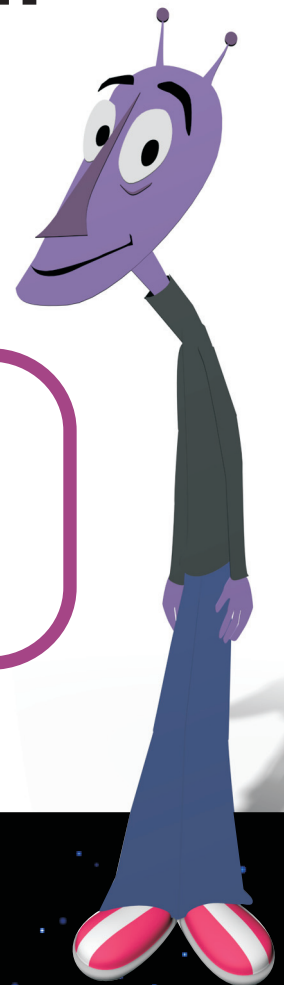


Geometry

★ Module 10 ★

Coordinate Geometry and Spatial Visualization

Lesson 1 Points in a Coordinate Plane

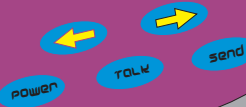


Teacher Notes

10.1

Objectives

- ◆ Use geometric vocabulary (horizontal/x-axis, vertical/y-axis, ordered pairs) to describe the location and to plot points in all four quadrants.
- ◆ Plot points in the coordinate plane.
- ◆ Use ordered pairs to locate points and to organize data.



Prerequisite

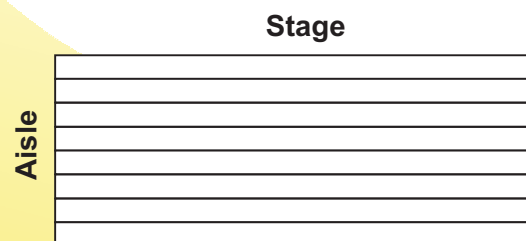
Locating numbers on a number line

Vocabulary

Number line (3.1)
Cartesian coordinate system
Coordinate plane
Axes
Origin
x-coordinate
y-coordinate
Ordered pair
Quadrant
x-axis
y-axis

Get Started

- Have each student choose one letter between A and H and one number between one and 20. Have them write their letter/number combination down so they do not forget it.
- Sketch a layout of a seating arrangement similar to the one shown below.



- Label the rows A through H, with row A being closest to the stage. Tell students each row has 20 seats with seat number one being closest to the aisle.
- Tell students that their letter/number combination is their seat assignment. Have each student come up to the board, state their seat assignment, and point to the approximate location of where they would be sitting with this seat assignment.
- Ask which seat assignments might cost the most and why.
Possible answer: Rows A through C, seats 5 through 15, for the best view
- As it is necessary to designate seating in rows in a theater, students will learn how to designate points in a coordinate plane.

Subtopic 1

Writing Ordered Pairs for Points in a Coordinate Plane

Expand Their Horizons

In this subtopic, students learn the parts of a coordinate plane. A coordinate plane is the intersection of two number lines, or axes, at their zero marks. The horizontal axis is the x -axis; the vertical axis is the y -axis. The x -axis is also called the *abscissa*, and the y -axis is also called the *ordinate*. These terms, however, are rarely used.

A coordinate is a location on a number line. Because each point is located by using two number lines, each point on a coordinate plane has two coordinates, which make up an ordered pair. In an ordered pair, the x -coordinate is written first, followed by the y -coordinate.

Common Error Alert:

Students may reverse the coordinates in an ordered pair. Point out that x comes before y in the alphabet and also in an ordered pair.

The coordinate plane is divided into four quadrants, numbered I through IV, starting in the top right quadrant and moving in a counterclockwise direction. Points that are on either the x - or y -axis are not located in a quadrant. That means any point is either in a quadrant or on an axis.

1

First, locate where the point is in reference to the x -axis: -3 . Then, locate where it is in reference to the y -axis: 3 . Write the ordered pair (x, y) : $(-3, 3)$.

2

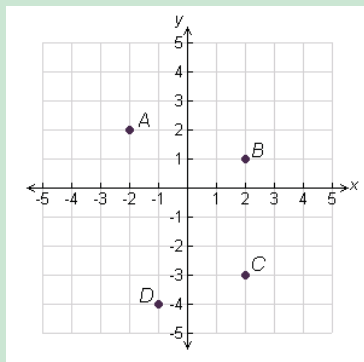
Point D is in the lower right quadrant. It is in Quadrant IV.

3

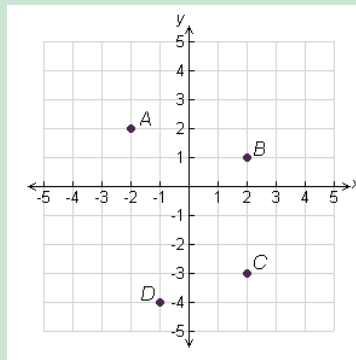
A point on an axis is not considered to be in any quadrant. Its location is the y -axis.

Additional Examples

1. Write the ordered pair representing each point.



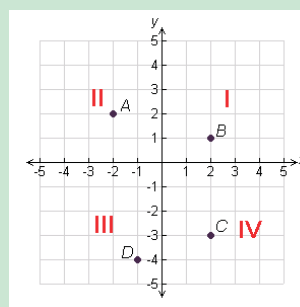
2. Tell which quadrant contains each point.



For each point, first write the x-coordinate and then write the y-coordinate:

- A: (-2, 2)
- B: (2, 1)
- C: (2, -3)
- D: (-1, -4)

The quadrants are labeled as shown:



Point B is located in Quadrant I, point A in Quadrant II, point D in Quadrant III, and point C in Quadrant IV.

Subtopic 2

Plotting Points in a Coordinate Plane

Expand Their Horizons

In this subtopic, given ordered pairs, students plot points. To plot a point, start at the origin, move right or left to the first coordinate on the x-axis, and from there, move up or down along the y-axis according to the second coordinate.

Common Error Alert:

Students may plot the x -coordinate on the y -axis and the y -coordinate on the x -axis. Teachers may consider drawing the diagram below on the board for students to refer to while working through this lesson. It shows that the first coordinate is located by moving right or left and the second by moving up or down.



A coordinate of zero indicates a move of zero units on that axis. If the x -coordinate is zero, just move up or down from the origin. If the y -coordinate is zero, just move right or left from the origin.

4

From the origin, move two units left and two units down. The point is in the third quadrant.

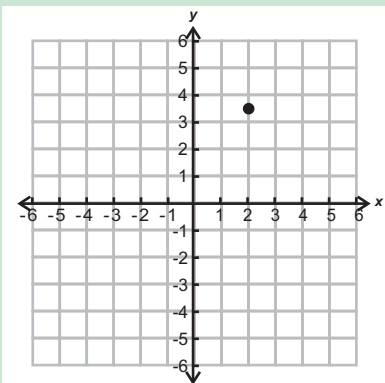
5

From the origin, move three units right and zero units up or down. In other words, stay there. The point is on the x -axis.

Additional Examples

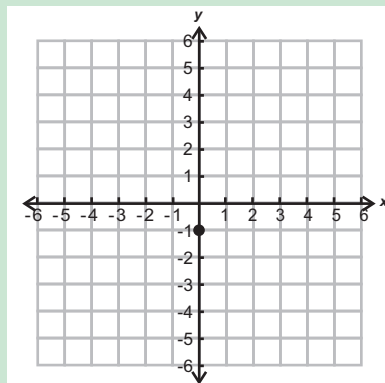
1. Plot the ordered pair $(2, 3\frac{1}{2})$.

From the origin, move two units to the right. Then, move $3\frac{1}{2}$ units up by going halfway between three and four.



2. Plot the ordered pair $(0, -1)$.

Stay at the origin and move one unit down.



Look Beyond

In more advanced classes, students will use a third axis, the z-axis to plot a point in three-dimensional space. Instead of an ordered pair, the coordinates will form an ordered triple.

In this course, students will later connect points on a coordinate plane to form polygons. These polygons can then be transformed by sliding, by flipping, or by turning them.

Connections

Coordinate grids are used in computer drafting programs to locate and to reference points, lines, and objects. Other types of grids are used in everyday life to aid in the location of objects or areas. Maps use grids to give locations of streets, cities, and places of interest. For example, a map's index may give the location of a city as 13-C4, meaning page or map 13, row C, column four. Stadiums and arenas use a grid system to number their seats. In addition to rows and columns, these systems may include additional information, such as level or box number.

