Unit Circle Exploration 1

Names Key Period ____

Discuss the answers to the following questions with your partner(s). Only fill in the blanks if you feel it helps you learn. Please do fill out the table in problem 25.

Open your bag of unit circle pieces. Find the quadrant ring and place it in the coordinate plane square.

1. What do the parentheses after each quadrant name indicate? the signs of the coordinates
2. Next, find the degree ring and place it into the coordinate plane. Where does 0° go? to right of origin
3. From 0°, the measures get larger in a counterclockwise direction.
4. There are two basic types of triangles in your unit circle set. Can you identify them? 30-60-90 & 45-45-90
5. The small arc on each triangle indicates the angle that should be placed at the origin. Practice placing each type of triangle in each quadrant.
6. Compare all the triangles. How are they similar? 30-60-90 are same size but different orientations
7. Why are each of these circles called **unit** circles? radius is 1 unit in length
8. Place the two isosceles right triangles in your unit circle in the first and second quadrants. (Remember that the arc indicates the angle that should be at the origin.)
9. Based on the measurements etched into the triangle in quadrant I, what should the $tan\ 45°$ be? 1
10. Recalling the parentheses in the quadrant ring, what should the $tan\ 135°$ be? -1
11. Place the isosceles triangles in quadrants III and IV. Find $tan\ 225°$ 1 Find $tan\ 315°$ -1
12. Take out a calculator and verify it is in degree mode. Find the tangent of 45°, 135°, 225°, and 315°. Do they match the results you discussed above? yes
13. What is the sin 45°? $\frac{\sqrt{2}}{2}$
14. Find the $sin\ 135°$, $sin\ 225°$, and $sin\ 315°$ $\frac{\sqrt{2}}{2}, -\frac{\sqrt{2}}{2}, -\frac{\sqrt{2}}{2}$
15. Do the decimal equivalents match the calculator values for the sine of these angles? yes
16. What is the cos 45°? $\frac{\sqrt{2}}{2}$
17. How can you quickly determine the $cos\ 135°$, $cos\ 225°$, and $cos\ 315°$? $-\frac{\sqrt{2}}{2}, -\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2}$
18. Move the isosceles right triangle to the side and examine the remaining triangles. What type of triangles are they? 30-60-90
19. Locate the triangle with the 30° arc that can be placed in the first quadrant and place it there. What is the $sin\ 30°$? $\frac{1}{2}$ What is the $cos\ 30°$? $\frac{\sqrt{3}}{2}$ What is the $tan\ 30°$? $\frac{\sqrt{3}}{3}$
20. Place the triangle with the 30° arc in quadrant II. Find $sin\ 150°$ $\frac{1}{2}$, $cos\ 150°$ $-\frac{\sqrt{3}}{2}$, $tan\ 150°$ $-\frac{\sqrt{3}}{3}$
21. What is a 30° angle in quadrant III? 210°
22. Based on what you know about the quadrant sign patterns, what will the sine, cosine, and tangent of that angle be? sine will be negative, tangent will be positive, and cosine will be negative
23. What is a 30° angle in quadrant IV? 330° Which trig function will be positive in quadrant IV? cosine

24. Now place your 60° angle with its arc at the origin in each quadrant and find sine, cosine, and tangent of each of the 60° angles.

25. Summarize your findings in the table below. Give exact values, not decimal equivalents.

	30°	45°	60°	120°	135°	150°	210°	225°	240°	300°	315°	330°
sin	$\frac{1}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{1}{2}$	$-\frac{1}{2}$	$-\frac{\sqrt{2}}{2}$	$-\frac{\sqrt{3}}{2}$	$-\frac{\sqrt{3}}{2}$	$-\frac{\sqrt{2}}{2}$	$-\frac{1}{2}$
cos	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{1}{2}$	$-\frac{1}{2}$	$-\frac{\sqrt{2}}{2}$	$-\frac{\sqrt{3}}{2}$	$-\frac{\sqrt{3}}{2}$	$-\frac{\sqrt{2}}{2}$	$-\frac{1}{2}$	$\frac{1}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$
tan	$\frac{\sqrt{3}}{3}$	1	$\sqrt{3}$	$-\sqrt{3}$	-1	$-\frac{\sqrt{3}}{3}$	$\frac{\sqrt{3}}{3}$	1	$\sqrt{3}$	$-\sqrt{3}$	-1	$-\frac{\sqrt{3}}{3}$

-1

26. What do you think $tan\ 405°$ is? 1 Explain. 405° is 45° more than 360° so it would be in Quad I

27. What should the $sin\ 510°$ be? $\frac{1}{2}$ - the same as $sin\ 150°$

28. If angles get bigger on a unit circle as you move counterclockwise, what happens as you move clockwise? the angles get smaller

29. What should $tan - 45°$ be? -1

30. How about $\sin -150°$? $-\frac{1}{2}$ Verify with your calculator.

31. Explain how knowing the values in the bolded part of the table above can help you find other special angles in a unit circle. They relate to where they are positioned with respect to the x-axis and the signs of the trig functions depend on which quadrants the angles are in

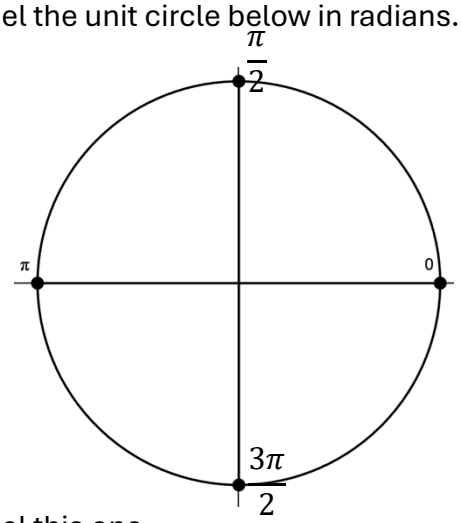
Unit Circle Exploration 2

Names Key Period ____

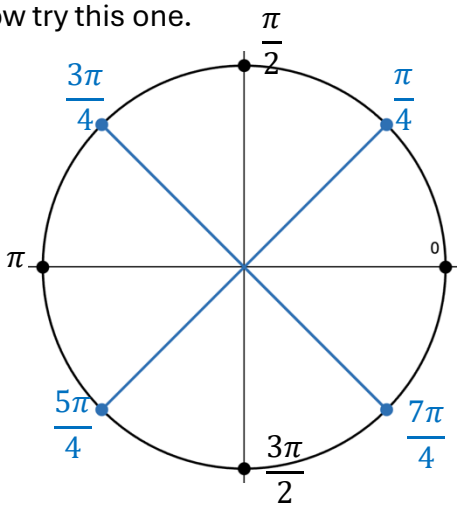
Discuss the answers to the following questions with your partner(s). Only fill in the blanks if you feel it helps you learn. Please do label problems 7 – 10.

1. Open your bag of unit circle pieces. Find the degree ring and place it in the coordinate plane square with 0° in the correct position.
2. Take one of the sectors of the circles (pie shaped wedge) and place it in the first quadrant aligned with the x-axis.
3. Now compare the radius of the circle to the arc length. they are the same
4. The central angle of the arc is 1 radian. Place two more sectors next to the original. How many radians are in a semicircle? π
5. How many radians are in a whole circle? 2π
6. If a semicircle is π radians, how many radians is ¼ of a circle? $\frac{\pi}{2}$

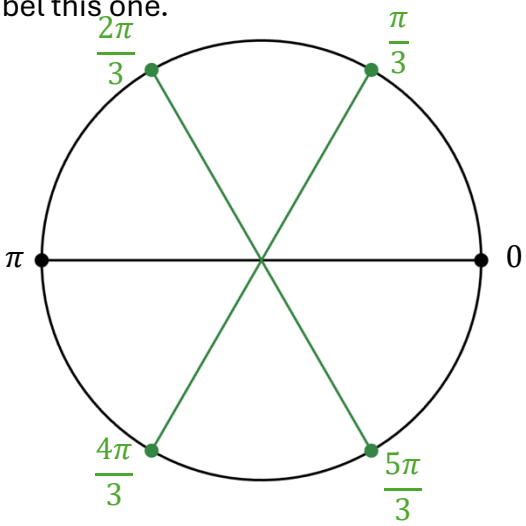
7. Label the unit circle below in radians.



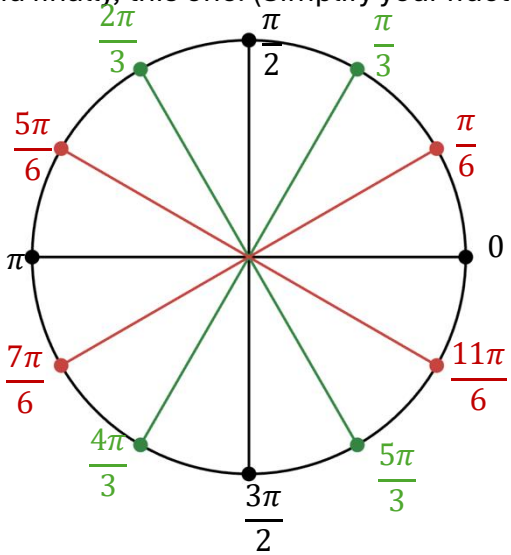
8. Now try this one.



9. Label this one.



10. And finally, this one. (Simplify your fractions.)



11. Now find the radian ring and compare it to your labeled images above. How did you do? _____
12. Compare the 45° angles with their radian measures. What do you notice? $\frac{\pi}{4}$s
13. Place the radian ring in the plane. Place the 30° angles in the plane. What do you notice? $\frac{\pi}{6}$s
14. When you place the 60° angles in the circle what do you notice about the radian measures? $\frac{\pi}{3}$s