

Coordinate Connections

Summary

Students will complete several activities that involve coordinates and graph paper.

Materials

For each student:

2 sheets 1/2-inch graph paper

1 sheet 1/4" graph paper

1 sheet lined paper

Privacy folder (optional)

- [Coordinate Grid worksheet](#)

- [Ice Cream Sundae worksheet](#)

Ruler

Pencil

Additional Resources

Book

- *Treasure Island*

, by Robert Louis Stevenson; ISBN 0-486-27559-0

Background for Teachers

Analytic geometry

, the branch of geometry that deals with lines, curves, and geometric figures plotted on a set of axes using coordinates, was first developed in the 17th century by the French mathematicians Pierre de Fermat and René Descartes.

You can use a *coordinate* grid to locate points on the plane. The x-axis and the y-axis are number lines. They intersect at right angles at their zero points, the *origin*. Any point can be located using an ordered pair. The first coordinate tells you how far to move on the x-axis from the origin. Coordinates of points to the right of the origin are positive numbers. Coordinates of points to the left are negative numbers. The second coordinate tells you how far to move on the y-axis from the origin. Coordinates of points up from the origin are positive numbers. Coordinates of points down from the origin have coordinates that are negative numbers.

Students should understand the following vocabulary for this activity:

number line--A line that shows numbers in order.

positive numbers--Numbers greater than zero.

negative numbers--Numbers less than zero.

coordinate grid--A set of lines used to locate points on a plane.

x-axis--The horizontal axis on a coordinate grid.

y-axis--The vertical axis on a coordinate grid.

origin--The point (0,0) where the x- and y-axes of a coordinate grid intersect.

quadrants--The four regions (labeled by Roman numerals) into which the two axes of a coordinate grid divide the plane (labeled in counter-clockwise order with quadrant I in upper right corner).

ordered pair--A pair of numbers used to locate a point on a coordinate grid. (The x-axis coordinate is always first because "x" comes before "y" alphabetically.)

coordinate--One of the numbers in an ordered pair.

x-coordinate--The first number in an ordered pair, locating a point on the x-axis of a coordinate grid.

y-coordinate--The second number in an ordered pair, locating a point on the y-axis of a coordinate grid.

Intended Learning Outcomes

4. Communicate mathematically.

Instructional Procedures

Invitation to Learn

Suppose you are having a birthday party and a friend you have invited has asked you for directions from the school to your house. You tell them it is five blocks away. Is this enough information for them to find your house?

Instructional Procedures

Discuss the importance of giving specific directions in real-life situations and have students give examples to illustrate.

Hold up a piece of graph paper and explain to students that you can also give specific directions to find an exact location on this piece of graph paper.

Distribute a [Coordinate Grid worksheet](#) to each student to use as the vocabulary is discussed.

Introduce or review the following vocabulary: number line, positive numbers, negative numbers, coordinate grid, x-axis, y-axis, origin, quadrants, ordered pair, coordinate, x-coordinate, y-coordinate.

Provide each student with 2 sheets of 1/2-inch graph paper and 1 sheet of lined paper.

On one piece of graph paper, instruct the students to draw and label a coordinate grid including the four quadrants and x- and y-axis lines.

Students draw a simple design that extends into all four quadrants of the coordinate grid.

Note: The design should consist of a series of dots connected by straight lines; "dot-to-dot" style with no curved lines.

Distribute an [Ice Cream Sundae worksheet](#) to each student as an example.

On the blank side of another piece of graph paper, have students write directions for their design, consisting of sequential ordered pairs that, when graphed and connected with straight lines, will duplicate their design.

After students have completed writing the series of ordered pair directions for their design, have them bring both the designs and their directions to the teacher for evaluation.

Students then exchange their *directions only* with another classmate who has not seen their design. (You may want to use privacy folders so students cannot see each other's designs.)

On another piece of graph paper, instruct the students to draw and label a coordinate plane including the four quadrants and x- and y-axis lines.

Following their classmate's written directions, have them graph each ordered pair on the coordinate grid.

Sequentially connect the points with straight lines using a ruler.

Compare the completed design with the classmate who wrote the directions. If their designs are not congruent (same shape and size), have the two troubleshoot and problem solve whether the problem was in the directions, or in the way the student read and graphed the directions. Discuss the implications these scenarios could have in real-world situations if either the directions were incorrect or unclear, or if they were not followed properly (e.g. an engineer writing directions for a mechanic to build a machine the engineer designed, an architect drawing plans for a builder to follow, etc.

Students complete the *Ice Cream Sundae* picture on 1/4" graph paper as they have time.

Extensions

- *Treasure Island*

is a classic story of a search for pirate treasure. Stevenson based the story on a map drawn by his son, Lloyd. Read this story and create connections using coordinates and mapping activities.

Make an entry in your daily math journal.

A person who makes maps professionally is known as a cartographer. Invite students to research maps that were made at an earlier time and compare them to maps made today.

Students find the location of latitude and longitude coordinates on a world map.

Challenge advanced learners to draw and write directions for a more complicated design on 1/4" graph paper.

Family Connections

Play Battleship as a family to reinforce the idea of coordinate grids and ordered pairs.

Locate streets on a map of your city using coordinates.

Assessment Plan

Evaluate students' understanding of the objective(s) using the following rubric:	
4 Full Accomplishment	Student accurately plots points and reads the coordinates of points on a coordinate grid.
3 Substantial Accomplishment	Student plots points and reads the coordinates of points on a coordinate plane, but not always accurately.
2 Partial Accomplishment	Student has difficulty plotting points and reading the coordinates of points on a coordinate plane.
1 Little Accomplishment	Student does not plot points or read coordinates of points on a coordinate grid accurately.

Have students draw a four-quadrant grid with all quadrants labeled. Then plot two given points in each quadrant and label them with the correct ordered pairs. Example: A(3,5); B(3,-4); C(0, 4); D(-2,0); etc.

Bibliography

Research Basis

Johnson, D. & Johnson R. (1975). *Learning together and Alone: Cooperation, Competition, and Individualization*. Englewood Cliffs: Prentice Hall.

In general, organizing students in cooperative learning groups has a powerful effect on learning regardless of whether groups compete with one another.

Kagan, S. (1992). *Cooperative Learning*. San Juan Capistrano, CA: Kagan Cooperative Learning. Cooperative learning increases communication, trust, leadership, decision-making, and conflict resolution.

Authors

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