Name: KEY Hour: ____________ Date: ____________

NOTES: Section 13.2 – Define General Angles and Use Radian Measure

Goals: #1 - I can fill out a unit circle with all special angles (increments of 30 and 45 degrees) marked in both radians and degrees.

#2 - I can convert an angles measure between radians and degrees.

#3 - I can draw an angle in standard position when given its measure in either radians or degrees.

#4 - I can find positive and negative angles conterminal with a given angle (working in both radians and degrees).

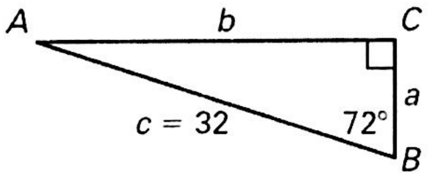
#5 - I can find the arc length and area of a sector when given the radius and central angle θ.

#6 - I can evaluate a trigonometric function of an angle whose measure is given in radians.

Homework: Lesson 13.2 Worksheet

Warm Up:

1. Solve ΔABC. Round answers to the nearest <u>tenth</u>.



$\cos 72° = \frac{a}{32}$

$a = 32\cos 72°$

$\boxed{a \approx 9.9}$

$\sin 72° = \frac{b}{32}$

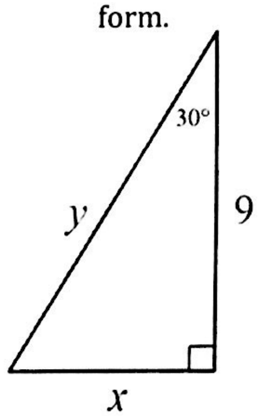
$b = 32\sin 72°$

$\boxed{b \approx 30.4}$

$\angle A = 180° - 90° - 72°$

$\boxed{\angle A = 18°}$

2. Find the exact value of x and y. Answers should be expressed in simplest radical form.



$\tan 30° = \frac{x}{9}$

$\frac{\sqrt{3}}{3} = \frac{x}{9}$

$3x = 9\sqrt{3}$

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

$\cos 30° = \frac{9}{y}$

$\frac{\sqrt{3}}{2} = \frac{9}{y}$

$\sqrt{3}y = 18$

$y = \frac{18}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}}$

$y = \frac{18\sqrt{3}}{3} = \boxed{6\sqrt{3}}$

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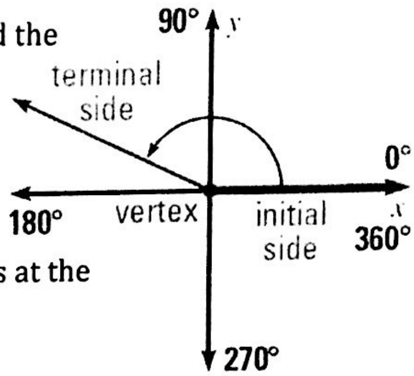
Notes:

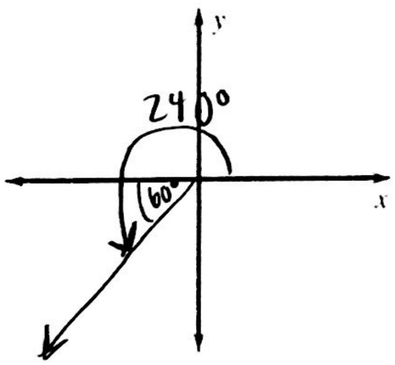


In a coordinate plane, an angle can be formed by fixing one ray, called the initial side and rotating the other ray called the terminal side about the vertex.

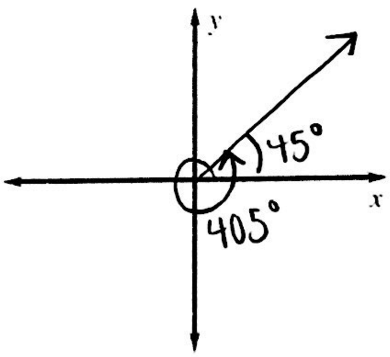
An angle is in standard position if its vertex is at the origin and its initial side lies on the positive x-axis.

Example #1: Draw an angle with the given measure in standard position.

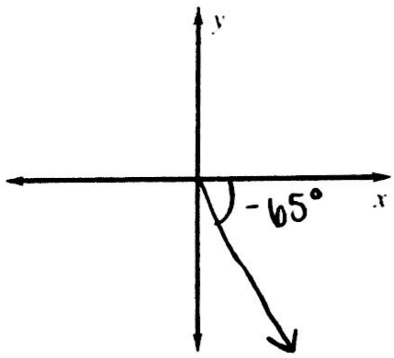
1. 240°



2. 405°



3. −65°

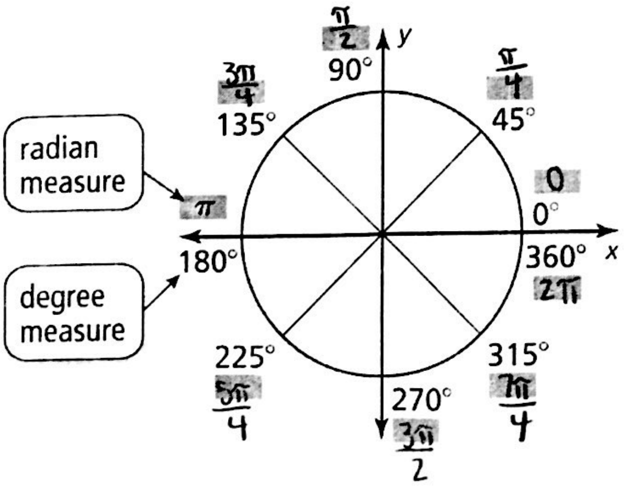


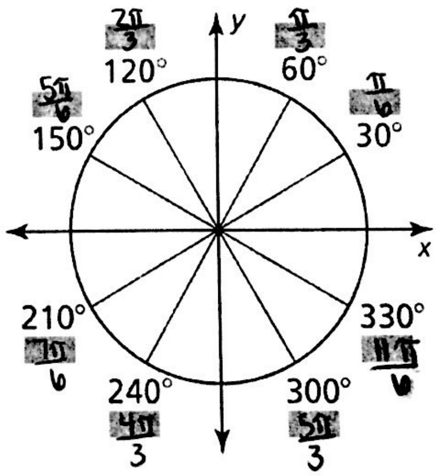
Notes:

Another unit of measuring angles is by using radians.

Because the circumference of a circle is $2\pi r$, there are 2π radians in a full circle.

Exploration #1: Work with a partner and write the radian measure of each angle with the given degree measure.





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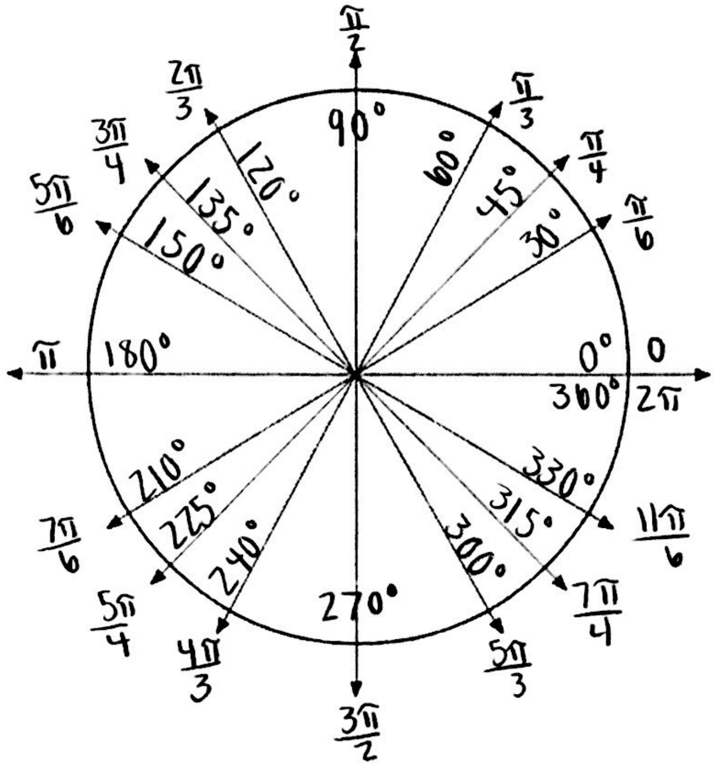
Notes:

Degree and Radian Measure of Special Angles:



To convert between Degrees and Radians:

- Degrees to Radians:

  Multiply degree measure by $\frac{\pi}{180°}$

- Radians to Degrees:

  Plug in 180° for π

Example #2: Convert the degree measure to radians or the radian measure to degrees.

1. 315°

$315°\left(\frac{\pi}{180°}\right)$

$\frac{315\pi}{180}$

$\boxed{\frac{7\pi}{4}}$

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

$-\frac{(180°)}{4}$

$\boxed{-45°}$

3. 500°

$500°\left(\frac{\pi}{180°}\right)$

$\frac{500\pi}{180}$

$\boxed{\frac{25\pi}{9}}$

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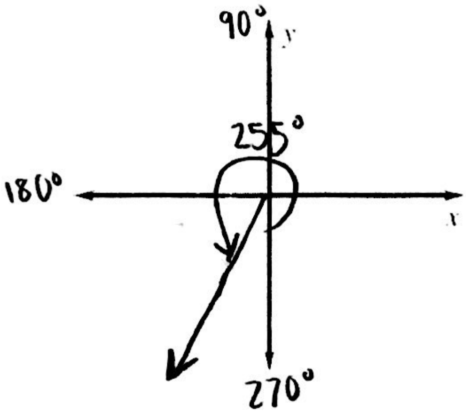
You practice:

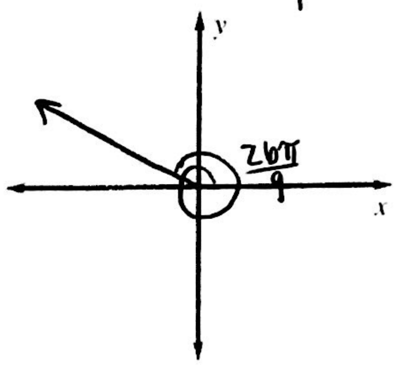
1. Draw an angle with the given measure in standard position.

   a. 255°



   b. $\frac{26\pi}{9}$

$\frac{26(180°)}{9} = 520°$



2. Convert the degree measure to radians or the radian measure to degrees.

   a. −310°

$-310°\left(\frac{\pi}{180°}\right)$

$\frac{-310\pi}{180}$

$\boxed{\frac{-31\pi}{18}}$

   b. $\frac{16\pi}{15}$

$\frac{16(180°)}{15}$

$\frac{2880°}{15}$

$\boxed{192°}$

Notes:

Angles that are <u>coterminal</u> lie in the <u>SAME</u> standard position.

We can find <u>coterminal</u> angles by adding and subtracting multiples of <u>360°</u>.
2π radians

Example #3: Find one positive angle and one negative angle that are coterminal with the given angle.

1. −130°

$-130° + 360° = \boxed{230°}$

$-130° - 360° = \boxed{-230°}$

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

$\frac{2\pi}{1} = \frac{8\pi}{4}$

$\frac{3\pi}{4} + \frac{8\pi}{4} = \boxed{\frac{11\pi}{4}}$

$\frac{3\pi}{4} - \frac{8\pi}{4} = \boxed{\frac{-5\pi}{4}}$

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Example #4: Evaluate the trigonometric funciton. When possible, give an exact answer. When using a calculator, round answers to the nearest <u>hundredth</u>.

1. $\cos\frac{\pi}{4}$

$\frac{180°}{4} = 45°$

$\cos(45°)$

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

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

2. $\csc\frac{4\pi}{11}$

$\frac{4(180°)}{11} = 65.45°$

$\frac{1}{\sin(65.5°)}$

$= \boxed{1.1}$

You practice:

1. Find one positive angle and one negative angle that are coterminal with $\frac{4\pi}{5}$.

$\frac{2\pi}{1} = \frac{10\pi}{5}$

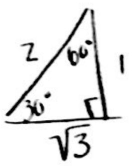
$\frac{4\pi}{5} + \frac{10\pi}{5} = \boxed{\frac{14\pi}{5}}$

$\frac{4\pi}{5} - \frac{10\pi}{5} = \boxed{\frac{-6\pi}{5}}$

2. Evaluate the trigonometric funciton. When possible, give an exact answer. When using a calculator, round answers to the nearest <u>hundredth</u>.

a. $\sec\frac{\pi}{3}$

$\frac{180°}{3} = 60°$



$\frac{1}{2}$

$\frac{1}{\cos(60°)}$

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

$\boxed{2}$

b. $\tan\frac{\pi}{5}$

$\frac{180°}{5} = 36°$

$\tan(36°)$

$= \boxed{0.73}$

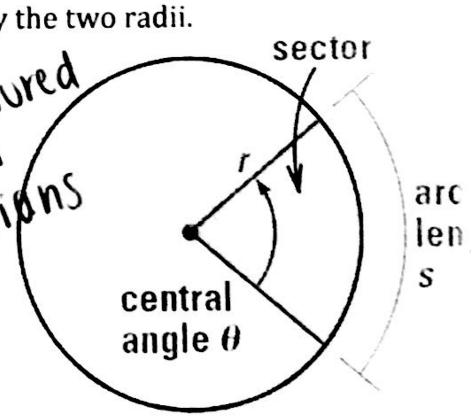
Notes:

A <u>Sector</u> is a region of a circle that is bounded by two radii and an arc of the circle.

The <u>central angle</u> θ of a sector is the angle formed by the two radii.

- <u>Arc length</u>: $s = r\theta$
- <u>Area</u>: $A = \frac{1}{2}r^2\theta$

measured in radians



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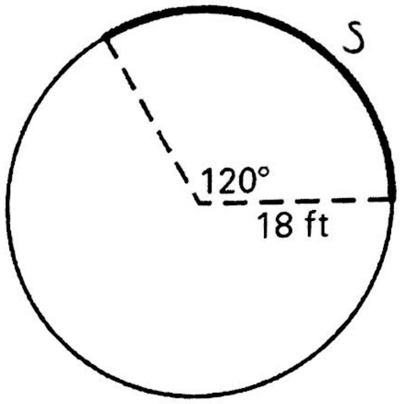
Example #5: Children at a day camp are playing a game on a circular field. The shaded sector in the figure is called the "safe zone," and is marked off by rope along its outer edge. Find the length of the rope and the area of the safe zone.



$s = r\theta$

$s = 18\left(\frac{2\pi}{3}\right)$

$s = \boxed{37.7 \text{ ft}}$

rope length

$120°\left(\frac{\pi}{180°}\right)$

$\frac{120\pi}{180}$

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

$A = \frac{1}{2} r^2 \theta$

$A = \frac{1}{2}(18)^2\left(\frac{2\pi}{3}\right)$

$A = \boxed{339.3 \text{ ft}^2}$

area of safe zone