

5.1 Angles and Radian Measure

GOALS:

1. Understand that angles have measures in degrees or radians.
2. There are $360^\circ = 2\pi$ radians in a complete circle.
1 radian subtends an arc = radius of the circle.
3. **Trig functions** of an angle are defined as **ratios** of:
 - the sides of the associated triangle; or
 - the coordinates of pt. (x,y) and the radius, r for a circle with C(0,0)
4. Signs (+ or -) of trig functions are determined by the quadrant with the terminal ray.
5. To convert **degrees to radians** mult. by $\pi / 180^\circ$.
To convert **radians to degrees** mult. by $180^\circ / \pi$.

Study 5.1 CVC # 1-7; #1-47; 51, 57-63; 71-75

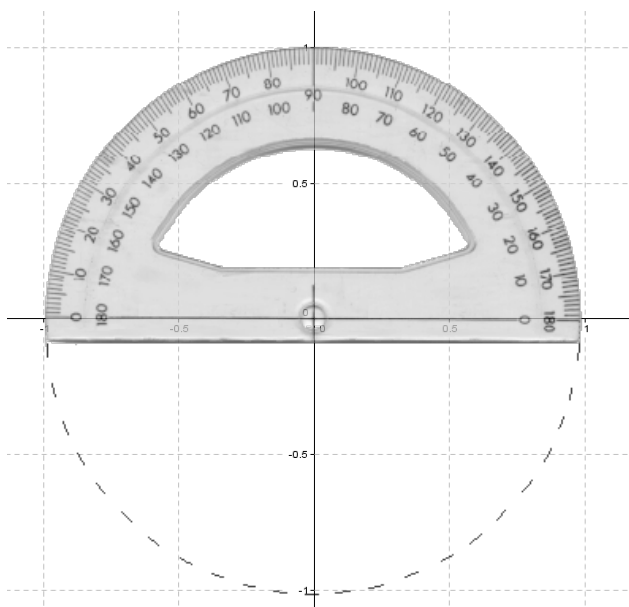
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5.1 Angles and Radian Measure

[basic_angles.mp4](#)



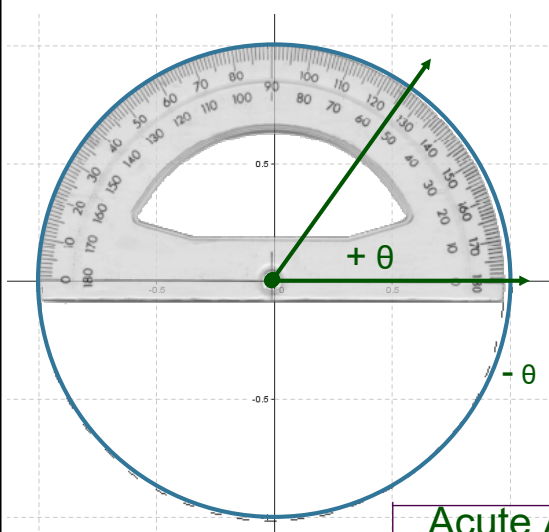
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Angle in **standard position**:

1. initial side on pos. x-axis
2. vertex (0, 0)

Angle is:

 $\theta > 0$ if counterclockwise $\theta < 0$ if clockwise

Acute Angle:

$0^\circ < \theta < 90^\circ$

Obtuse Angle:

$90^\circ < \theta < 180^\circ$

Right Angle:

90°

Straight Angle:

180°

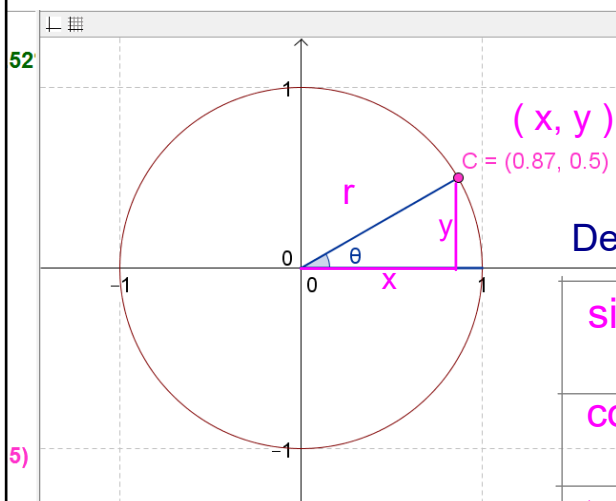
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Definitions of Trig. Functions

$\sin \theta = \frac{y}{r}$

$\csc \theta = \frac{r}{y}$

$\cos \theta = \frac{x}{r}$

$\sec \theta = \frac{r}{x}$

$\tan \theta = \frac{y}{x}$

$\cot \theta = \frac{x}{y}$

sine θ
cosine θ
tangent θ

cosecant θ
secant θ
cotangent θ

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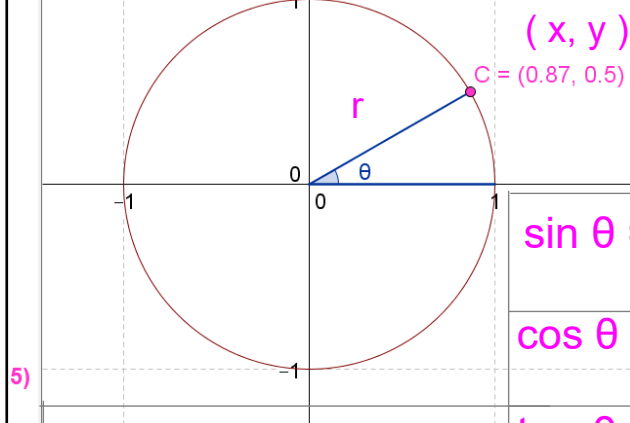
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52



$$\sin \theta = \frac{y}{r} = \frac{0.5}{1}$$

$$\csc \theta = \frac{1}{0.5}$$

$$\cos \theta = \frac{x}{r} = \frac{0.87}{1}$$

$$\sec \theta = \frac{1}{0.87}$$

$$\tan \theta = \frac{y}{x} = \frac{0.5}{0.87}$$

$$\cot \theta = \frac{0.87}{0.5}$$

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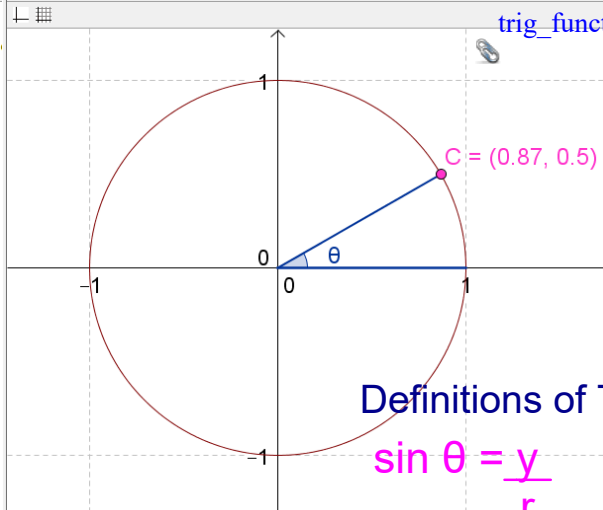
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- Angle
 - radians = 0.52
 - $\theta = 29.94^\circ$
- Conic
- Number
 - COS = 0.87
 - COT = 1.74
 - CSC = 2
 - SEC = 1.15
 - SIN = 0.5
 - TAN = 0.58
- Point
 - A = (0, 0)
 - B = (0, 1)
 - C = (0.87, 0.5)
 - D = (1, 0)



Definitions of Trig. Functions

$$\sin \theta = \frac{y}{r}$$

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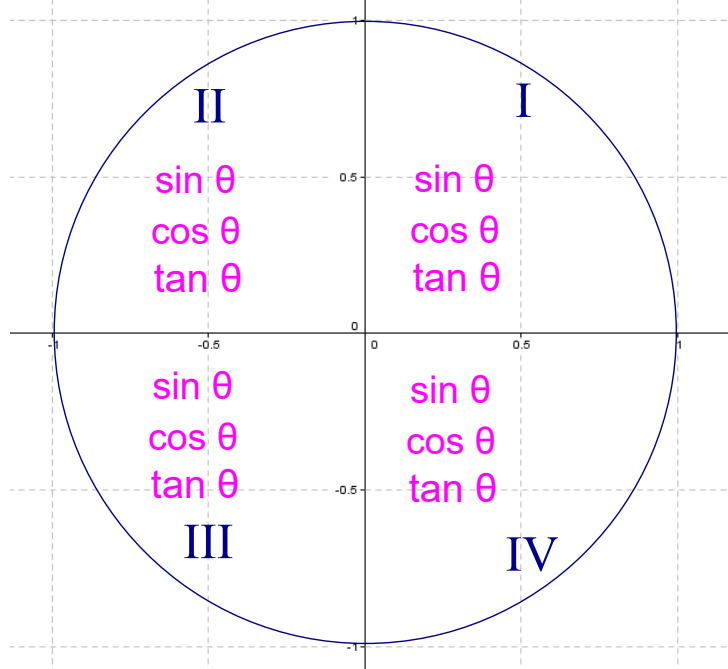
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Which are positive? Which negative?



$$\begin{aligned} \sin \theta &= \frac{y}{r} & \csc \theta &= \frac{r}{y} \\ \cos \theta &= \frac{x}{r} & \sec \theta &= \frac{r}{x} \\ \tan \theta &= \frac{y}{x} & \cot \theta &= \frac{x}{y} \end{aligned}$$

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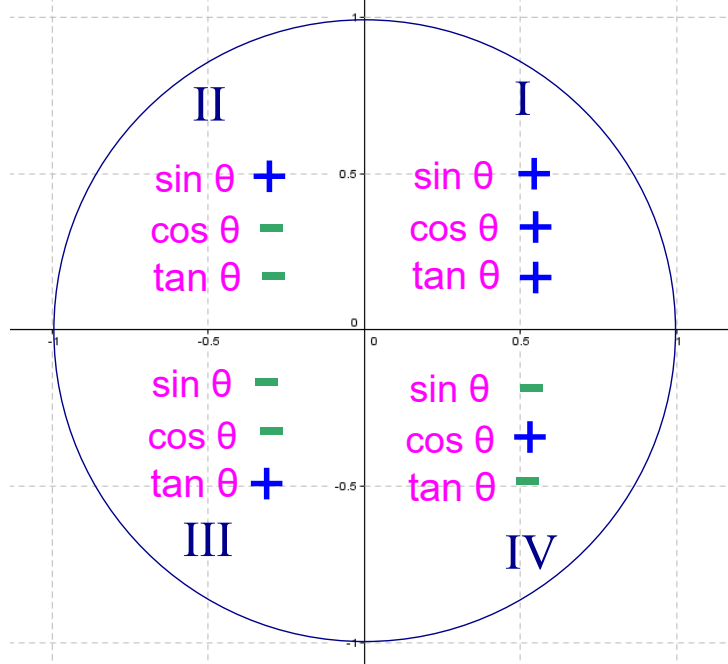
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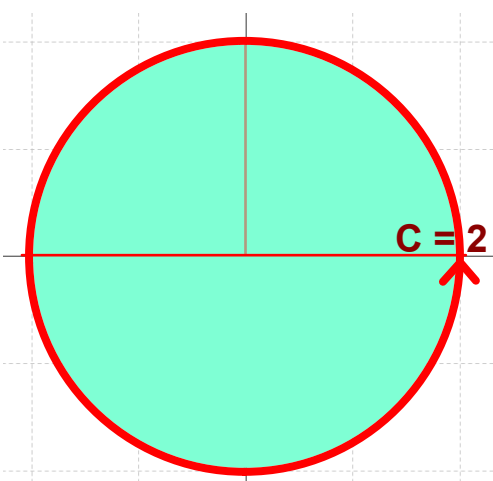
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Circumference: $C = 2\pi r$ 

The circumference of a circle is a measure of the length around the whole circle.

If $r = 1$,
what is the length around
the whole circle?

what is the length around
half of the circle?

around one quarter of
the circle?

A sector of a circle is the
linear measure of part of
the circumference.

$$s = r\theta \quad \theta \text{ in radians}$$

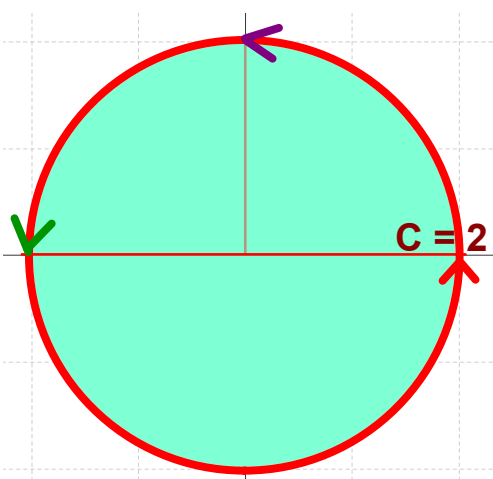
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Circumference: $C = 2\pi r$ 

The circumference of a circle is a measure of the length around the whole circle.

If $r = 1$,
what is the length around
the whole circle?

$2\pi(1) = 2\pi$
what is the length around
half of the circle?

$2\pi/2 = \pi$
around **one quarter of
the circle** $2\pi/4 = \pi/2$

A sector of a circle is the
linear measure of part of
the circumference.

$$s = r\theta \quad \theta \text{ in radians}$$

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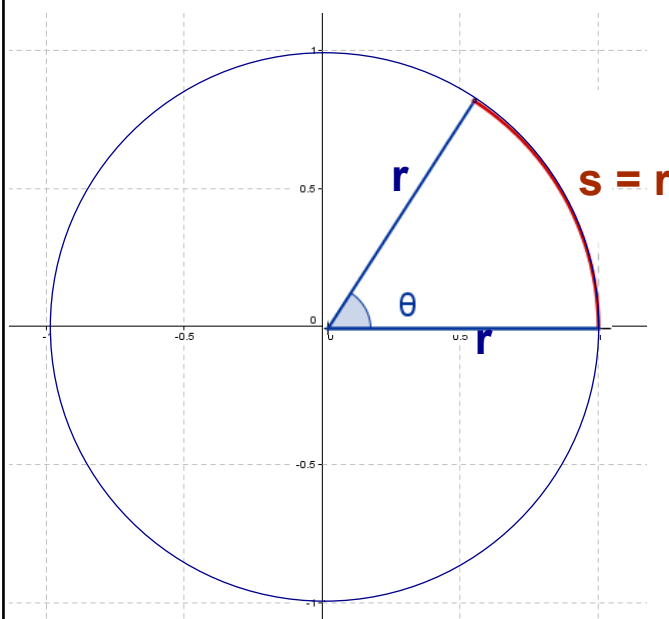
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Radian: angle that subtends an arc of length = r of the circle



degrees	radians
0°	0
90°	$\frac{\pi}{2}$
180°	π
270°	$\frac{3\pi}{2}$

$$s = r\theta \quad \theta \text{ in radians}$$

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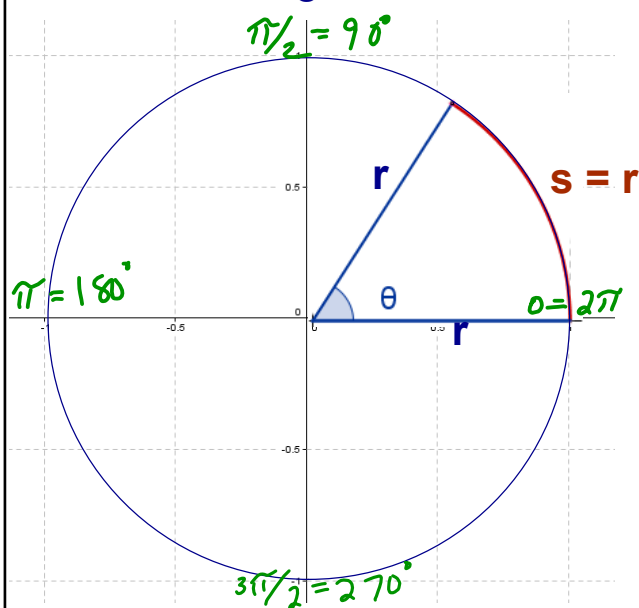
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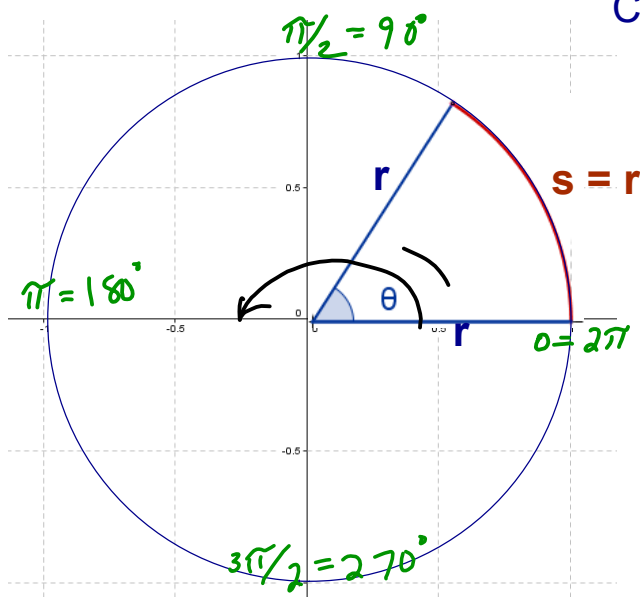
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5.14
 $\frac{32}{7}$

Convert from Degrees to Radians:

Multiplication Property of 1: multiply by $\pi / 180^\circ$ Convert 45° to radians

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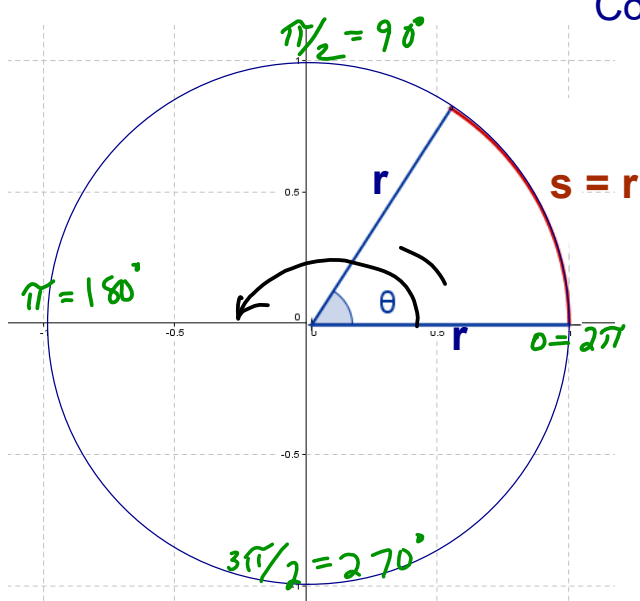
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5.14
 $\frac{32}{7}$

Convert from Degrees to Radians:

Multiplication Property of 1: multiply by $\pi / 180^\circ$ Convert 45° to radians

$$45^\circ \cdot \frac{\pi}{180} =$$

$$\frac{45}{180} \pi = \frac{\pi}{4}$$

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Label the angles in degrees and radians.

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5.1 Angles and Radian Measure

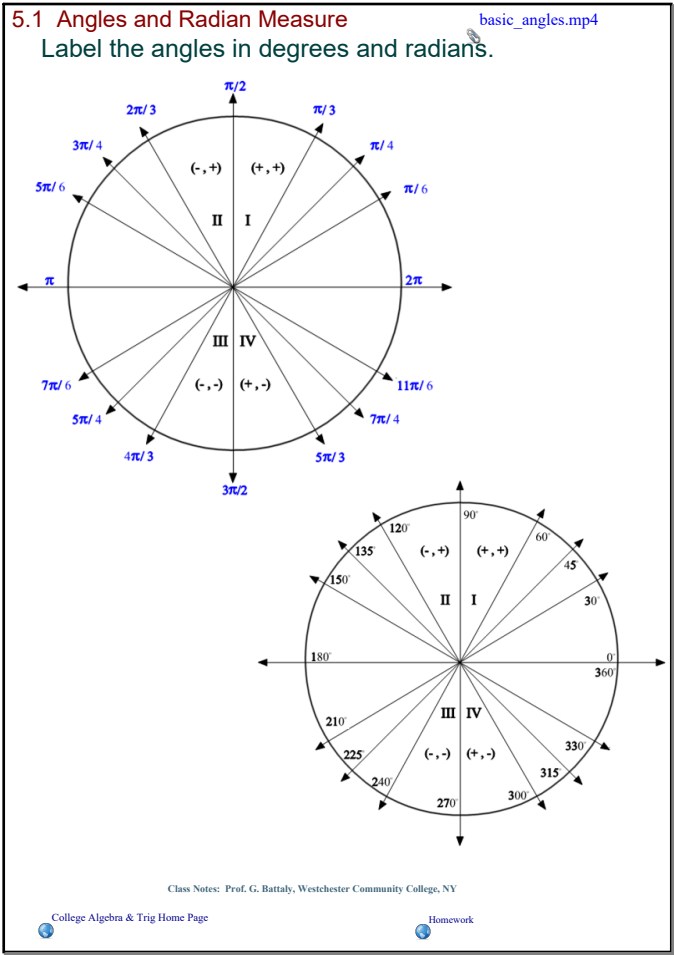
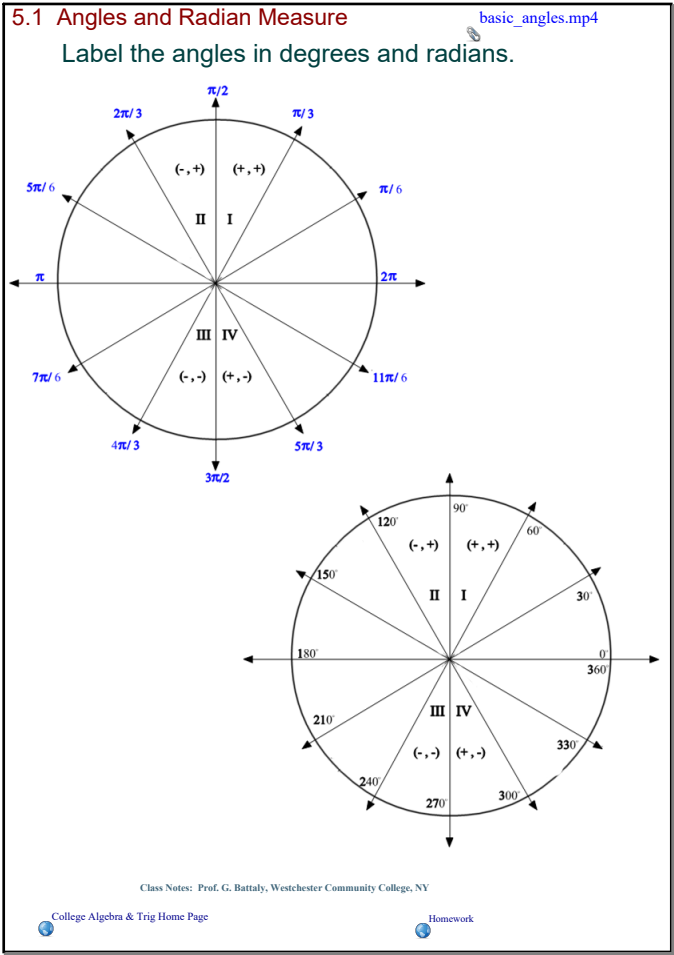
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Label the angles in degrees and radians.

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5.1 Angles and Radian Measure

Hint: Use the multiplication property of 1.

Convert to radians: 60°

$$\pi = 180^\circ$$

$$\left(\frac{\pi}{180}\right) = \frac{.081}{4} \cdot .09$$

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5.1 Angles and Radian Measure

Hint: Use the multiplication property of 1.

Convert to radians: 60°

$$\pi = 180^\circ$$

$$60^\circ \cdot \frac{\pi}{180} = \frac{\pi}{3}$$

$$\left(\frac{\pi}{180}\right) = \frac{.081}{4} \cdot .09$$

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5.1 Angles and Radian Measure

Hint: Use the multiplication property of 1.

Convert to radians: 150°

$$\pi = 180^\circ$$

$$\frac{150}{180} = \frac{5}{6} \cdot \frac{1}{2}$$

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5.1 Angles and Radian Measure

Hint: Use the multiplication property of 1. $\pi = 180^\circ$ Convert to degrees: $\frac{7\pi}{4}$ Which quadrant?

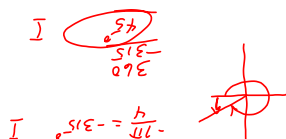
$$\frac{7\pi}{4} = \left(\frac{5\pi}{4}\right) + \frac{\pi}{4} = \frac{5}{4} \cdot \frac{\pi}{4} + \frac{\pi}{4}$$

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5.1 Angles and Radian Measure

Hint: Use the multiplication property of 1. $\pi = 180^\circ$ Convert to degrees: $-\frac{7\pi}{4}$ Which quadrant?

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G: 415° F: positive angle $< 360^\circ$ or 2π , coterminal.

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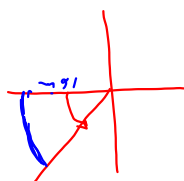
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Length of a Circular Arc: $s = r\theta$, θ in radians

G: $r = 16 \text{ in}$, $\theta = 60^\circ$, F: s

$$\frac{2\pi}{360} \cdot 60 = \frac{\pi}{3}$$

$$\theta = \frac{\pi}{3}$$



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Length of a Circular Arc: $s = r\theta$, θ in radians

G: $r = 9 \text{ yds}$, $\theta = 315^\circ$ F: s

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5.1 Angles and Radian Measure

Length of a Circular Arc: $s = r\theta$, θ in radiansG: $r = 9$ yds, $\theta = 315^\circ$ F: s

$$s = r\theta$$

$$= 9 \text{ yds} (315^\circ) \cdot \frac{\pi}{180^\circ}$$

$$= \frac{9 (315)^\circ}{180^\circ} \pi \text{ yds.}$$

$$= \frac{\cancel{9}(\cancel{5})(63)^\circ}{\cancel{9}(\cancel{20})^\circ} \pi \text{ yds.}$$

$$= \frac{63}{4} \pi \text{ yds.}$$

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Attachments

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