

Round and Round She Goes...

ID: 12386

Time Required
20 minutes

Activity Overview

Students will explore relationships on the unit circle. They 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

- This activity was designed for use with TI-Nspire technology, both CAS and non-CAS versions.
- The first problem in the TI-Nspire document engages students in the exploration of the connection between angle measure and the coordinates of points in the first quadrant. The second problem extends this exploration to the other quadrants.
- The use of the worksheet is optional for this activity. It is used as a place for students to record their answers.
- **To download the student and solution TI-Nspire documents (.tns files) and student worksheet, go to education.ti.com/exchange and enter "12386" in the quick search box.**

Associated Materials

- RoundandRoundSheGoes_Student.doc
- RoundandRoundSheGoes.tns
- RoundandRoundSheGoes_Soln.tns

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

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

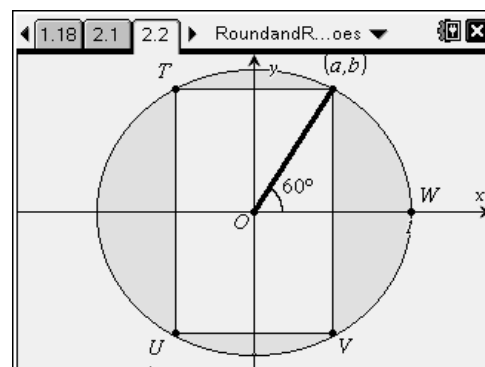
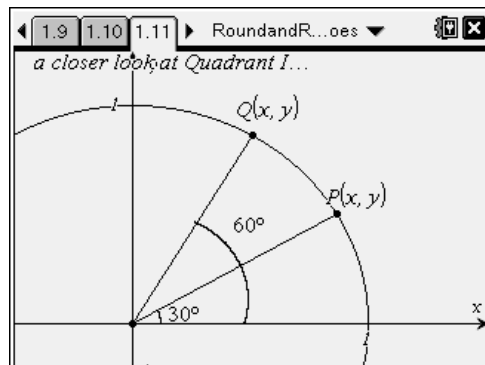
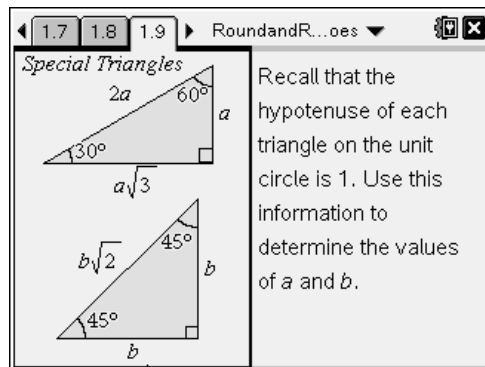
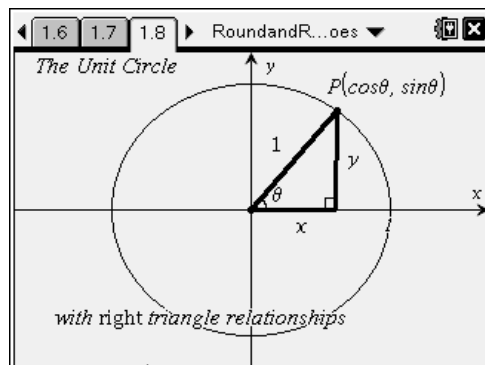
a y-value that is $\frac{1}{2}$.

Students answer several questions as they proceed through this activity. The questions may be answered on the provided worksheet or on the student TI-Nspire document.

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. $y = \sin \theta$

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

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

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

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

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

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

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

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

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

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

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

14. $(-a, b)$

15. $(-a, -b)$

16. $(a, -b)$

17. 120°

18. 240°

19. 300°