Before the activity:

Make sure your students' calculators are in degrees mode. Show them how to enter radians mode because they will be required to do so during the activity. If you have not already done so, familiarize them with the methods of solving special right triangles. Tell them that the unit circle is a circle centered at the origin in the coordinate plane, with a radius of 1. Give each of your students a copy of the blank unit circle (included) and tell them to draw an empty ordered pair by each red dot.

During the activity:

Transfer the "the unit circle.tns" file to each of your students' handhelds. Have them open it and go to page 1.2. They will see a circle centered at the origin, with radius one. Notice the text box in the bottom right-hand corner of the screen and that it measures the angle formed by the point on the unit circle, the origin, and the x-axis. Also notice the text box in the upper left-hand corner. It shows the coordinates of the point on the unit circle. Have your students change the angle measure a bunch of times.

On the blank unit circle, have each student use his or her protractor and measure each angle formed by each red point, the origin, and the x-axis. Fill in the angle measures on the unit circle. Have them choose any one of the red points in the first quadrant and draw a segment perpendicular to the x-axis through the point, forming a special right triangle. Then, tell them to solve the triangle and fill in the coordinates of the red point.

On page 1.2, the students should set the angle to 60 degrees. Take note of the coordinates. Have them then go to page 1.3. Have them calculate sin, cos, and tan of 60. Then calculate $\frac{\sin(60)}{\cos(60)}$. Ask your class the relationship between tangent and slope.

On the blank unit circle, continue filling in coordinates using the sin and cos ratios. If either coordinate appears irrational, it is either $(\sqrt{2})/2$ or $(\sqrt{3})/2$. $(\sqrt{2})/2$ is about .707, and $(\sqrt{3})/2$ is about .866.
Tell your class that 1 radian = the length of the radius around a circle. Then put their calculators in radian mode. On the blank unit circle, locate the point representing 180 degrees.

On page 1.3, enter 180, and then enter the degree symbol via the catalog. Press enter. Notice 180° = π radians. On the unit circle, have your students write, by the point representing 180°, π rad. Have your students go to page 1.2, and change their graphing angle to radians. Change the angle measure to π, and the angle measure in degrees should be 180. Change the graphing angle to degrees.

Have your students calculate the radians for each red point on the blank unit circle, and write it down. To get the exact value of the number of radians:

- Divide the approximate value by pi
- Convert to fraction
- That number will be the number of pi the exact value of radians is = to

Have your students turn in the blank unit circle. Answer key included as Blank Unit Circle Solution.pdf.

After the activity:

Print out the PDF file Blank Unit Circle Solution.pdf. Play a simple game with your students:

Ask a question from one of these templates:

- How many degrees are blank radians?
- How many radians are blank degrees?
- What is sin of blank radians?
- What is cos of blank radians?
- What is sin of blank degrees?
- What is cos of blank degrees?

The first student who calls out correctly the answer gets 30 “radian points”. Play until one person has 180 radian points.

I hope you and your class have fun with this activity!