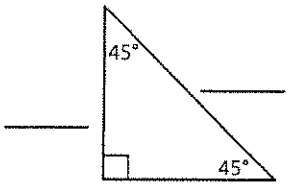
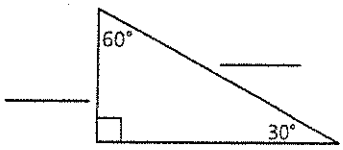
Name:_____Period:_____

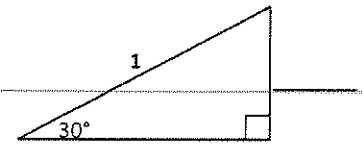
The Unit Circle

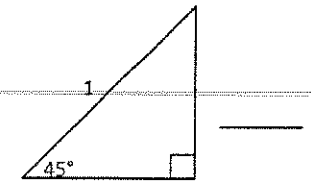
- We're going to be using special right triangles, so first, remind yourself of the patterns of 45-45-90 triangles and 30-60-90 triangles:

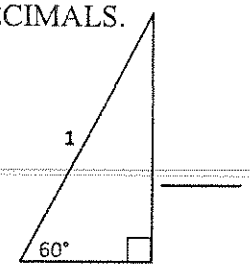




- Use special right triangles to fill in the lengths of the missing sides. NO DECIMALS.







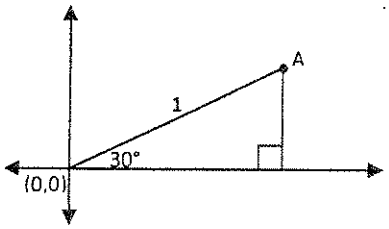
- Now use what you know about trigonometry to write the following sine and cosine ratios for the angles shown in these triangles. SIMPLIFY THOSE RATIOS!

sin 30° = sin 45° = sin 60° =

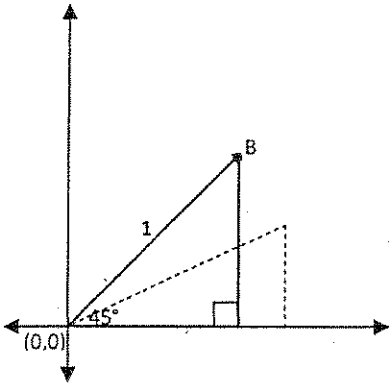
cos 30° = cos 45° = cos 60° =

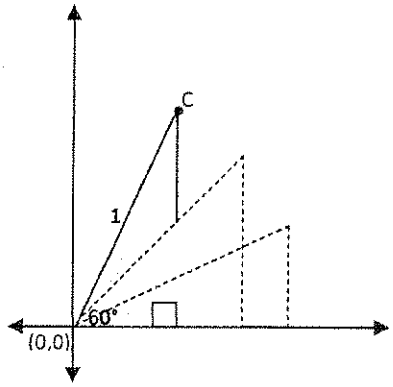
- Next we'll take one of those triangles and put it on a coordinate plane:

What would the *x*- and *y*- coordinates of point A (formed by a 30° angle) be? *(Hint: Use the lengths of the sides of the triangle.)*

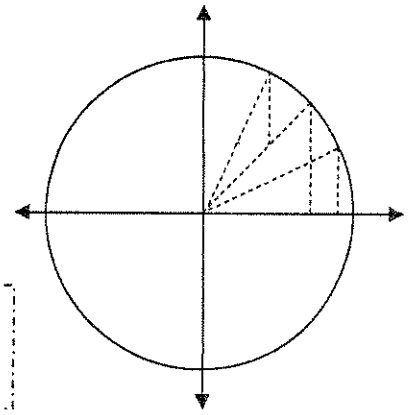


- Do the same for a 45° angle and a 60° angle:





If you look at the three points we have traced out so far, they all lie on a circle centered at the origin.



What is the radius of this circle?

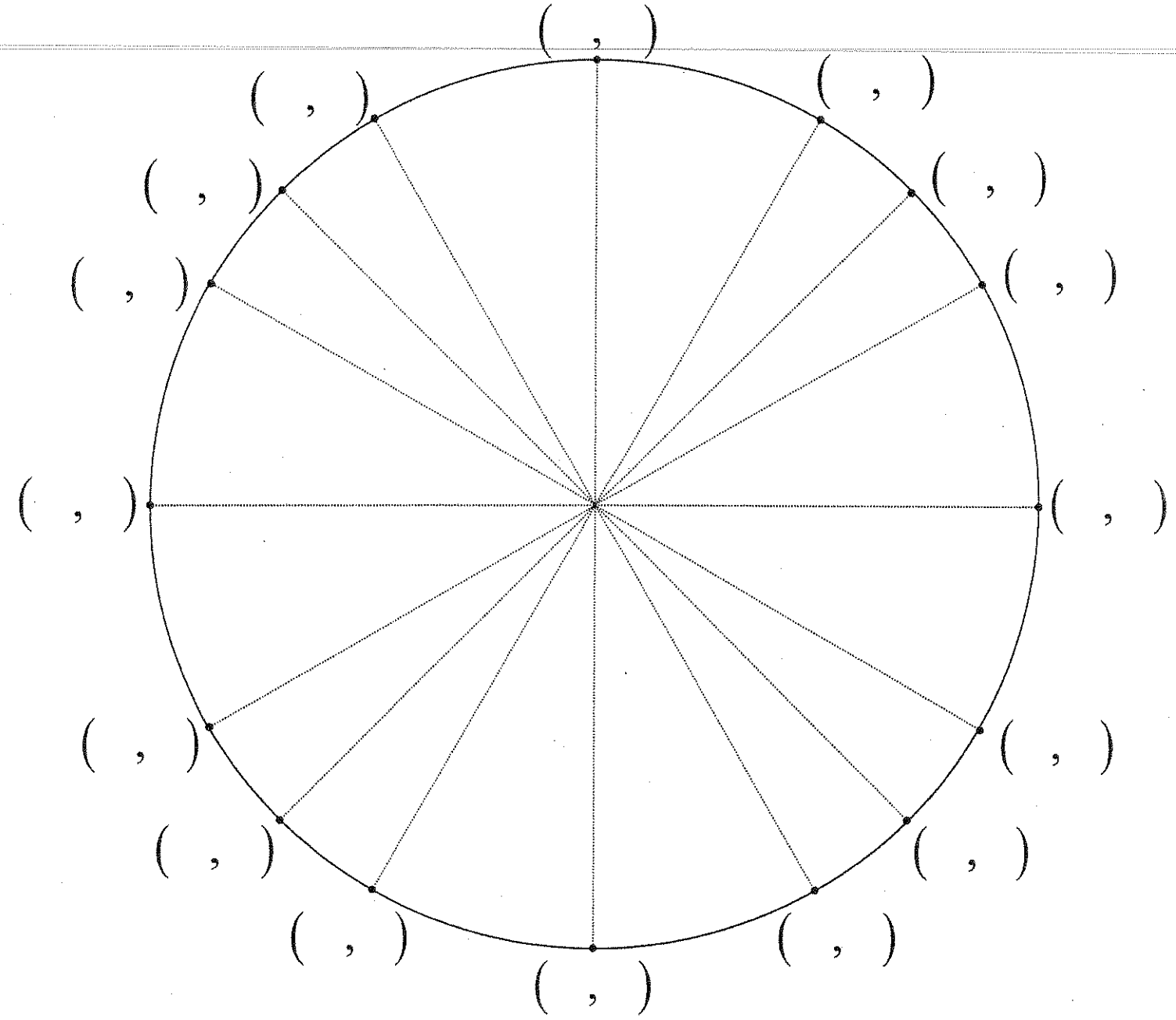
The circle is known as the **unit circle**, since its radius is one unit. It is an integral part of trigonometry.

You will cut out the triangles on the next page to help fill in the coordinates of this unit circle. Use what you know about reflections to help!

HINTS FOR QUADRANT II:
The angles in quadrant II are 120°, 135°, and 150°.

Look at the 120° point and the 60° point.
What should be true about their y-coordinates?

What should be true about their x-coordinates?

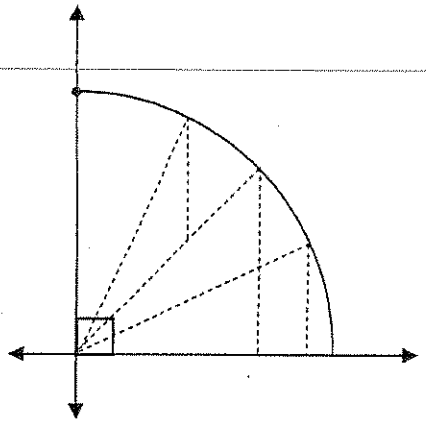


- Use the work you did with the triangles on the front page to fill in the following table:

Angle measure	Coordinate on unit circle	Value of sine	Value of cosine
30°			
45°			
60°			

What relationship do you notice between the coordinate on the unit circle and the values of sine and cosine?

- Look at the point shown below, which corresponds to 90°.



What are the coordinates of this point?

So what is the value of sin 90°?

What is the value of cos 90°?

What would be the coordinates of the point that corresponds to 0°?

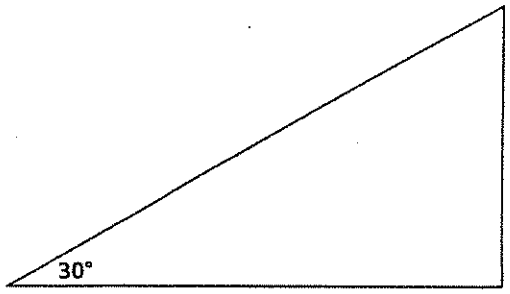
What is sine of 0°?

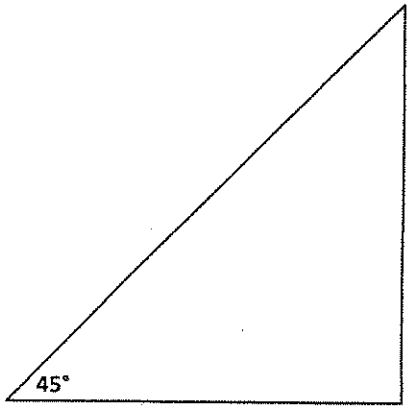
What is cosine of 0°?

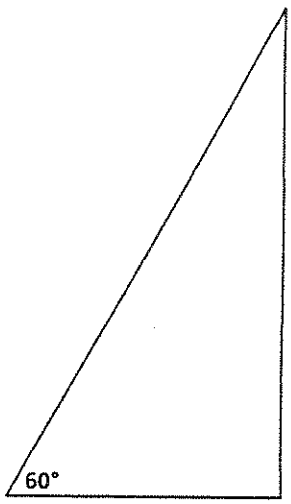
- More practice: *Use the unit circle you just made - your answers should be exact, NO DECIMALS.*

1. sin 120° =
2. cos 180° =
3. cos 135° =
4. sin 315° =
5. cos 240° =
6. sin 330° =

(Hint: Write the sides lengths inside each triangle)







Name: Key Period:

The Unit Circle

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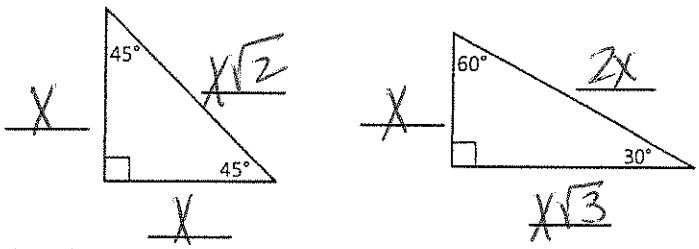
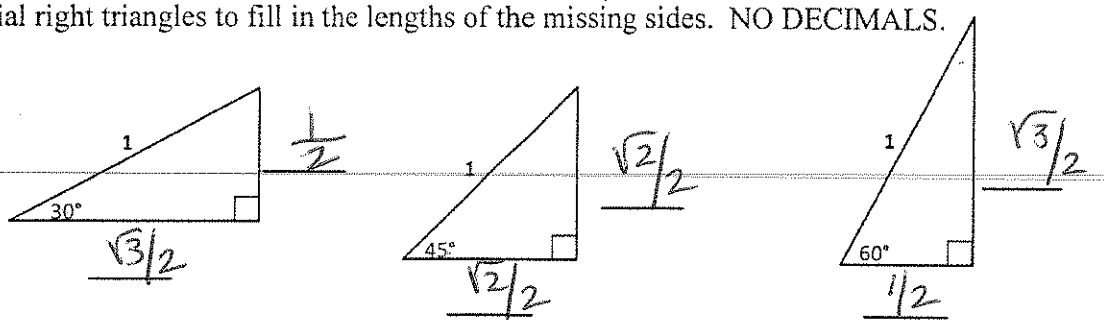


- Use special right triangles to fill in the lengths of the missing sides. NO DECIMALS.

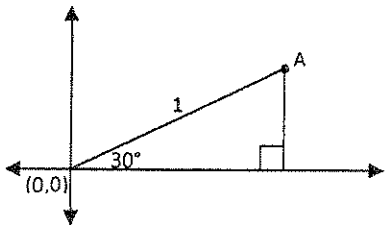


- Now use what you know about trigonometry to write the following sine and cosine ratios for the angles shown in these triangles. SIMPLIFY THOSE RATIOS!

$\sin 30° = \frac{1}{2}$ $\sin 45° = \frac{\sqrt{2}}{2}$ $\sin 60° = \frac{\sqrt{3}}{2}$

$\cos 30° = \frac{\sqrt{3}}{2}$ $\cos 45° = \frac{\sqrt{2}}{2}$ $\cos 60° = \frac{1}{2}$

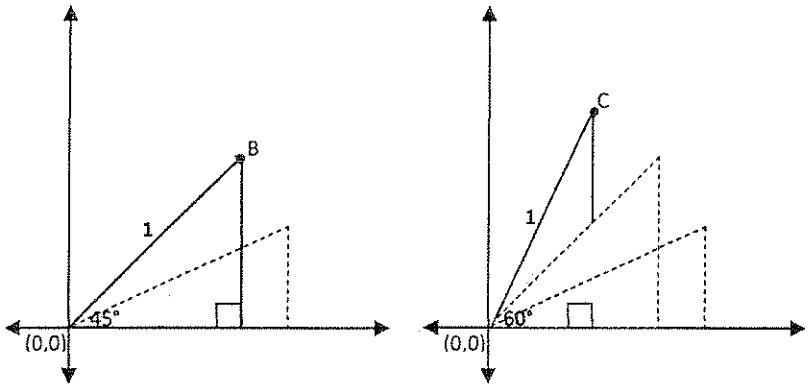
- Next we'll take one of those triangles and put it on a coordinate plane:



What would the *x*- and *y*- coordinates of point A (formed by a 30° angle) be? *(Hint: Use the lengths of the sides of the triangle.)*

$(\sqrt{3}/2, 1/2)$

- Do the same for a 45° angle and a 60° angle:



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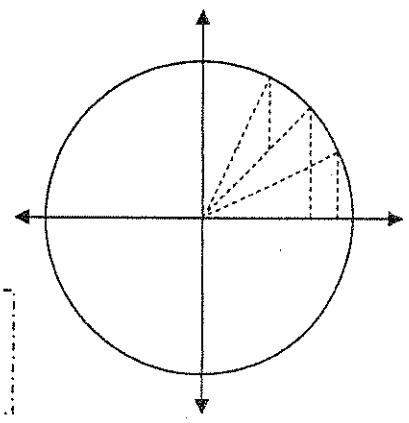

What is the radius of this circle?

1

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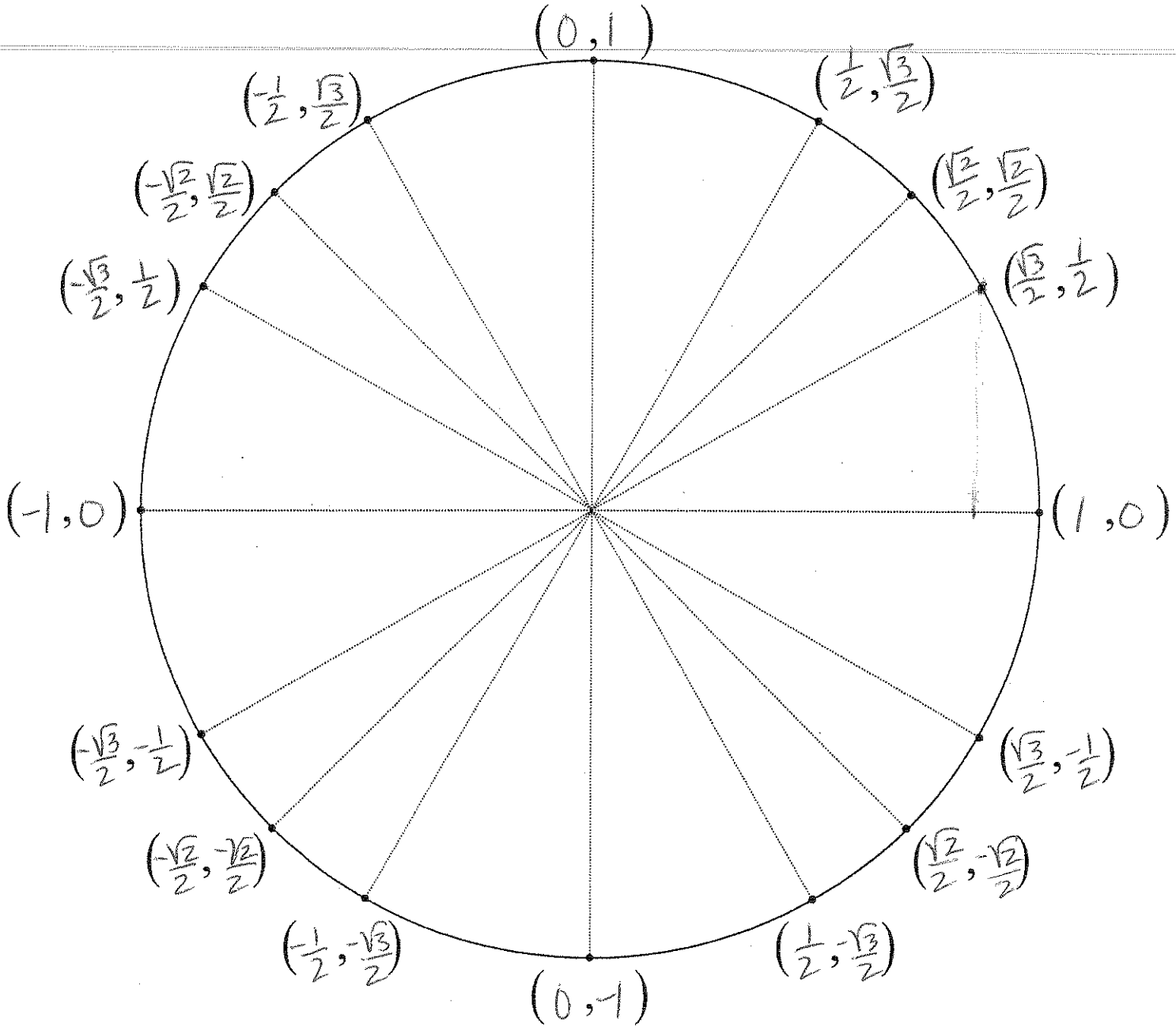


▸▸ Use the work you did with the triangles on the front page to fill in the following table:

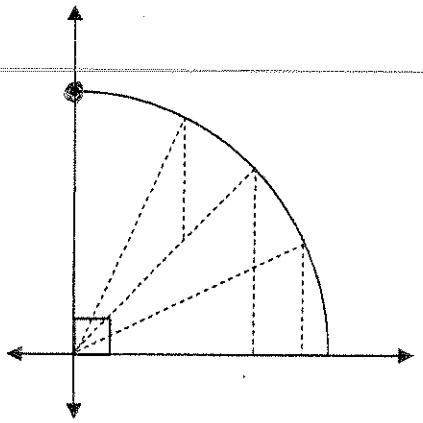
Angle measure	Coordinate on unit circle	Value of sine	Value of cosine
30°	$\left(\frac{\sqrt{3}}{2}, \frac{1}{2}\right)$	$\frac{1}{2}$	$\sqrt{3}/2$
45°	$\left(\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2}\right)$	$\sqrt{2}/2$	$\sqrt{2}/2$
60°	$\left(\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$	$\sqrt{3}/2$	$1/2$

What relationship do you notice between the coordinate on the unit circle and the values of sine and cosine?

x = cosine

y = sine

▸▸ Look at the point shown below, which corresponds to 90°.



What are the coordinates of this point? (0, 1)

So what is the value of sin 90°? 1

What is the value of cos 90°? 0

What would be the coordinates of the point that corresponds to 0°? (1, 0)

What is sine of 0°? 0

What is cosine of 0°? 1

▸▸ More practice: *Use the unit circle you just made - your answers should be exact, NO DECIMALS.*

1. sin 120° = $\sqrt{3}/2$
2. cos 180° = -1
3. cos 135° = $-\sqrt{2}/2$
4. sin 315° = $-\frac{\sqrt{2}}{2}$
5. cos 240° = $-1/2$
6. sin 330° = $-\frac{1}{2}$

(Hint: Write the sides lengths inside each triangle)