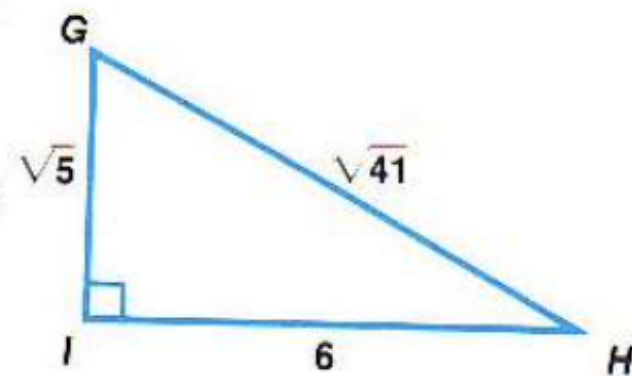
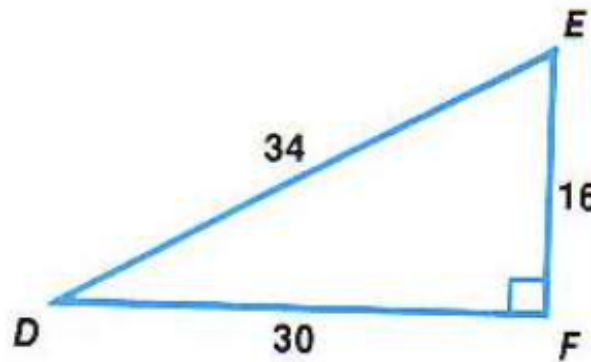
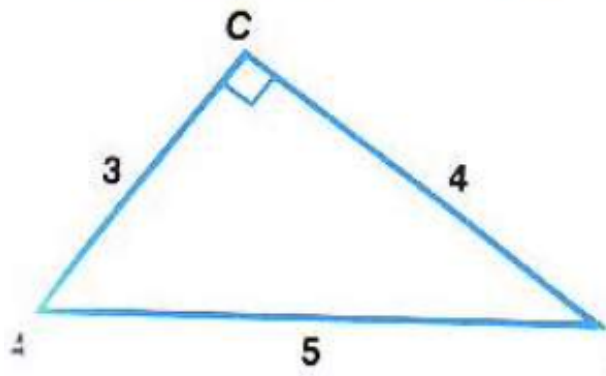


Warmup

Find each value as a fraction.



1. $\cos G = \frac{\sqrt{205}}{41}$

3. $\sin G = \frac{6\sqrt{41}}{41}$

5. $\tan H = \frac{\sqrt{5}}{6}$


7. $\cot B = \frac{4}{3}$

2. $\tan G = \frac{6\sqrt{5}}{5}$

4. $\cot G = \frac{\sqrt{5}}{6}$

6. $\sin H = \frac{\sqrt{205}}{41}$

8. $\sec D = \frac{17}{15}$



Law of Cosines

7.2 - Law of Cosines

1/13

Find x

$$\cos A = \frac{x}{c}$$

$$c \cdot \cos A = x$$

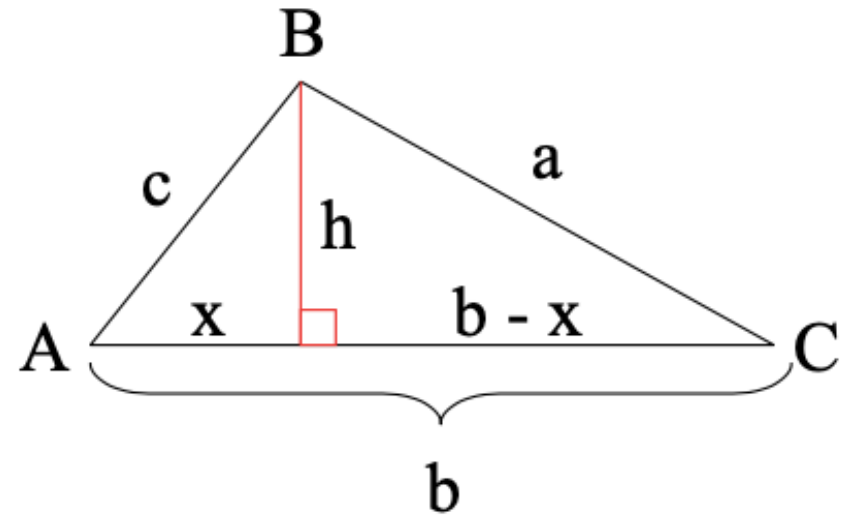
Pythagorean Theorem

$$a^2 = (b - x)^2 + h^2$$

$$a^2 = b^2 - 2bx + x^2 + h^2$$

$$a^2 = b^2 - 2bx + c^2$$

$$a^2 = b^2 - 2bc \cdot \cos A + c^2$$



$$a^2 = b^2 + c^2 - 2bc \cdot \cos A$$

$$b^2 = a^2 + c^2 - 2ac \cdot \cos B$$

$$c^2 = a^2 + b^2 - 2ab \cdot \cos C$$

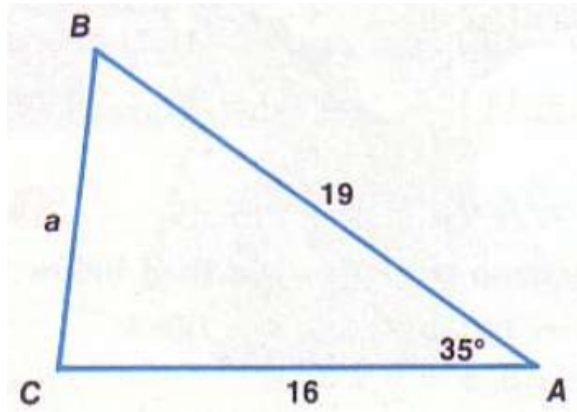
Law of Cosines

Good for solving triangles with known SAS or SSS

7.2 - Law of Cosines

2/13

Solving SAS - Solve for a

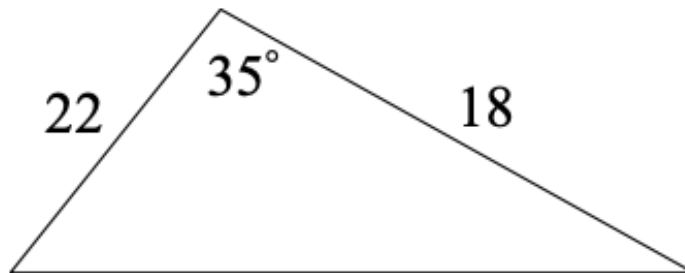


$$a^2 = 19^2 + 16^2 - 2(19)(16)\cos 35^\circ$$

$$a \approx 10.91$$

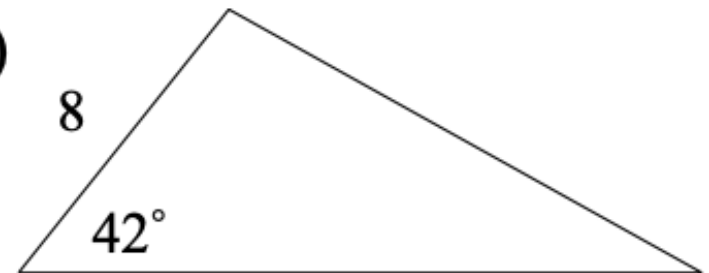
Practice - Find the missing side

1)



$$\approx 12.62$$

2)

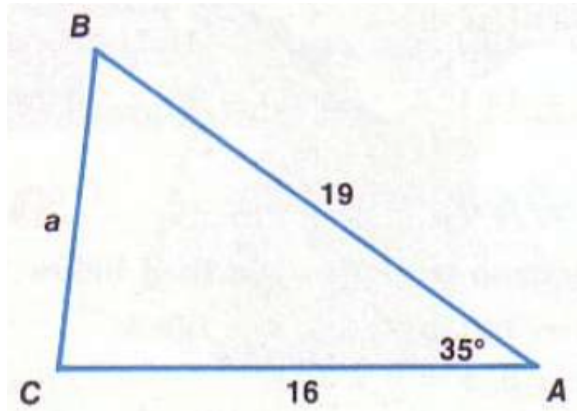


$$\approx 5.35$$

7.2 - Law of Cosines

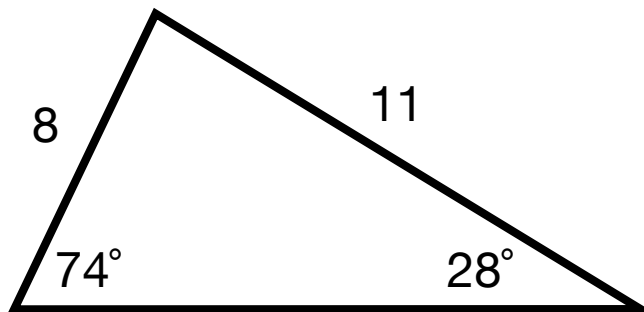
3/13

Solving SAS - Solve for a



$$a \approx 10.91$$

Find a

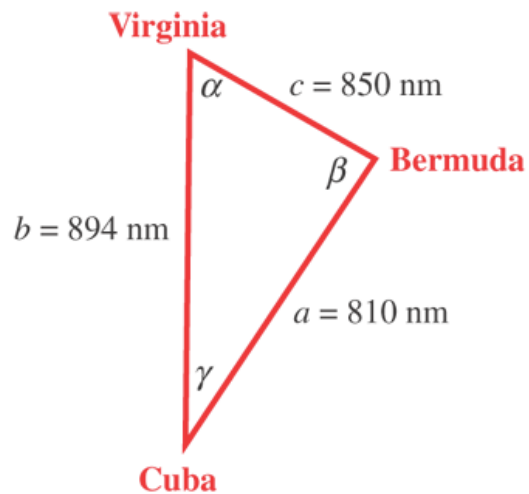


$$a \approx 12.18$$

7.2 - Law of Cosines

4/13

Solving SSS - Solve for angles



$$810^2 = 894^2 + 850^2 - 2(894)(850)\cos \alpha$$

$$\alpha = \cos^{-1} \left(\frac{810^2 - 894^2 - 850^2}{-2(894)(850)} \right)$$

$$\alpha \approx 55.28^\circ$$

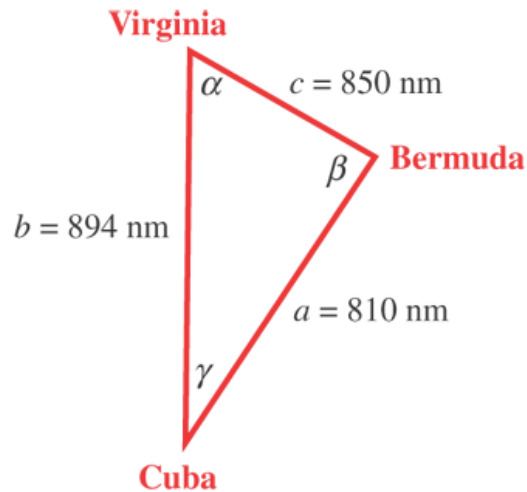
$$\beta \approx 65.12^\circ$$

$$\gamma \approx 59.60^\circ$$

7.2 - Law of Cosines

5/13

Solving SSS - Solve for angles



$$810^2 = 894^2 + 850^2 - 2(894)(850)\cos \alpha$$

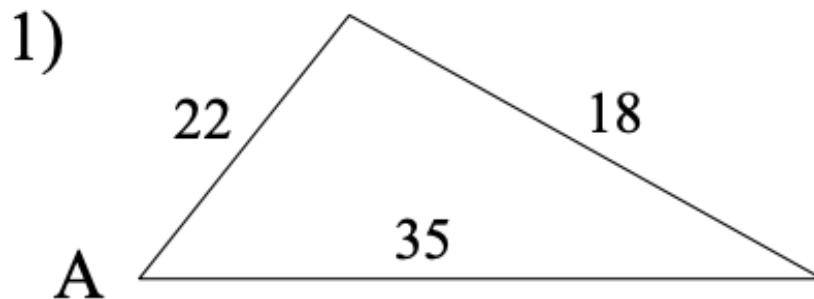
$$\alpha = \cos^{-1} \left(\frac{810^2 - 894^2 - 850^2}{-2(894)(850)} \right)$$

$$\alpha \approx 55.28^\circ$$

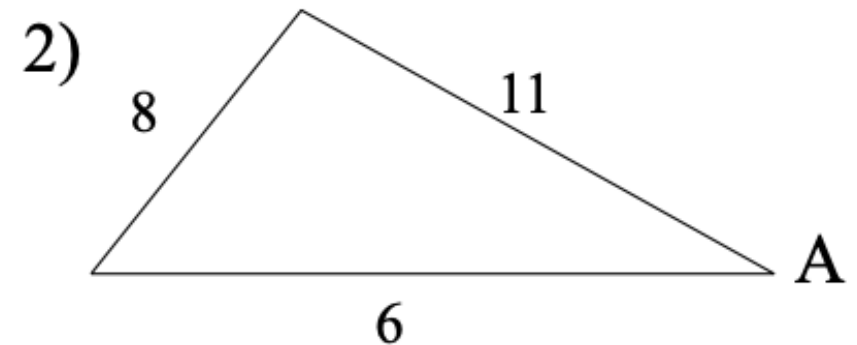
$$\beta \approx 65.12^\circ$$

$$\gamma \approx 59.60^\circ$$

Practice - Find the angle A



$$25.9^\circ$$

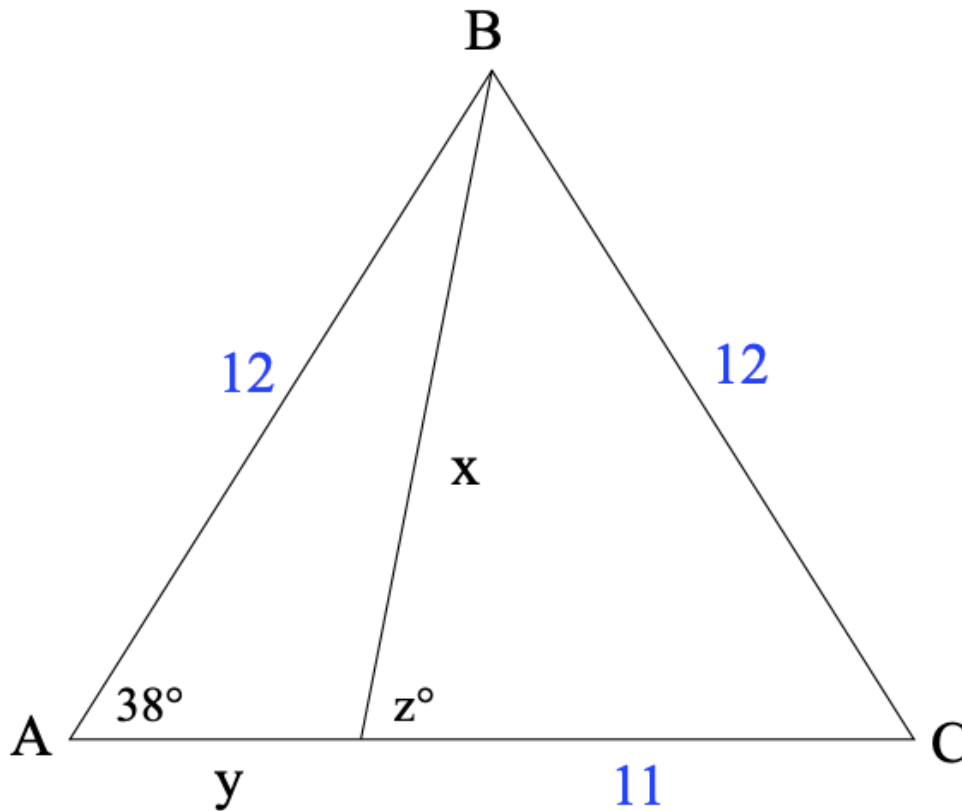


$$45.2^\circ$$

7.2 - Law of Cosines

6/13

Solve for x , y , and z



$$x = 7.5$$

$$y = 7.9$$

$$z = 78.2^\circ$$

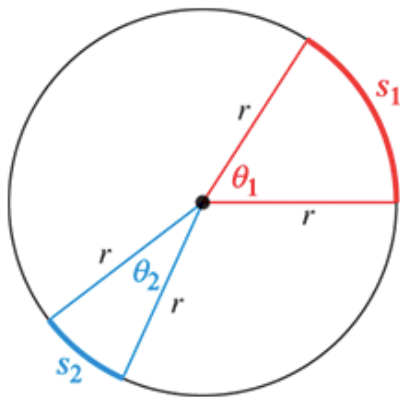
Degrees vs. Radians

3.1.2 - Degrees vs. Radians

7/13

Definition of a radian

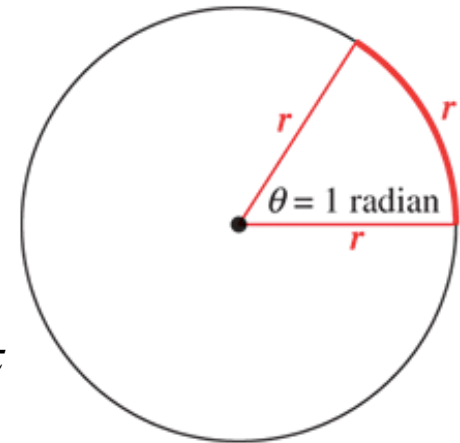
θ_1 subtends the arc s_1



$$\theta_1(\text{in radians}) = \frac{s_1}{r}$$

$$\text{if } s_1 = r \quad \theta_1(\text{in radians}) = 1$$

$$\text{if } s = C = 2\pi r \quad \theta = \frac{2\pi r}{r} = 2\pi$$



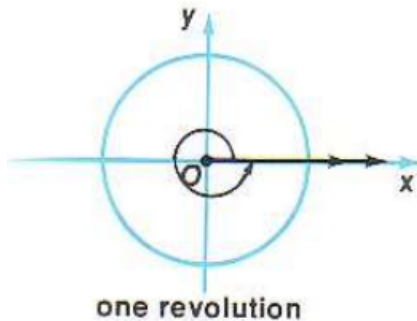
Practice

If $s = 4 \text{ ft}$ and $r = 10 \text{ ft}$, what is the angle in radians?

$$\theta = \frac{4}{10} = 0.4 \text{ rad}$$

3.1.2 - Degrees vs. Radians

8/13



How many degrees?

360°

How many radians?

2π radians

$$270^\circ? = 270 \cdot \frac{\pi}{180} = \frac{3\pi}{2}$$

$$\frac{2\pi}{360^\circ} = \frac{\pi}{180^\circ}$$

$$\theta_r = \frac{\pi\theta_d}{180^\circ}$$

$$\theta_d = \frac{180^\circ\theta_r}{\pi}$$

Practice - Convert to degrees

1. $\frac{\pi}{6}$

30°

2. $\frac{3\pi}{4}$

135°

3. $\frac{7\pi}{4}$

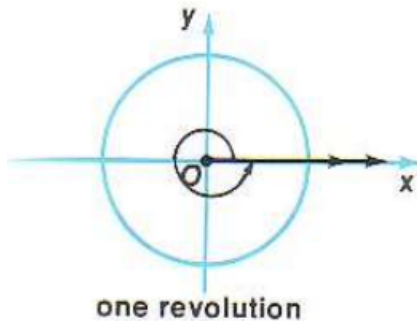
315°

4. $\frac{5\pi}{6}$

150°

3.1.2 - Degrees vs. Radians

9/13



How many degrees?

360°

How many radians?

2π radians

$$270^\circ? = 270 \cdot \frac{\pi}{180} = \frac{3\pi}{2}$$

$$\frac{2\pi}{360^\circ} = \frac{\pi}{180^\circ}$$

$$\theta_r = \frac{\pi\theta_d}{180^\circ}$$

$$\theta_d = \frac{180^\circ\theta_r}{\pi}$$

Practice - Convert to radians

1. 45°

0.25π

2. 210°

$\frac{7}{6}\pi \approx 1.17\pi$

3. 130°

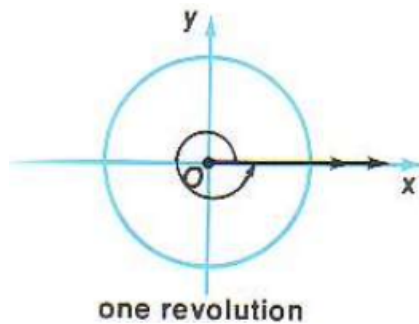
$\frac{13}{18}\pi \approx 0.722\pi$

4. 87°

$\frac{87}{180}\pi \approx 0.483\pi$

3.1.2 - Degrees vs. Radians

10/13



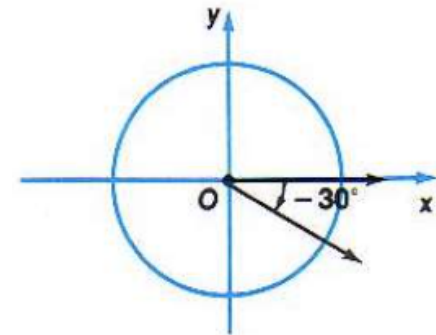
How many degrees?

360°

How many radians?

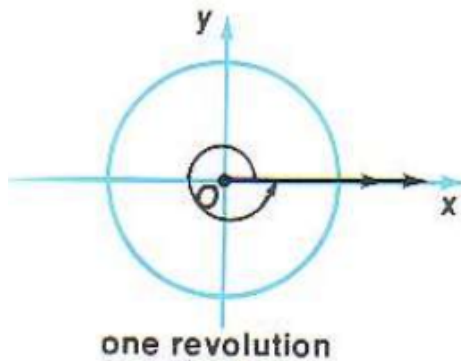
2π radians

$$\frac{2\pi}{360^\circ} = \frac{\pi}{180^\circ}$$

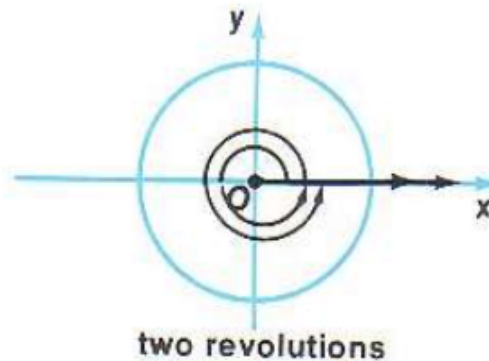


330°

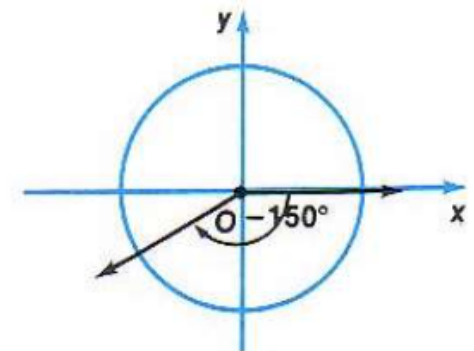
Find the least positive angle that is coterminal



360°



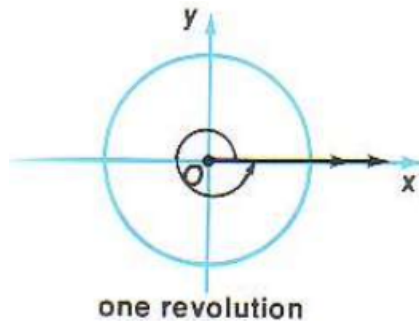
360°



210°

3.1.2 - Degrees vs. Radians

11/13



How many degrees?

360°

How many radians?

2π radians

$$\frac{2\pi}{360^\circ} = \frac{\pi}{180^\circ}$$

Find the least positive angle that is coterminal

$$420^\circ = 420^\circ - 360^\circ = 60^\circ$$

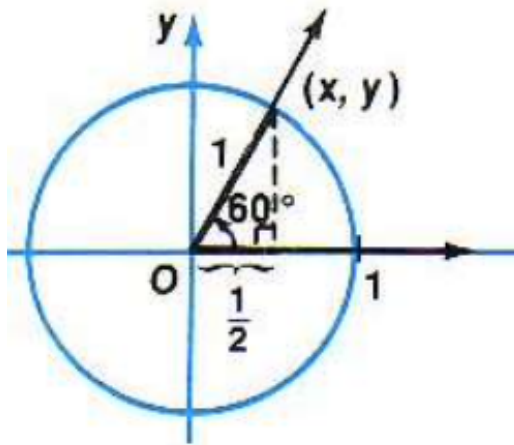
$$1550^\circ = 1550^\circ - 4(360^\circ) = 110^\circ$$

$$-220^\circ = -220^\circ + 360^\circ = 140^\circ$$

3.1.2 - Degrees vs. Radians

12/13

Find the sin, cos, tan of 60°

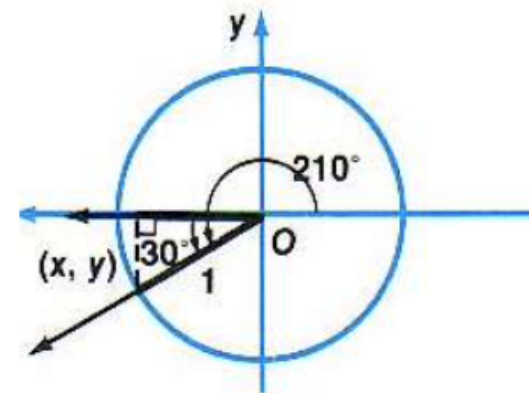


$$\sin 60^\circ = \frac{\sqrt{3}}{2}$$

$$\cos 60^\circ = \frac{1}{2}$$

$$\tan 60^\circ = \sqrt{3}$$

Find the sin, cos, tan of 210°



$$\sin 210^\circ = -\frac{1}{2}$$

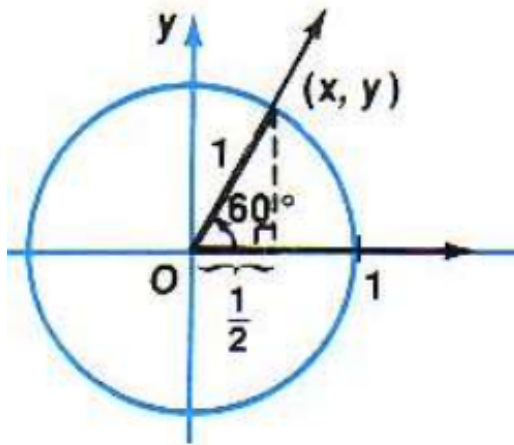
$$\cos 210^\circ = -\frac{\sqrt{3}}{2}$$

$$\tan 210^\circ = \frac{\sqrt{3}}{3}$$

3.1.2 - Degrees vs. Radians

13/13

Find the sin, cos, tan of 60°

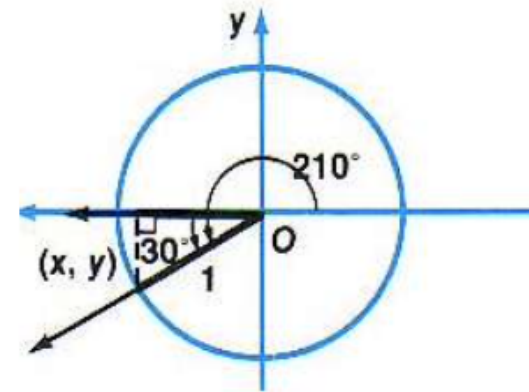


$$\sin 60^\circ = \frac{\sqrt{3}}{2}$$

$$\cos 60^\circ = \frac{1}{2}$$

$$\tan 60^\circ = \sqrt{3}$$

Find the sin, cos, tan of 210°



$$\sin 210^\circ = -\frac{1}{2}$$

$$\cos 210^\circ = -\frac{\sqrt{3}}{2}$$

$$\tan 210^\circ = \frac{\sqrt{3}}{3}$$

Practice

1. $\sin(30^\circ)$

$$\frac{1}{2}$$

2. $\sec(210^\circ)$

$$-\frac{2\sqrt{3}}{3}$$

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

$$-1$$

4. $\cos\left(\frac{3\pi}{2}\right)$

$$0$$

