Do You See What I See? Graphing on the Coordinate Plane

Students will be given integer and decimal coordinates that will reveal a picture when graphed. Students will also create their own images to challenge classmates. This lesson can be extended to polygon attributes for 5th and 6th grade, and transformations and proportional reasoning for 7th and 8th grades.

Grade Level: 4th (enrichment) - 6th

Topics: Place Value
Proportional Reasoning
Geometry: graphing on the coordinate plane
two-dimensional figures on the coordinate plane

Math Standards:

5.1NBT	6.5NS
5.1G	6.6NS
5.3G	6.7NS
	6.8NS
	6.3G

Goals:
- Students will be able to graph (x,y) coordinates in all 4 quadrants.
- Students will recognize the relationship between positive and negative numbers.
- Students will use place value to create decimal coordinates to the hundredths.
- Students will transform figures using reflection, translation and dilation.
- Students will be able to identify properties of two dimensional figures.

Prerequisite Knowledge: Student should be able to graph integer coordinates in the first quadrant of the coordinate plane.

Materials list:
- 8 ½ x 11 sheets of grid paper in 1 inch and ¼ inch sizes, **or** 1 cm and ½ cm sizes
- large sheets of 1 inch grid paper **or** grid for overhead/computer projector
- Mystery Pictures activity sheet for each student
- rulers

Activity time: 2 – 5 class periods

References: illuminations.nctm.org/Activities.aspx?grade=all&standard=all
Turtle Pond
Scale Factor
Shape Sorter, Shape Tool, Shape Cutter
www.nsa.gov/academia
select Middle School Geometry
"Exploring Transformations"
"What's Your Coordinate"

Directions for Graphing: Students will graph the given points and connect the points by following the arrows. Each row of coordinates begins a new line of the drawing. Students should connect the points as they go and not graph all coordinates first.

Lesson Plans

Day 1

Tell students that they are going to be given coordinates that will reveal secret pictures. Ask them to keep the secret until their classmates are finished.

Assessment for this task is very authentic. If the pictures are drawn incorrectly, students quickly see where they made errors and can self correct.

Provide students with directions for "Lighting the Night" , centimeter grid paper, and rulers. Students will need to create axes and numbers. Discuss how the grid should be numbered and whether or not all four quadrants are required for the picture. Students should notice that all coordinates are positive numbers and they could just use quadrant one. Have students graph the coordinates and compare results.

Have students work in pairs for "Furry Friend". Students could use a different color and the same coordinate grid. Observe how students work with coordinates $(5.5,2)$ and $(5.5,1)$. After students complete the cat picture, discuss these two coordinates. "What does this tell us about points on the plane?" Students should be led to understand that there are infinite numbers on the plane.

Day 2

Hand out centimeter or inch grid paper to each student. Review the discovery that points exist between the numbered lines on a coordinate plane. Students should work in groups. Each member of the group will draw axes and number by ones. Students will then graph and draw "Boo" on their grid.

Hand out ½ cm or ¼ inch grid paper to students and direct students to label the axes by tenths beginning with the origin (0,0). Have students work with a partner to complete "Rhymes with Cat" and then compare their results.

Students should work independently on "Two Cats".

Day 3

"Autumn Night" has coordinates that use hundredths. Invite students to write numbers from 0 to 1 with increments of .05 and compare their results with a partner. Students may want to think of counting by nickels up to one dollar. After discussing their ideas, write the numbers on the board or chart paper and have students use centimeter grid paper to create a coordinate plane. This will make it easier for students to write the numbers on the grid. Students will only need quadrant one.

Hand out the directions for "Winter Night" and have each student work to graph the picture. After students are done, invite them to add leaves or other branches to the tree and find the correct coordinates. These should be written on the board or on chart paper for classmates to try.

"Computer" is the only picture that uses positive and negative coordinates. This offers an opportunity to discuss the relationship between positive and negative numbers and absolute value.

Days 4 and 5

Students will design their own secret picture. It is helpful for students to draw the picture first and then plan how to write the coordinates. Students should be encouraged to include decimals as well as integers in their picture. Have students exchange their list of directions and challenge them to create the picture they planned.

Extension activities

Have students explore polygon attributes by drawing squares, rectangles, triangles and parallelograms on the coordinate plane. Use the illuminations computer activity "Shape Sorter" or create a classroom Venn Diagram to discuss what these polygons have in common and how they differ.