2nd Quarter Project NC Math 3 Honors – The Unit Circle

Your job is to design a creative Unit Circle Poster that demonstrates your understanding of the unit circle and its derivation. This project will count as one test grade and is due on _____.

Directions:

Part A:

1. On a poster board, ***draw*** a large unit circle, including angle measures in both degrees and radians. Correctly label the coordinates at each point. The unit circle should cover a majority of the poster.
2. Choose 5 points (none that are on the axes, so not 90, 180, or 270 degrees) and ***draw*** five separate smaller circles around your larger circle. For each circle, show ALL work for deriving the coordinates of that angle measure, including any rationalizing that you do. (See the example below).

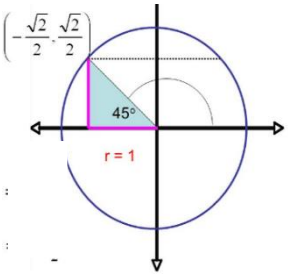
Part B:

3. Use your knowledge of the unit circle to fill in the chart on the back of this sheet. Make sure all your answers are in simplest radical form.

Things to remember:

- Your project must be neat and all angle measurements should be precise.
- Use creativity in presenting your project (3 dimensions, themes, bright colors, etc.)
- Be sure to attach the grading rubric to the back of your poster board.

Angle Derivation Example: Let's say I'm going to show the derivation for 135^0 $(3\pi/4)$ in one of my 5 smaller circles. I would go to that point and drop a perpendicular towards the x-axis thus forming a right triangle. I know the hypotenuse would measure 1 (because it's the unit circle and the radius is one). The central angle at this point (the reference angle) measures 45^0 (180 – 135 = 45). Therefore, this is a 45-45-90 special right triangle. I would then use my knowledge of a 45-45-90 and the Pythagorean Theorem to explain why the coordinates of this point are $\left(-\sqrt{2}/2, \sqrt{2}/2\right)$.



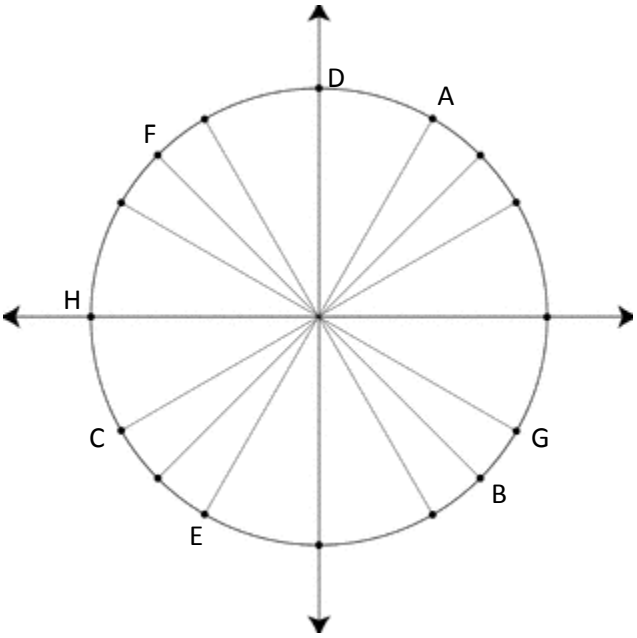
Unit Circle Project Grading Rubric

Your project will be graded using the following rubric:

- ◊ The main circle covers most of the poster board. (_____/5 points)
- ◊ The unit circle has correct angle measures in degrees. (_____/5 points)
- ◊ The unit circle has correct angle measures in radians. (_____/5 points)
- ◊ The unit circle has correct coordinates at each point. (_____/5 points)
- ◊ The unit circle angle measurements are accurate (i.e., the amount of space from 30 degrees to 45 degrees should be less than the amount of space from 60 degrees to 90 degrees). (_____/5 points)
- ◊ The student drew 5 separate circles to show derivations. (_____/5 points)
- ◊ All derivations were drawn by dropping perpendicular lines towards the x-axis. (_____/5 points)
- ◊ The project is neat, colorful, and creative. (_____/5 points)
- ◊ All mathematics is correct. Student has explained the derivations correctly and shown all work. (_____/10 points)
- ◊ Part B table is completed correctly. (_____/15 points)

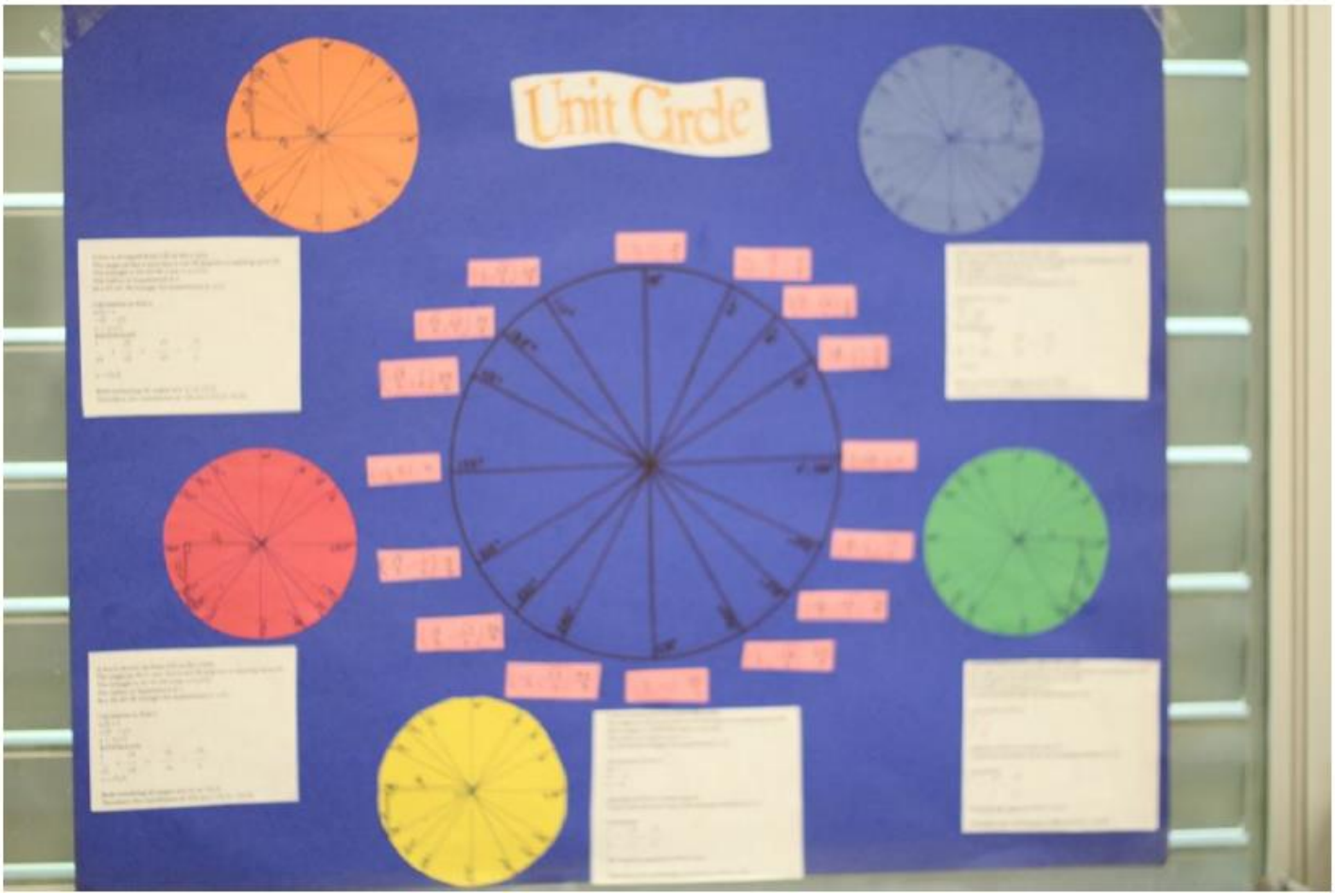
Total number of points: _____/65 Grade:_____

Part B: Fill in (__,__) with the correct ordered pair at each point. Then fill out the chart on the back of the page.



	Degree Measure	Radian Measure	Sin θ	Cos θ	Tan θ	Csc θ	Sec θ	Cot θ
Point A								
Point B								
Point C								
Point D								
Point E								
Point F								
Point G								
Point H								

Sample Unit Circle Projects



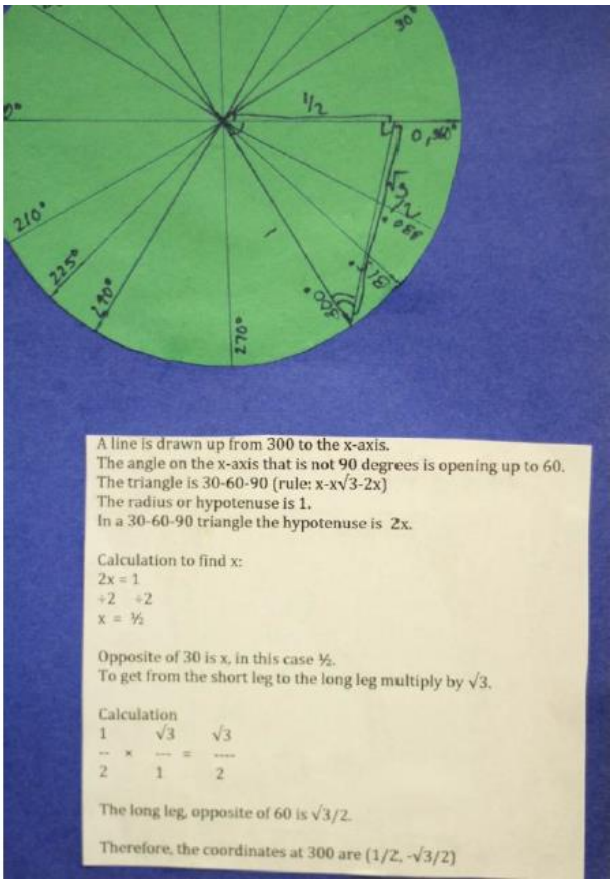
A line is drawn up from 225 to the x-axis.
The angle on the x-axis that is not 90 degrees is opening up to 45.
The triangle is 45-45-90 (rule: x-x-x$\sqrt{2}$)
The radius or hypotenuse is 1.
In a 45-45-90 triangle the hypotenuse is $x\sqrt{2}$.

Calculation to find x:
$x\sqrt{2} = 1$
$\div\sqrt{2} \quad \div\sqrt{2}$
$x = 1/\sqrt{2}$
RATIONALIZE

$$\frac{1}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} \rightarrow \frac{\sqrt{2}}{\sqrt{4}} = \frac{\sqrt{2}}{2}$$

$x = \sqrt{2}/2$

Both remaining 45 angles are "x" or $\sqrt{2}/2$
Therefore, the coordinates at 225 are $(-\sqrt{2}/2, -\sqrt{2}/2)$



A line is drawn up from 300 to the x-axis.
The angle on the x-axis that is not 90 degrees is opening up to 60.
The triangle is 30-60-90 (rule: x-x$\sqrt{3}$-2x)
The radius or hypotenuse is 1.
In a 30-60-90 triangle the hypotenuse is 2x.

Calculation to find x:
$2x = 1$
$\div 2 \quad \div 2$
$x = \frac{1}{2}$

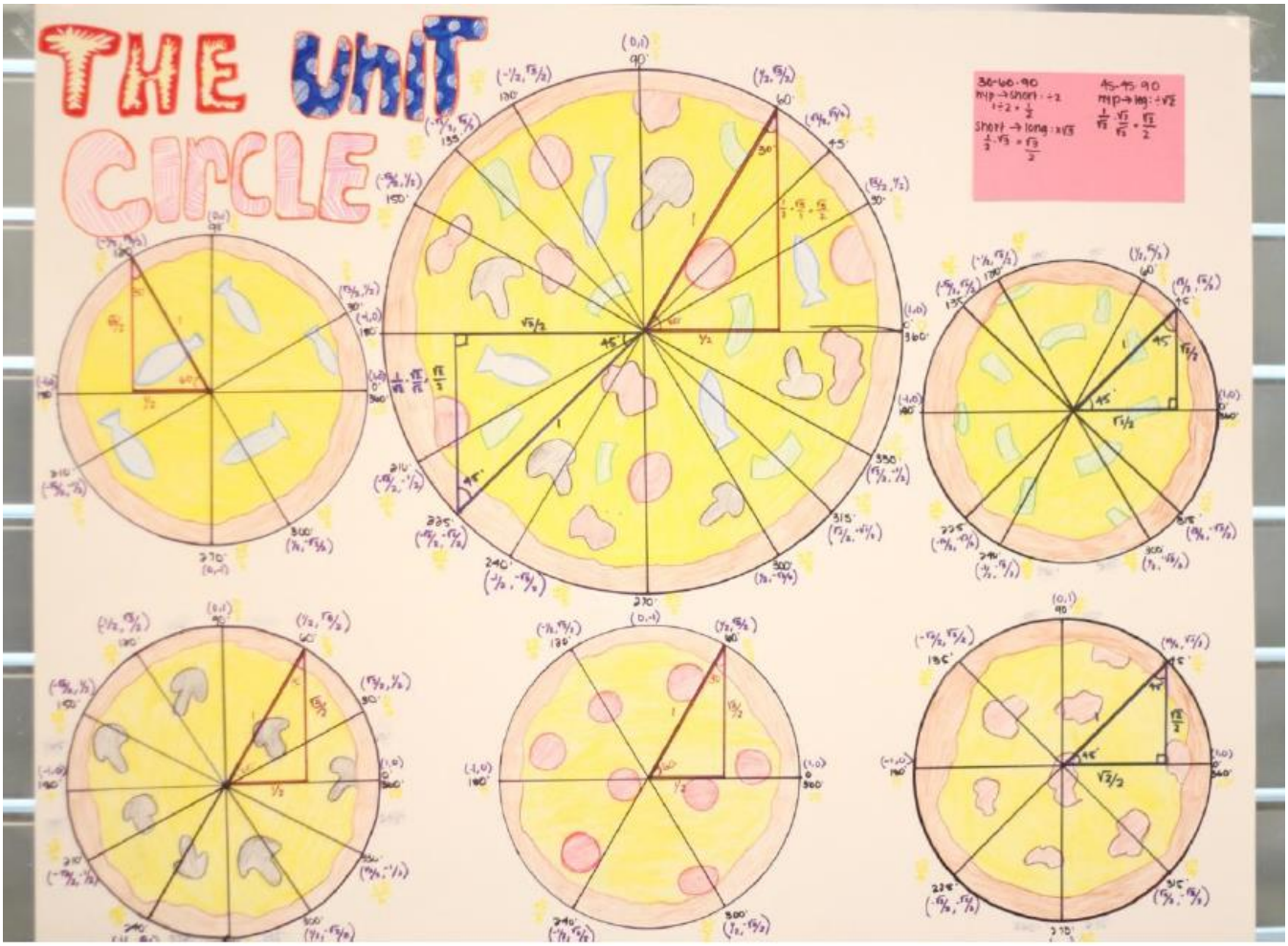
Opposite of 30 is x, in this case $\frac{1}{2}$.
To get from the short leg to the long leg multiply by $\sqrt{3}$.

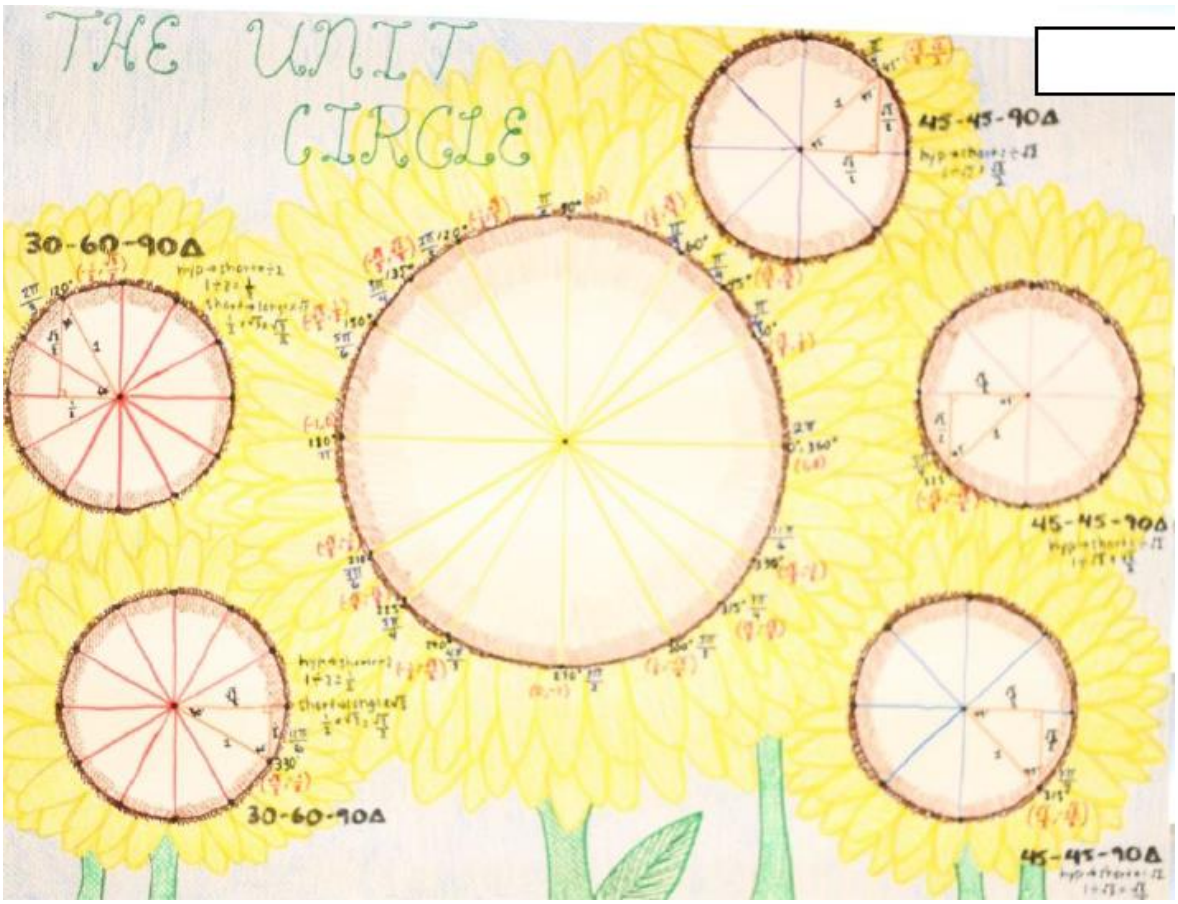
Calculation

$$\frac{1}{2} \times \frac{\sqrt{3}}{1} = \frac{\sqrt{3}}{2}$$

The long leg, opposite of 60 is $\sqrt{3}/2$.

Therefore, the coordinates at 300 are $(1/2, -\sqrt{3}/2)$




THE UNIT CIRCLE
45-45-90Δ
30-60-90Δ
45-45-90Δ
30-60-90Δ
45-45-90Δ