1.05 Radian Investigation Date: _____

Materials: Circles Handout, Protractor, Ruler, 5 Twizzler strands

Part 1: Defining a Radian:

Measuring the Radii

Work on one circle at a time

Step 1: Use a Twizzler strand to measure the radius of the circle. Cut your Twizzler to that length.

Step 2: Wrap your radius Twizzler along the circle, starting at the line and in either direction.

Step 3: Make a mark on your paper where the Twizzler ends.

Repeat for the other circles. In Step 2, make sure to wrap the Twizzler strand around in the same direction as you did for the first circle.

Measuring the Angle Formed

Step 1: From the center, draw a line of best fit passing between your three points.

Step 2: Using a protractor, measure the angle that is created: _____

Step 3: Share your measurement with the class.

Definition of Radian

The angle that you submitted is measured in degrees. **Radian** is another unit that we can use to express angle measurement. More specifically, a radian is defined as

Radian is the unit of measure of an angle, equal to an angle at the center of a circle whose arc is equal in length to the radius.

Part 2: Converting Between Degrees and Radians:

Degrees vs. Radians

So we know: $C = 2\pi r$

$360° = 2\pi$ radians

$180° = \pi$ radians

Therefore, each radian is how many degrees?

$1 \text{ radian} = \frac{180}{\pi}$

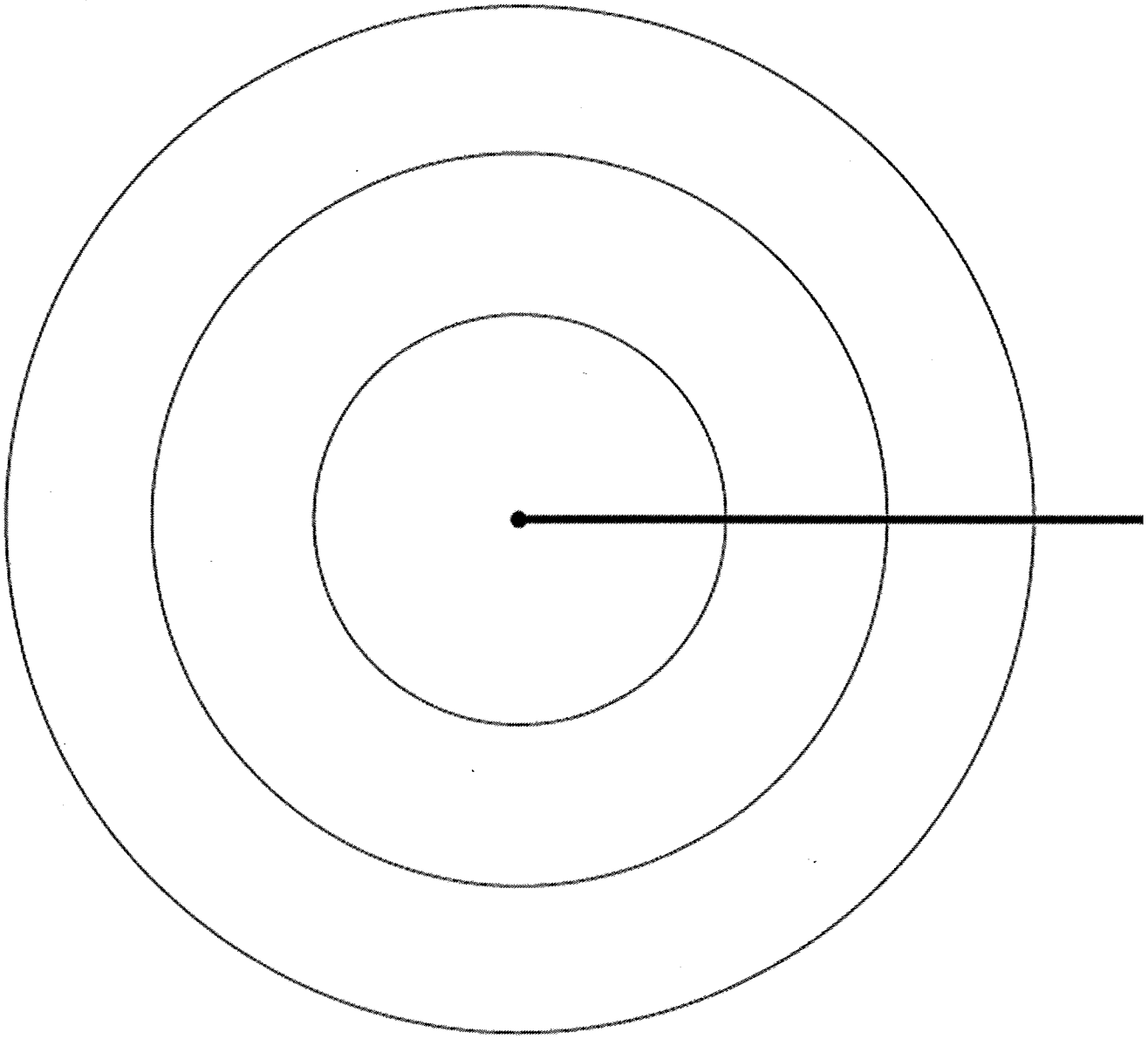
Convert from Degrees to Radians:

multiply by $\frac{\pi}{180}$

Convert from Radians to Degrees:

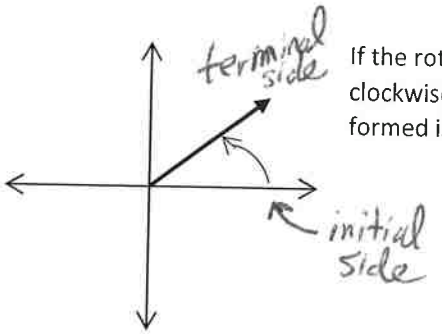
multiply by $\frac{180°}{\pi}$

3dimensional analysis

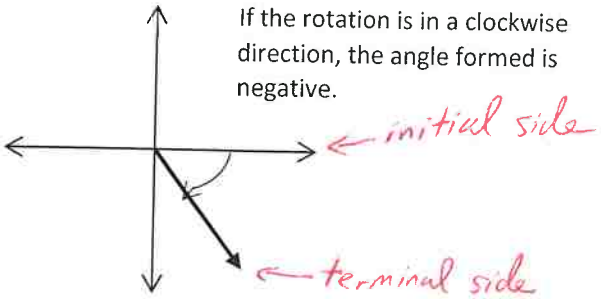


Accel Pre-Calculus
1.06 Angle Measures in Degrees and Radians

An **angle** is formed by two rays that share a fixed endpoint known as the **vertex**. One of the rays is fixed to form the **initial side** of the angle and the other ray rotates to form its **terminal side**. An angle with its vertex at the origin and its initial side along the positive x-axis is in **standard position.**

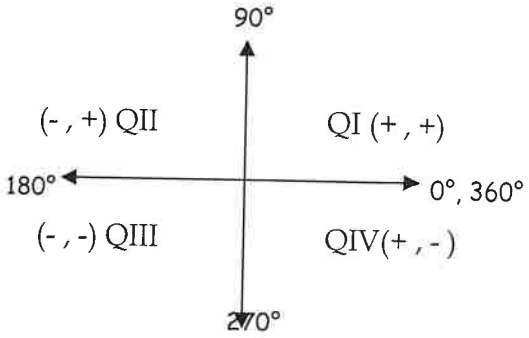


If the rotation is in a counter-clockwise direction, the angle formed is positive.



If the rotation is in a clockwise direction, the angle formed is negative.

Know the quadrants and the signs for x and y in each quadrant! That is very important in trigonometry. Degree or angle measures are read with respect to the quadrants starting at the positive x-axis (standard position) and moving in a counter-clockwise direction.



If the terminal side of an angle falls on one of the axes, the angle is a **quadrantal** angle.

There are four (4) quadrantal angles on a unit circle. They are:
0° (360°) on the x-axis, 90° on the y-axis, 180° on the –x-axis, and 270° on the –y-axis.

More Vocabulary from Geometry:

Right Angle: an angle whose measure is exactly 90°

Acute Angle: an angle whose measure is less than 90°

Obtuse Angle: an angle whose measure is greater than 90°

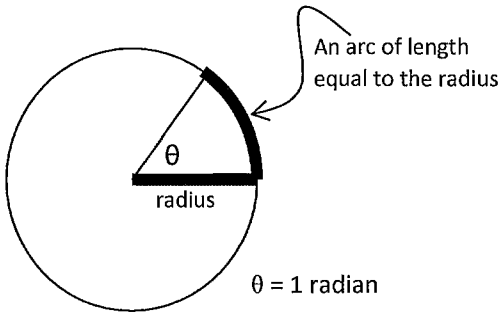
Complementary Angles: two angles the sum of whose measure is 90°

Supplementary Angles: two angles the sum of whose measure is 180°

, new *unit of measurement* for angles: a **radian** is the measure of an angle in a circle whose intercepted arc has a length equal to the radius.

Remember the formula relating the length of a radius (r) of a circle to the circumference of the circle (C):

$C = 2\pi r$



About the center of a circle is 360° (degrees).

Also about the center of a circle is 2π radians.

Therefore: 360° is equivalent to 2π radians

So 360° = 2π radians

Or simplified, **180° = π radians**

(This is our conversion unit!)

Degrees → Radians

Convert from degrees to radians.
State the quadrant in which the angle lies.

a. 120° Multiply by $\frac{\pi}{180°}$ to cancel the degrees and get radians.

$120° \cdot \frac{\pi}{180°} = \frac{120\pi}{180} = \frac{2\pi}{3}$ radians

Radians → Degrees

Convert from radians to degrees.
State the quadrant in which the angle lies.

b. $\frac{5\pi}{6}$ radians Multiply by $\frac{180°}{\pi}$ to cancel the radians and get degrees.

$\frac{5\pi}{6} \cdot \frac{180°}{\pi} = 150°$ degrees

1.06 Degree & Radian Conversion Practice

Directions: Complete #10 – 17 all

Write each degree measure in radians as a multiple of π and each radian measure in degrees. (Example 2)

10. $30° \cdot \frac{\pi}{180} = \pi/6$

11. $225° \cdot \frac{\pi}{180} = 5\pi/4$

12. $-165° \cdot \frac{\pi}{180} = -\frac{11\pi}{12}$

13. $-45° \cdot \frac{\pi}{180} = -\pi/4$

14. $\frac{2\pi}{3} \cdot \frac{180}{\pi} = 120°$

15. $\frac{5\pi}{2} \cdot \frac{180}{\pi} = 450°$

16. $-\frac{\pi}{4} \cdot \frac{180}{\pi} = -45°$

17. $-\frac{7\pi}{6} \cdot \frac{180}{\pi} = -210°$