Section 4.1 - Radian and Degree Measure

PART ONE: Radians and Degrees

Example 1: Sketch the following angles in standard position.

a. 245°

b. −170°

Radian Measure:

One radian is the measure of a central angle that intercepts an arc equal to the radius of the circle.

There are 360 degrees in ONE revolution.

Example 1: Sketch the following angles in standard position.

a. 245°

b. −170°

Radian Measure:

One radian is the measure of a central angle that intercepts an arc equal to the radius of the circle.

Draw in an angle with measure of “about” one radian.

Approximately how many radians are in a circle? ≈ ___________ radians

EXACTLY how many radians are in a circle? = ___________ radians

What is circumference of a circle? \( C = \) _________________

This means that one revolution is equal to _________ radians.
Example 2: Sketch the following angles in standard position.

- a. $\frac{15\pi}{4}$
- b. $-\frac{2\pi}{3}$
- c. 4 rads

Example 3: State the quadrant or axis where each angle terminates.

- a. 157°
- b. -75°
- c. 252°
- d. -390°
- e. -2π
- f. $\frac{5\pi}{3}$
- g. 3.75
- h. -5.12

Co-terminal Angles are angles that have the \textit{same initial and terminal sides.} 

Draw in three other angles co-terminal with the given angle.

How many angles are co-terminal with 120°? __________
Could you get the calculator to give you a list of ALL of them? __________________________

How many angles are co-terminal with $\frac{5\pi}{4}$ radians? ______________
Could you get the calculator to give you a list of ALL of them? __________ In π form? __________
Yes, if __________________________________________________________________________.
Example 4: State two coterminal angles for each given angle... one positive and one negative.

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<tbody>
<tr>
<td>a. $40^\circ$</td>
<td>b. $-800^\circ$</td>
<td>c. $\frac{5\pi}{4}$</td>
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<tr>
<td>d. $9\pi$</td>
<td>e. $5$</td>
<td>f. $-47^\circ$</td>
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PART TWO: Conversions Between Degrees and Radians

1 revolution is $2\pi$ radians

$$2\pi \text{ radians} = 360^\circ$$

SO $\text{1 radian} = \frac{360^\circ}{2\pi}$

then $7\text{ radians} = \frac{360^\circ \times 7}{2\pi}$

To convert rad ⇒ deg, multiply rads by $\frac{180^\circ}{\pi}$

degrees.

Example 1: Convert from degrees to radians.

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<tbody>
<tr>
<td>a. $135^\circ$</td>
<td>b. $540^\circ$</td>
<td>c. $-270^\circ$</td>
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Example 2: Convert from radians to degrees.

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</thead>
<tbody>
<tr>
<td>a. $-\frac{\pi}{2}$</td>
<td>b. $\frac{9\pi}{2}$</td>
<td>c. $2$</td>
</tr>
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Can we divide an angle up into units smaller than a degree? ____________

Why would we want to do so? __________________________________________________________________________
1 degree can be divided into 60 minutes (NOT TIME), so

\[ 1' = \frac{1}{60} \text{ deg} \]

1 minute can be divided into 60 seconds (NOT TIME), so

\[ 1'' = \frac{1}{60} \text{ min} \]

So, there are 3600 seconds in 1 degree, resulting in

\[ 1'' = \frac{1}{3600} \text{ deg} \]

Example 3: Change each angle measure to decimal degree form. SHOW YOUR WORK.

| a. 42°33'40" | b. −300°52'30" |

Example 4: Change each angle measure to D° M' S" form. SHOW YOUR WORK.

| a. 2.54° | b. −36.126° |

Will the calculator do the computations above for us? _____________

How?