UNIT CIRCLE INVESTIGATION

Pre-AP Geometry - 9th grade

Objectives

- apply the relationships in special right triangles 30°-60°-90° and 45°-45°-90° and the Pythagorean theorem, including Pythagorean triples, to solve problems.
- select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate, and techniques, including mental math, estimation, and number sense as appropriate, to solve problems;
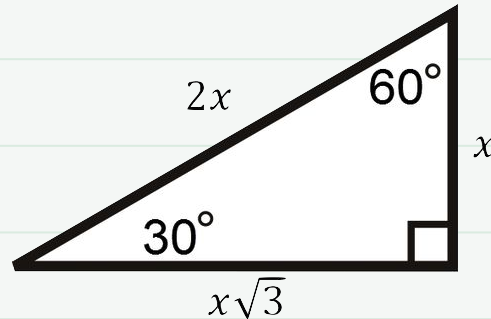
Student prior knowledge

Special Right Triangles

45-45-90

45°
$x\sqrt{2}$
x
45°
x

30-60-90

$2x$
60°
x
30°
$x\sqrt{3}$
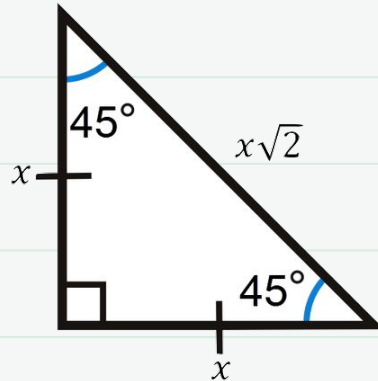
Lesson Outline

Engage

Students will review the special right triangles.

Explore

Students will construct the unit circle using the special right triangles and a compass.

Evaluate

Students will be given an exit ticket to evaluate whether or not they met the learning goals for this lesson.

Warm Up

Students will review the special right triangles by

- cutting out a square and two equilateral triangles from a sheet of paper,
- folding each shape in half to create the special right triangles, and
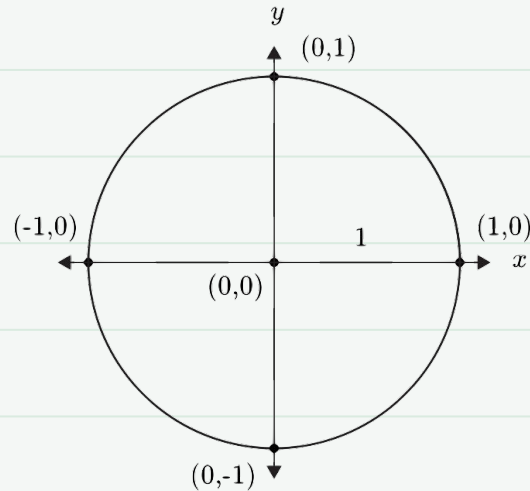- labeling them according to their patterns.

Note: The length of the hypotenuse of each triangle will be 1.
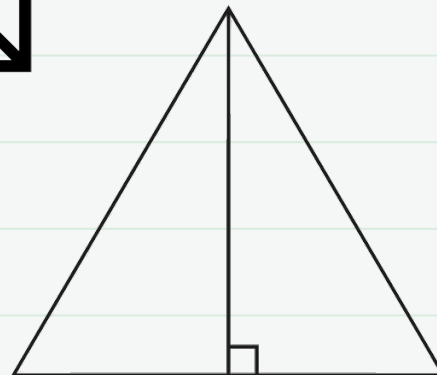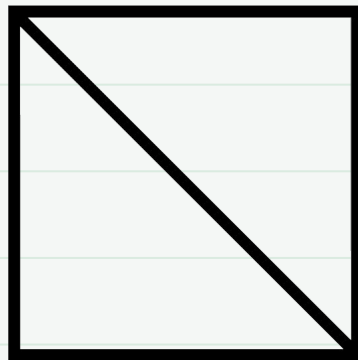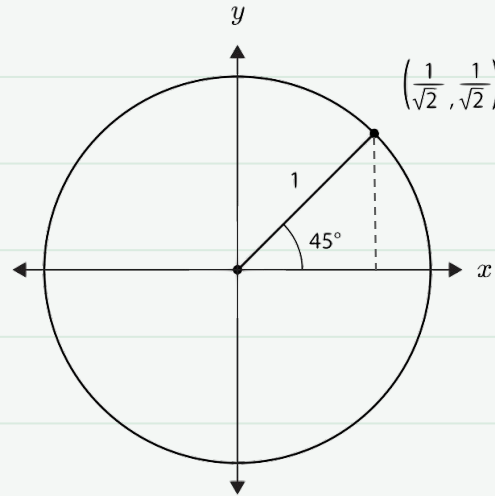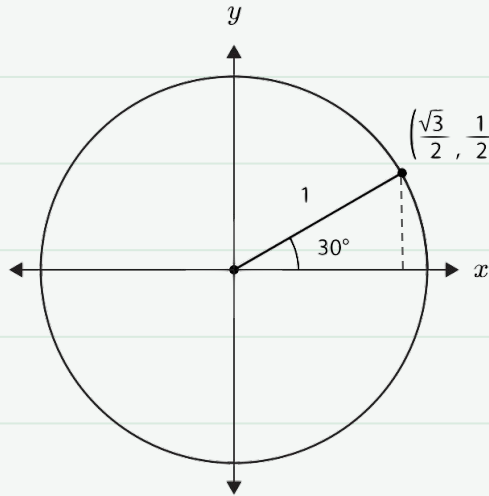
Lesson Activity: Step 1

Students will be given the following definition:

A **unit circle** is a circle with center O starting at the origin (0,0) and a radius of one.

Lesson Activity: Step 2

Students will solve for the coordinate points of the two triangles below by using the patterns they reviewed in the warm up and the fact that the hypotenuse of each triangle is one.
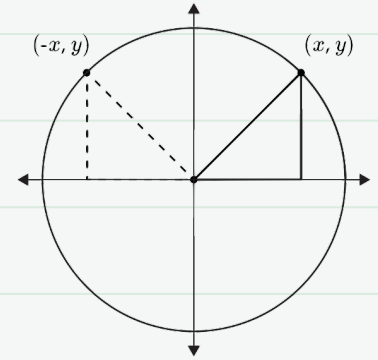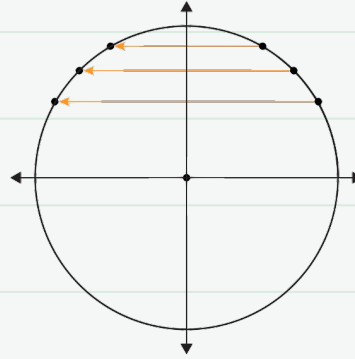
Lesson Activity: Step 3

Students will reflect the point at 30 degrees diagonally to get the point at 60 degrees. They will see that this new point has the same coordinate points as the original one, except that their order is flipped.
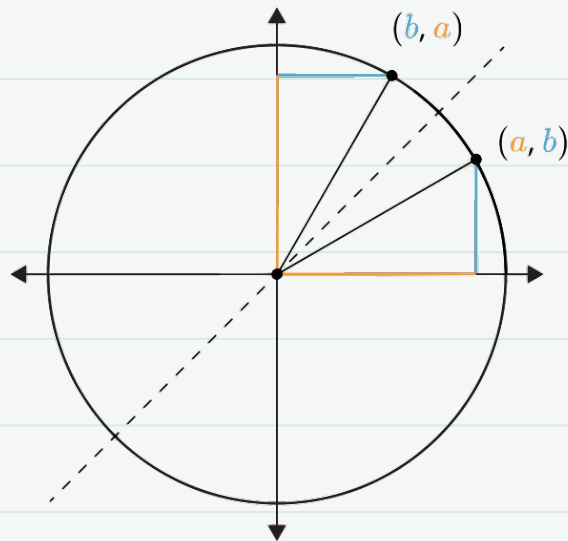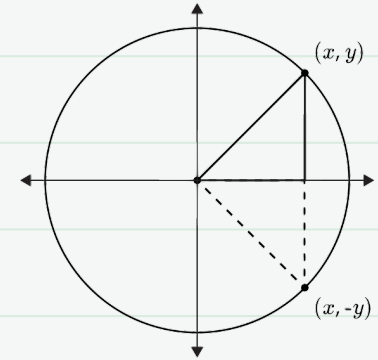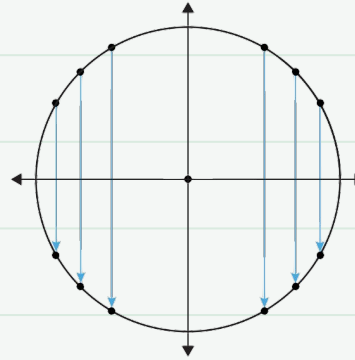
Lesson Activity: Step 4

Students will reflect the points in the first quadrant into the second quadrant. They will observe that all of the y coordinates will be the same, but all of the x coordinates will become negative
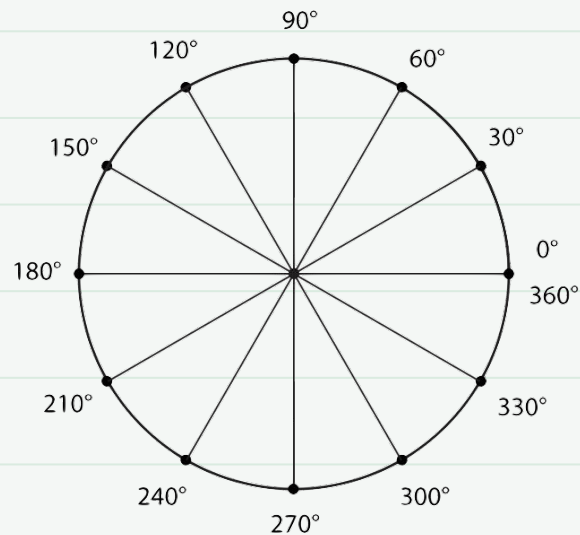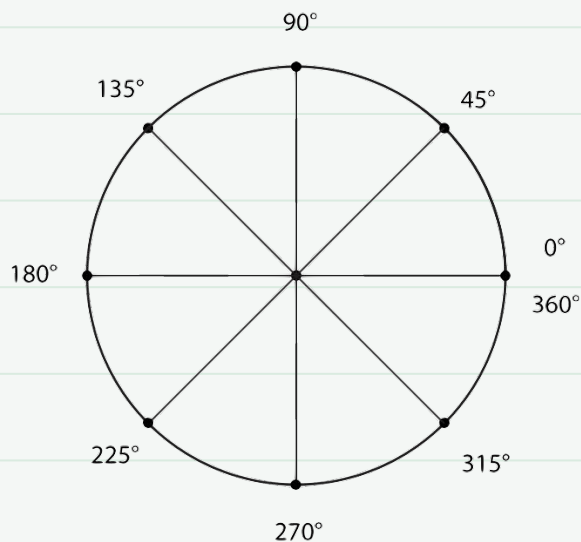
Students will reflect the points across the x axis. They will observe that all of the x coordinates will be the same, but all of the y coordinates will become negative.

Lesson Activity: Step 5

Students will label the angle measures at each point by following the pattern the angle measures follow in the first quadrant.

How Did I get the students excited about the lesson?

- My students love hands-on activities, especially when they get to use the compass. The students were actively engaged because it was a hands-on, collaborative activity.
- They were also very curious when I told them that we were going to construct a circle by using triangles. They wanted to know how this was possible.

How were students formatively assessed?

Students completed an exit ticket that asked them to reflect on how they were able to use the special right triangles to construct the unit circle.

How I differentiate Instruction

Students are able to go through each step at their own pace since they will be given a checklist of all the steps.

Self-Paced

This lesson is great for students who benefit from hands-on, social, and visual activities.

Caters to different Learning Styles

Connection with a future Topic

This lesson was exciting for me to teach because it introduces Geometry students to a topic they will cover in Pre-Calculus. Most importantly, it connects a topic they are learning now, Special Right Triangles, to a future topic. Students will be better able to understand the unit circle if they know that special right triangles are used to construct it. They will be less intimidated by learning the unit circle in Pre-Calculus since they have been introduced by it before and will also be able to learn it quicker.

END