Round and Round She Goes…
ID: 12385

Time Required
20 minutes

Activity Overview
In this activity, students will explore relationships on the unit circle. Students will identify coordinates of points given an angle measure in degrees.

Topic: Unit Circle
- *Right triangle trigonometry and the unit circle*
- *Special right triangles*
- *Cosine and sine on the unit circle*

Teacher Preparation and Notes
- *The first problem and second problem engage students in the exploration of the connection between angle measure and the coordinates of points in the first quadrant.*

- ***To download the student worksheet, go to education.ti.com/exchange and enter "12385" in the quick search box.***

Associated Materials
- *PrecalcWeek08_UnitCircle_Worksheet_TI84.doc*

Suggested Related Activities
To download any activity listed, go to education.ti.com/exchange and enter the number in the quick search box.
- *Graphs of Sine and Cosine (TI-Nspire technology) — 9431*
- *Graphs of Sine, Cosine, and Tangent (TI-Nspire technology) — 8314*
- *Graphing in Circles (TI-Nspire technology) — 9893*
- *The Unit Circle (TI-Nspire technology) — 9404*
- *Trig Values of the Unit Circle (TI-84 Plus) — 6562*

Problem 1 – Introduction to the Unit Circle

Students are introduced to the concept of the unit circle. Right triangle relationships are explored to develop an understanding of the patterns involved.

Special right triangles are addressed to help students understand the exact values they will likely be expected to know.

Students often have difficulty with remembering some of these special values. Ask students if they can see a pattern that might help them remember that $\frac{\sqrt{2}}{2}$ goes with the 45-45-90 triangle. Students may point out that there is a pattern of twos—two angles and two sides are the same.

Similarly, ask them how they might remember that $\frac{\sqrt{3}}{2}$ goes with the 30-60-90 triangle. Students may state that there is a pattern of threes—all angles involved are multiples of 3. Next, once students realize that $\frac{\sqrt{3}}{2}$ and $\frac{1}{2}$ go together in an ordered pair, it is easy to point out using a unit circle sketch that a 60° angle involves an x-value that is $\frac{1}{2}$ and the 30° angle involves a y-value that is $\frac{1}{2}$.

Problem 2 – Extending the Pattern

Students use a visual model to extend what they established in Quadrant I to Quadrants II, III, and IV.

It is very helpful for students to think about symmetry as they move on to these other quadrants. Construction of rectangles in the unit circle is helpful for many students to make this extension.
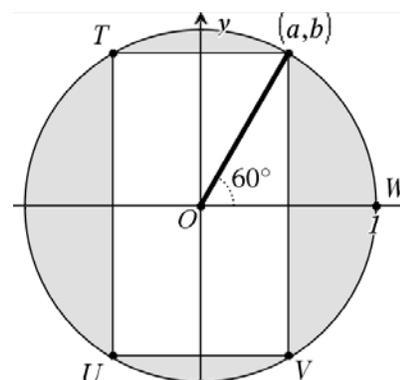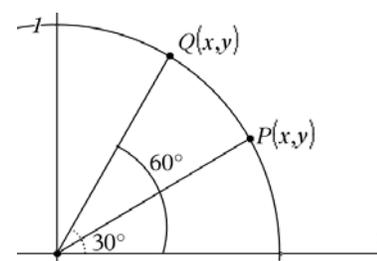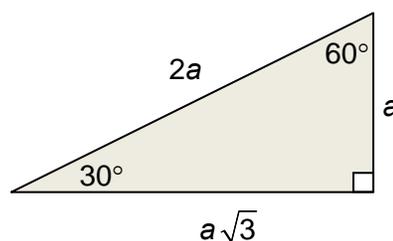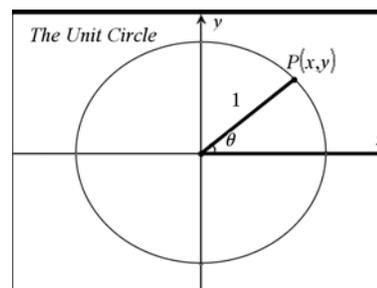
Student Solutions

1. $x = \cos \theta$

2. $x = \sin \theta$

3. $\dfrac{1}{2}$

4. $\dfrac{\sqrt{2}}{2}$

5. $\left(\dfrac{\sqrt{3}}{2}, \dfrac{1}{2} \right)$

6. $\left(\dfrac{1}{2}, \dfrac{\sqrt{3}}{2} \right)$

7. $\dfrac{\sqrt{3}}{2}$

8. $\dfrac{1}{2}$

9. $\dfrac{1}{2}$

10. $\dfrac{\sqrt{3}}{2}$

11. $\left(\dfrac{\sqrt{2}}{2}, \dfrac{\sqrt{2}}{2} \right)$

12. $\dfrac{\sqrt{2}}{2}$

13. $\dfrac{\sqrt{2}}{2}$

14. $(-a, b)$

15. $(-a, -b)$

16. $(a, -b)$

17. $120°$

18. $240°$

19. $300°$