Section 3.2 Unit Circles with Sine and Cosine

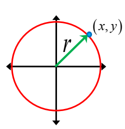
I) Review:

SOH-CAH-TOA (*Right Triangle*)

$\sin\theta = \frac{opp}{hyp}$ $\cos\theta = \frac{adj}{hyp}$ $\tan\theta = \frac{opp}{adj} = \frac{\sin\theta}{\cos\theta}$

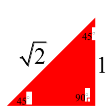
Pythagorean Theorem:

Circle Equation:

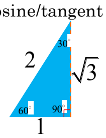


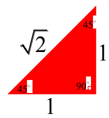
Review: Special Triangles

- There are two types of special triangles:
  - 30°, 60°, 90° triangle
  - 45°, 45°, 90° triangle



- Special triangles can be used to find the exact value of sine/cosine/tangent of basic angles like: 30°, 45°, 60°, and 90°





$\sin 60^\circ$ $\sin 30^\circ$ $\sin 45^\circ$

$\cos 60^\circ$ $\cos 30^\circ$ $\cos 45^\circ$

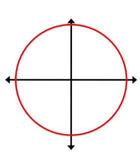
$\tan 60^\circ$ $\tan 30^\circ$ $\tan 45^\circ$

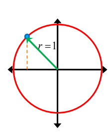
Ex: Use the special triangles to determine the exact value for each of the following:

i) $\sin\frac{\pi}{3} =$ *ii*) $\cos\frac{\pi}{4} =$ *iii*) $\tan\frac{\pi}{6} =$

II) Unit Circles:

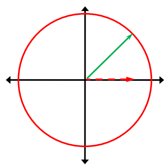
- In a unit circle, the radius (terminal arm) is
- The tip of the terminal arm is given by
- the terminal arm can be used to make a right triangle, so the sum of both





III) Sine & Cosine in Unit Circles:

- When given the angle in std. position, we can find the coordinates of any point on the circumference using trigonometry



$\sin\theta = \frac{opp}{hyp}$ $\cos\theta = \frac{adj}{hyp}$

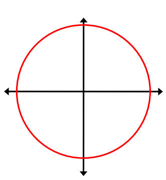
- The coordinates of any point on the circumference of a unit circle can be represented by:

$P(x, y) =$

Ex: Given the angle in standard position in a unit circle, find the coordinates of each of the following points P(x,y).

IV) Sine/Cosine/Tangent in Different Quadrants

- The sine/cosine/tangent of angles in each of the four quadrants will either
- Use the reference angle to determine whether



	$Q1$	$Q2$	$Q3$	$Q4$
$\sin\theta = \frac{opp}{hyp}$				
$\cos\theta = \frac{adj}{hyp}$				
$\tan\theta = \frac{opp}{adj}$				

- The previous table can be used to determine which quadrant an angle will be in when given the ratio of a trig function

Ex: Given each of the following trig. functions and its ratios, determine which quadrants the angle can be in:

$i)\ \sin\theta = \frac{-2}{3}$ $ii)\ \cos\theta = \frac{2}{\sqrt{5}}$ $iii)\ \tan\theta = \frac{-3}{\sqrt{7}}$

Ex: Solve for the angle, given the following trig functions.

$i)\ \sin\theta = \frac{1}{\sqrt{3}}$

Practice: Solve for the angle:

$i)\ \cos\theta = -\frac{2}{\sqrt{5}}$

V) Using Special Triangles to Solve Trig Equations

For angles with reference angles of 30°, 45°, 60°, we can use special triangles

Ex: Find the exact value of: $\sin 210^\circ$

Ex: Find the exact value of: $\cos\frac{7\pi}{3}$ and ii) $\sin\frac{5\pi}{4}$

Ex: Find the exact value of: $\tan\frac{7\pi}{3}$ and ii) $\tan\frac{5\pi}{4}$

90°

VI) Finding the coordinates of point P on the terminal arm

- When given the ratio of a trig function, you will be asked to find the coordinates of the endpoint on the terminal arm

Method #1) Find the value of the central angle

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$$P(x,y)=P(\cos\theta,\sin\theta)$$

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Method #2) Finding the <u>exact value</u> using the Pythagorean Thm.

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Ex: Given that cos θ = $^3/_5$ find all the possible coordinates for point P*(x,y)* in the unit circle

Practice: Given that $\sin\theta=\frac{-2}{\sqrt{5}}$ show the angle in standard position, and the coordinates of P on the unit circle.

Ex: Given that $\sin\theta = -\frac{\sqrt{11}}{6}$ and 180° $^\circ$ find the exact value of the coordinates of point P(x,y) in the unit circle

Ex: Given that $\tan\theta = {}^{3}/_{5}$ find all the possible coordinates for point P(x,y) in the unit circle