Using and Understanding the Unit Circle - Step-by-Step Lesson

Let cos $\theta = -\dfrac{8}{24}$

Find the values of the given trigonometric ratio using unit circles:
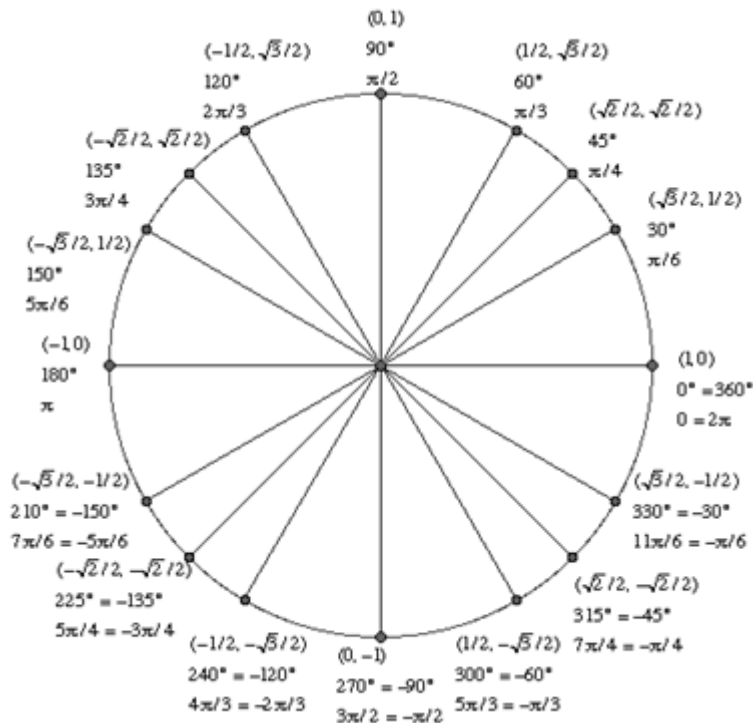
1) sin θ =

2) tan θ =

3) sec θ =

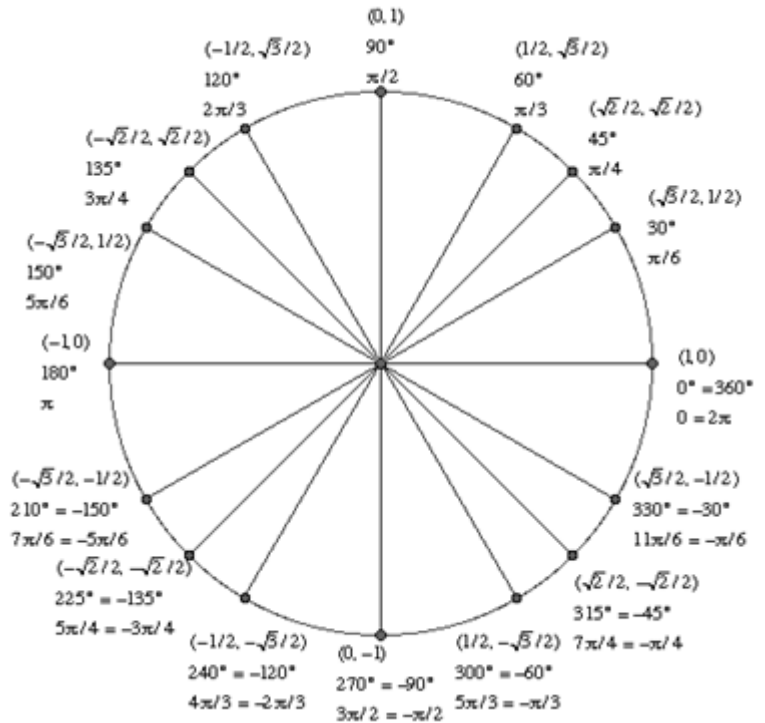4) csc θ =

Use the unit circle below as a reference tool.

Explanation:

To the right, you will see a unit circle. The unit circle is a wonderful reference tool for determining trigonometric values. This can be used to make trigonometric function graphs.

Think of the vertical line as the y-axis and the purely horizontal line as the x-axis. This in itself helps you establish information about the quadrants.

The same quadrant rules apply with the unit circle. Q1= positive values, Q2= all values are negative except sin and csc., Q3= all values are negative except tan and cot, Q4= all values are negative except cos and sec.

The unit circle can used to find trigonometric ratios and help you when graphing.

We first need to remember all the basic identities:

$$\tan \theta = \frac{\sin \theta}{\cos \theta} \qquad \cot \theta = \frac{\cos \theta}{\sin \theta} \qquad \sec \theta = \frac{1}{\cos \theta} \qquad \cot \theta = \frac{1}{\sin \theta}$$

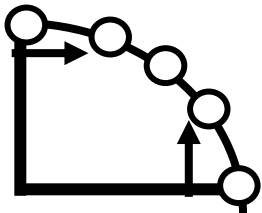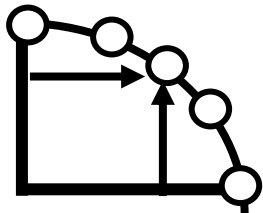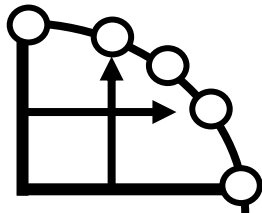$$\sin(x) = \cos(x - π/2) \qquad \csc \theta = \frac{1}{\sin \theta}$$

As we can see, you can determine any identity, if you have the value of sine and cos.   Sine values on the unit circle run **top-to-bottom**. Cosine values run **right-to-left** on the unit circle.

As you can see on the unit circle, every quarter section of the circle has start and end values with 3 possible lengths in between.

Short	Medium	Large
Length = $\dfrac{1}{2}$	Length = $\dfrac{\sqrt{2}}{2}$	Length = $\dfrac{\sqrt{3}}{2}$

Let's apply what we have learned. Let see how cos θ relates or can be used to determine the other trig. values. I would start with the third question as it will lead us to our other answers.

3) sec θ = $\frac{1}{\cos\theta}$ so the reciprocal of our starting value will be the answer:

- $\frac{8}{24}$ = - $\frac{24}{8}$ = -3

1) sin(x) = cos(x - π/2) = $\frac{2\sqrt{2}}{3}$

2) tan θ = $\frac{\sin\theta}{\cos\theta}$ tan θ = 2√2

4) csc θ = $\frac{1}{\sin\theta}$ reciprocal again here   csc θ = - $\frac{3}{2\sqrt{2}}$