Geometry

Coordinate Connections

Grade 5

Rationale

- Many students become familiar with coordinate grids in a practical way by reading maps or playing games. However, it is important for students to have a working understanding of the coordinate system, including correct terminology and an understanding of the x and y axes, for application in higher level mathematics. This lesson helps students to begin to understand the coordinate system in a way that allows them to learn and use the structure of the coordinate grid. The most common errors students make when using the coordinate system involve the reversal of the x and y coordinates or x and y axis. In this lesson, students will see what happens when the coordinates are reversed and will devise a memory aid to help differentiate between the y and y axes and coordinates.

Goal

- To plot coordinate points accurately within a coordinate system and represent two-dimensional figures by connecting points that have been plotted on the coordinate grid

Standard

- **5.G.1** Use a pair of perpendicular lines, called axes, to define a coordinate system, with the intersection of the lines (the origin) arranged to coincide with the 0 on each line and a given point in the plane located by using an ordered pair of numbers, called its coordinates. Understand that the first number indicates how far to travel from the origin in the direction of one axis, and the second number indicates how far to travel in the direction of the second axes, with the convention that the names of the two axes and the coordinates correspond (e.g., *x*-axis and *x*-coordinate, *y*-axis and *y*-coordinate).

Objectives

- Students will plot given coordinates within the coordinate system.
- Students will connect coordinate plots with line segments to create two-dimensional figures.
- Students will develop a list of coordinates that, when connected, will create design for a two-dimensional figure.

Materials

- Graph paper
- Pencils
- Rulers
- Overhead transparency of graph paper or other large chart graph paper and various colored markers
- ***Coordinate System*** example sheet
- ***Blank Grid***

Procedures

Duration: This lesson should take between 45 to 60 minutes.

Structure:

- Start the lesson by posting or drawing a grid with a pair of axes on the board.
- Brainstorm as a whole group to determine prior knowledge about this system. Say, "Today we are going to learn about the coordinate system. What do you already notice or know about the coordinate system?" Record students' answers, and continue to prompt them to share without commenting on the accuracy of their responses.
- Give students an individual copy of the ***Blank Grid.*** Choose a student to place a point somewhere on his/her individual grid and keep it hidden from the rest of the class. Make sure that the student places the point at the intersection of two lines on the grid.
- Have the student try to tell the rest of the class where his/her point was placed without showing it. Have the students place the point on their own grids by following the first student's instructions.
- Have the first student show his/ her point to the class. Lead the class in a discussion about how the description had either helped or not helped them correctly place the point. Discuss how it could have been better and through the discussion help to clarify, insert correct terminology, and correctly label the grid. Then, if it has not come up in the discussion, show how to properly name a point using the *x* and *y* coordinates.
- Say, "One of the biggest errors that people make when using the coordinate system, is that they confuse which number represents how far to move along the x axis, and which tells them how far to move along the y axis. Now we are going to do an activity to help us see the importance of reading and using the coordinates correctly."
- Provide students with the coordinates for the point (1,0) and ask a student volunteer to plot the point plot the point on the coordinate system.

- Continue this process with the next three coordinate points guiding students, if necessary to place the points correctly. The final 3 points are as follows: (4,0), (4,4), and (1,4).
- Once all points have been plotted, have a student volunteer connect the plotted points to form a square.
- Say, "Placing the points correctly, we formed a square, what shape do you think we would make if we confused the *x* and *y* coordinates?"
- Using a different color for the overhead transparency or chart paper, show the students what the figure would look like if the coordinate points were not read correctly. In other words, by reversing the distance and direction designated by the x-axis and the y-axis, a rectangle would have been formed.
- Pass out 3 more sheets containing copies of the blank coordinate points and provide students with the remaining coordinate points for 3 more two-dimensional figures. They are as follows: triangle – (0,0), (3,0), (0,4); trapezoid – (1,0), (5,0),(4,3),(2,3) ; rhombus – (3,0),(5,3),(3,6),(1,3).
- Students will work in small groups (3 or so students per group) to plot the coordinate points onto the coordinate system and connect the plotted points to create two-dimensional figures.
- Students will then name the two-dimensional figures created to check for accuracy of their work.
- *Closing:* The instructor will involve students in a discussion revisiting the brainstorming activity conducted prior to the coordinate point plotting activity to review information gathered during the activity that helped to plot coordinate points accurately onto a coordinate system and review the x-axis and y-axis correspondence. "What have we learned about the x and y-axis?" "What happens if we don't follow the x-axis direction and distance for the correct coordinate point?" "What happens if we don't follow the y-axis direction and distance for the correct coordinate point?" Ask students to think about how they could come up with a way to remember and differentiate between the x and y coordinates and x and y axes.

Teacher Tips

- As small groups conduct plotting, check for accuracy of x-axis and y-axis plotted points. If they are reversing the points, have them look at the sample points that were plotted on the board or overhead. Have them use this as a reference to see if they are interpreting the points in the say way.
- Using color coding, for the axes and points x (red) and y (blue) may be helpful reminders for students having difficulty remembering which direction and how far to travel on each axis.
- Memory keys will be best if they are suggested by the students. However, the following methods can be suggested: For remembering which axis is which, remember that the letter y has a straight line that "hangs down." Remember that x comes before y in the alphabet, so therefore, the x coordinate comes before the y coordinate when naming a point.
- Providing key cooperative roles for small group work may be helpful. Such roles

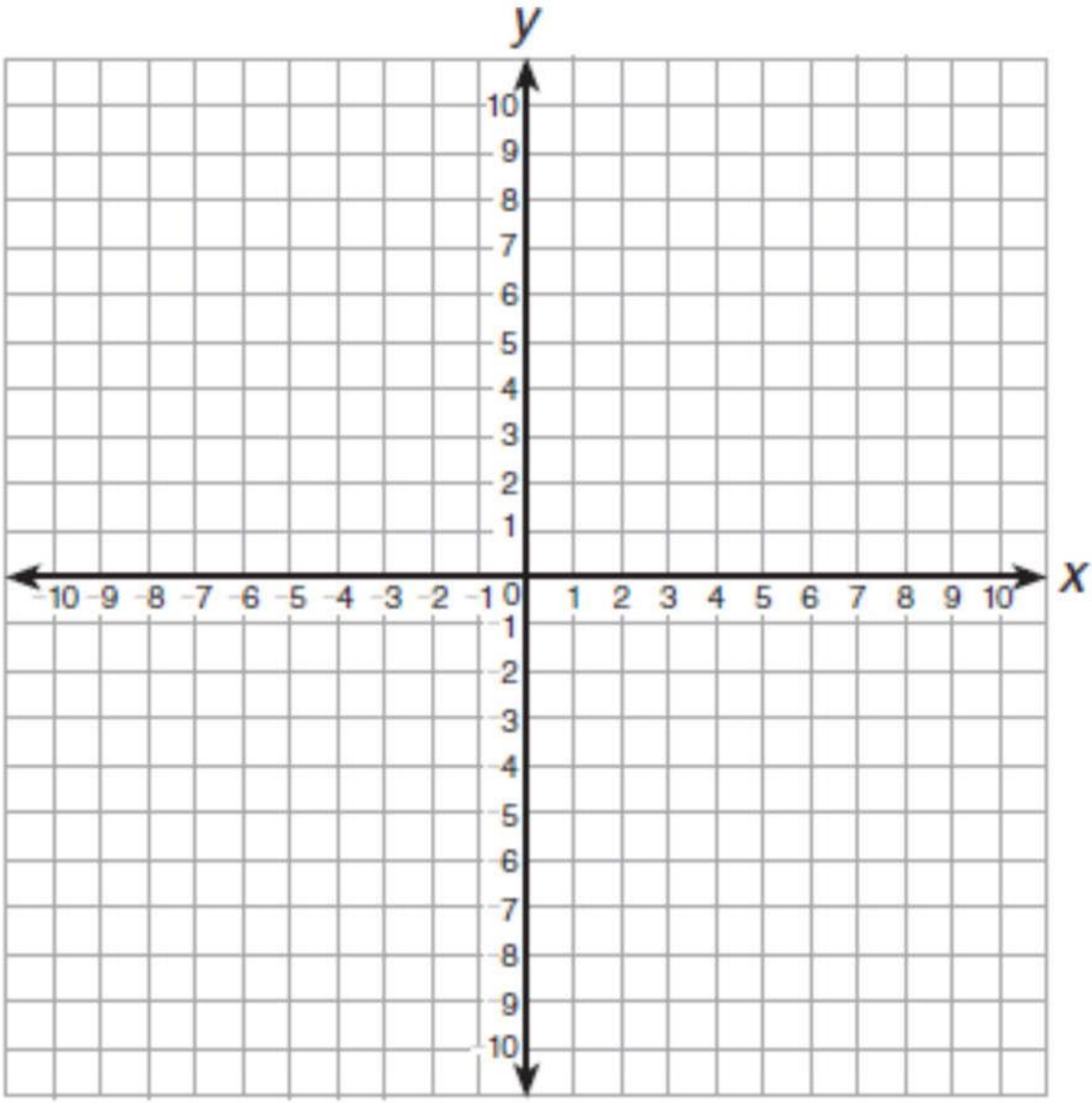
may resemble a recorder, x-axis locator, and y-axis locator. All members of the team are responsible for the two-dimensional figure represented on the coordinate system as each are completed. These roles can be rotated so that all team members have the opportunity to perform each role within the lesson.

- For the purposes of this lesson, students will only be plotting points in the first quadrant (all positive values.) When drawing the axes, all four quadrants should be shown and discussion can include an understanding of negative values, however the naming and placement of points should be within the first quadrant at this grade level.

Extension Activities

- Extend the lesson by allowing students to create their own two-dimensional figures on the grid. Have them list the coordinate points so that another individual could recreate their drawing by following their directions (coordinate points.) All coordinate points that make up the figure must be recorded in order as the figure is designed and that the plotted points should be connected. The final step in the process is to connect the first and last coordinate point to show the design of the two-dimensional figure. The figure should also be named according to the number of sides (e.g. a pentagon if the figure has 5 sides).
- Students may trade lists of coordinates for other students to plot and recreate their shape. The coordinate lists can also be used for an interactive bulletin board.
- Play a hide and seek game using the coordinate grid. One person will choose a location to "hide" a point somewhere on the grid. The rest of the class will then make guesses to narrow down and eventually guess the location of the point by asking yes and no questions (i.e. "Is the *x* coordinate greater than 5?")

Coordinate System



Two-Dimensional Figure Name: _____

Blank Grid