SECTION 3.1 RADIANS AND ANGLES IN STANDARD POSITION

I) MEASURING ANGLES IN DEGREES

- When working with angles of rotation:
  - Counter clockwise:
  - Clockwise:
- Begin on the right side at zero degrees

II) CIRCUMFERENCE & RADIANS:

- The circumference of a circle is given by the equation:

$$\pi = 3.141592654......$$

- The radian is a unit for angle measurement
- Based on measuring the
- 1 radian is equal to an angle created by

III) CONVERTING DEGREES TO RADIANS:

- Angles in degrees will correspond with a value in radians
- Radians can be written as a fraction or a multiple of π

Degrees	Radians
$0°$	
$30°$	
$45°$	
$60°$	
$90°$	
$180°$	
$270°$	
$360°$	

- To convert degrees into radians, multiply the fraction by $\dfrac{\pi}{180°}$

Ex: Convert the following to radian measure:

i) $135° \longrightarrow 135°$

ii) $225° \longrightarrow 225°$

iii) $305° \longrightarrow 305°$

iv) $280° \longrightarrow 280°$

- In contrast, to convert from radians to degrees, multiply the value by: $\dfrac{180°}{\pi}$

Ex: Convert the following to degrees:
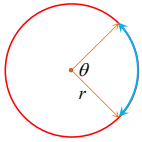
i) $\dfrac{5\pi}{3} \longrightarrow$

ii) $\dfrac{8\pi}{13} \longrightarrow$

iii) $6.337\ rad. \longrightarrow$

iv) $0.471 rad. \longrightarrow$

IV) FINDING THE ARC LENGTH OF A CIRCLE

- The arc length is a fraction of the circumference of the circle
- The fraction is given by the central angle divided by the 2π

θ
r

- If the central angle is given in degrees, you must
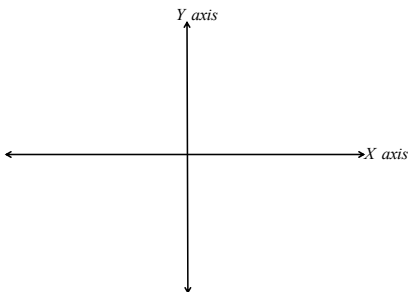
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Ex: An arc with a radius of 5m has a central angle of 2.5 radians. Find the arc length.

Practice: An arc with a radius of 7m has a central angle of 177.4°. Find the arc length.

Practice: An arc with a radius of 2.4m has an arc length of 5.3m. Find the central angle in radians and degrees.

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V) REVIEW: QUADRANTS & X /Y AXIS

Y axis

X axis

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VI) UNIT CIRCLES & ROTATIONS

o A "unit circle" is a circle rotated around the origin with

o The radius starts to rotate from
o The line rotating around the center is called a "**Terminal Arm**"
   • Rotated Counter clock-wise
   • Rotated Clock-wise

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VII) ANGLES IN STANDARD POSITION:

o All angles in "standard position" begin

o The angle is created by rotating the

Ex: Draw the following angles in standard position:
   a) 62°   b) 152 °

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Ex: Draw the following angles in standard position:
   a) 312°   b) -77°

   c) 2.5π radians   d) 9.42 radians

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VIII) Co-terminal Angles

- Angles that have their terminal arms at the same position
- Co-terminal angles have a difference

ie: 30°, 390°, 750°, -330°, -330°, -690°, ..etc

Ex: Given the following angles, provide two co-terminal angles and a formula for all the co-terminal angles

i) 123°

ii) $\dfrac{7\pi}{3}$

IX) Reference Angles

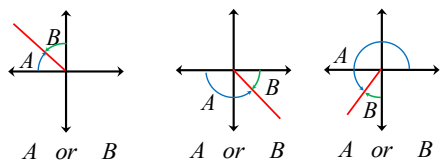- An angle created by the
- Reference angles must be in the

Ex: Given the following angles in standard position, find the reference angle

i) 152° in standard position

ii) 255° in standard position

Ex: Given each of the following terminal arms, indicate which is the reference angle:

A or B   A or B   A or B

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Practice: Find the reference angle for each of the following angles in standard position:

i) $\dfrac{7\pi}{3}$

ii) $-6.78 radians$

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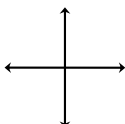
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PRACTICE: FIND THE REFERENCE ANGLE FOR EACH OF THE FOLLOWING ANGLES IN STANDARD POSITION

i) $\dfrac{4\pi}{3}$
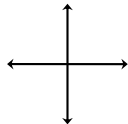
ii) $\dfrac{5\pi}{6}$

ii) $\dfrac{-5\pi}{4}$
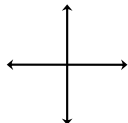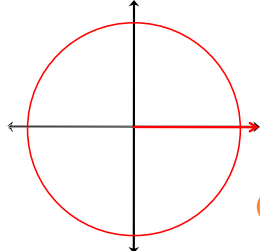
iv) $\dfrac{12\pi}{5}$

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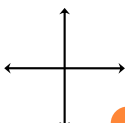
IX) Recognizing Reference angles

○ Angles with the same height will have the same reference angle
ie: 30°, 150°, 210°, and 330° all have the same reference angle at 30°
ie: 60°, 120°, 240°, and 300° all have the same reference angle at 60°
ie: 45°, 135°, 225°, and 315° all have the same reference angle at 45°

Recognizing Special Angles in Radian Form

$\pi \leftarrow$ $\frac{\pi}{6}$ $\frac{\pi}{6}$ $\frac{\pi}{6}$ $\frac{\pi}{6}$ $\rightarrow 2\pi$