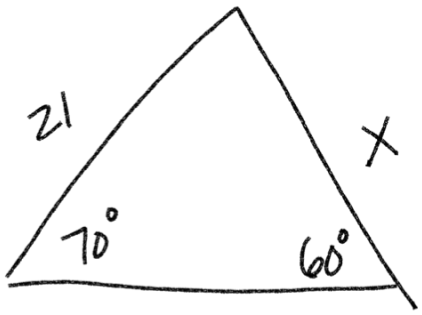
$$X = \sin^{-1}(0.59)$$

$$\boxed{X = 36.2^\circ}$$




Law of Sines

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




Larger Angles open to Larger Sides

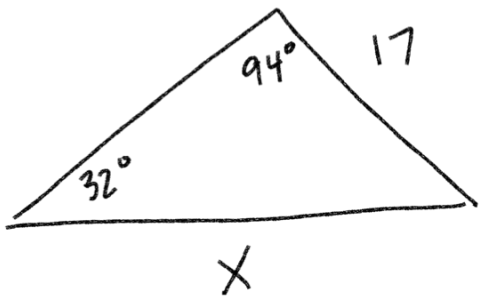
$$\frac{\sin 60}{21} = \frac{\sin 70}{X}$$

$$\frac{X(\sin 60)}{\sin 60} = \frac{21 \sin 70}{\sin 60}$$

$$X = \frac{21 \sin 70}{\sin 60} =$$

$$\boxed{X = 22.8}$$

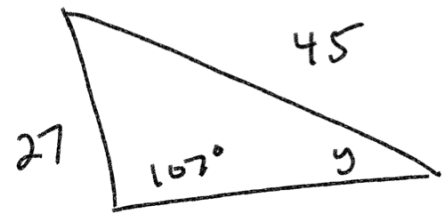
1.)




$$\frac{\sin 32}{17} = \frac{\sin 94}{X}$$

$$X = \frac{17 \sin 94}{\sin 32} = \boxed{32.}$$

2.)



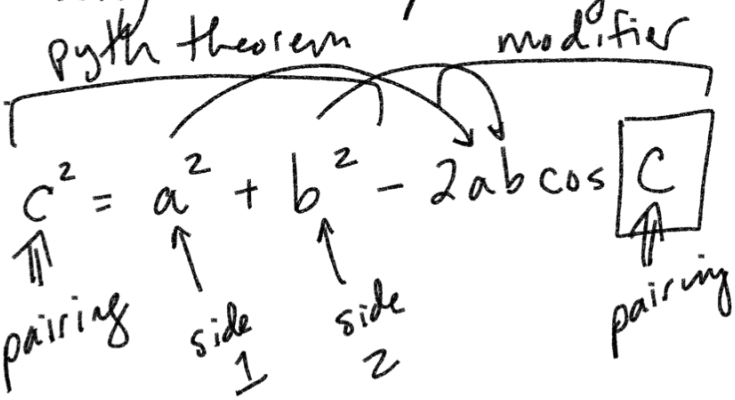

$$\frac{\sin 107}{45} = \frac{\sin y}{27}$$

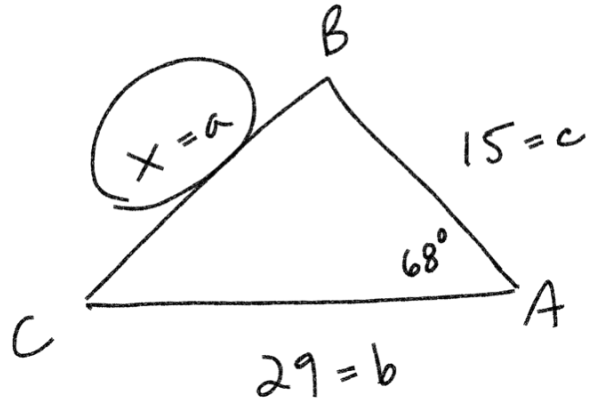
$$\sin y = \frac{27 \sin 107}{45}$$

$$y = \sin^{-1}\left(\frac{27 \sin 107}{45}\right) = \boxed{35°}$$

When we don't have an angle-side pairing...

Law of Cosines ...




$x^2 = 15^2 + 29^2 - 2(15)(29)\cos 68°$

$x^2 = 225 + 841 - 870\cos 68°$

$x^2 = 1066 - 870\cos 68$

$x^2 = 1066 - 325.9$

$\sqrt{x^2} = \sqrt{734.1}$

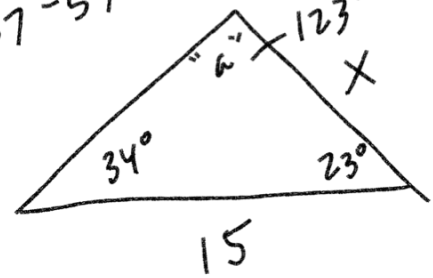
$\boxed{x = 27.1}$

$180 = 34 + 23 + a$

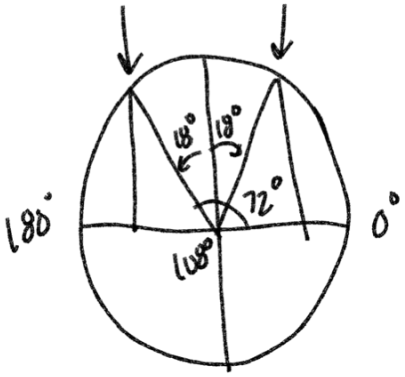
$180 = 57 + a$

$-57 \quad -57$

$a = 123$

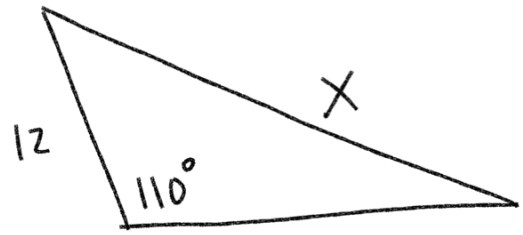



Law of Sines




$\frac{\sin 34}{x} = \frac{\sin 123}{15}$

$x = \frac{15\sin 34}{\sin 123} = \boxed{10}$




$$X^2 = 12^2 + 18^2 - 2(12)(18)\cos 110^\circ$$

$$X^2 = 144 + 324 - 432\cos 110^\circ$$

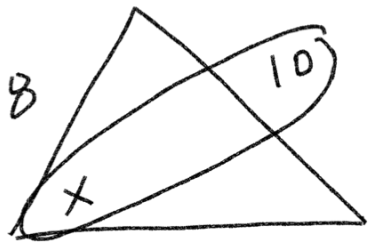
$$X^2 = 468 - 432\cos 110^\circ$$

$$X^2 = 468 - (-147.8)$$

$$X^2 = 468 + 147.8$$

$$\sqrt{X^2} = \sqrt{615.8}$$

$$\boxed{X = 24.8}$$




$$10^2 = 8^2 + 12^2 - 2(8)(12)\cos X$$

$$100 = 64 + 144 - 192\cos X$$

$$100 = 208 - 192\cos X$$

$$-208 \quad -208$$

$$\frac{-108}{-192} = \frac{-192\cos X}{-192}$$

$$\cos X = \frac{108}{192}$$

$$X = \cos^{-1}\left(\frac{108}{192}\right)$$

$$= \boxed{55.8^\circ}$$