Notes
LESSON 3.1

GOAL
Identify and plot points in a coordinate plane.

Vocabulary
The coordinate plane can be divided into four regions called **quadrants**, labeled I, II, III, and IV.

Key Concept
When the x-axis and y-axis are extended to include negative values, the coordinate plane can be divided into four quadrants. Points are plotted in a coordinate plane by first moving right or left (right if x-coordinate is positive, left if x-coordinate is negative) on the x-axis from the origin and then up or down (up if the y-coordinate is positive, down if the y-coordinate is negative) from the x-axis.
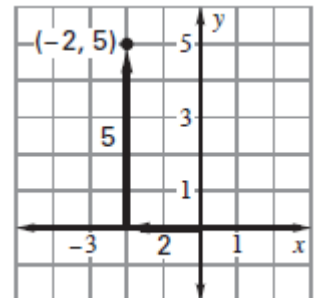
Common Student Errors
• Switching x- and y-coordinates or x- and y-axes

  Tip Graph the coordinates alphabetically (x comes before y).
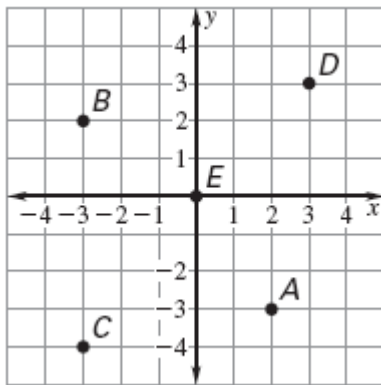
Example:

Graph: (-2, 5)

EXAMPLE 1

Name points in a coordinate plane

Give the coordinates of the point.
  a. *A*
  b. *B*

Solution
  a. Point *A* is 2 units to the right of the origin and 3 units down. So, the *x*-coordinate is 2, and the *y*-coordinate is –3. The coordinates are (2, –3).
  b. Point *B* is 3 units to the left of the origin and 2 units up. So, the *x*-coordinate is –3, and the *y*-coordinate is 2. The coordinates are (–3, 2).

Exercises for Example 1

Use the coordinate plane in Example 1 to give the coordinates of the point.
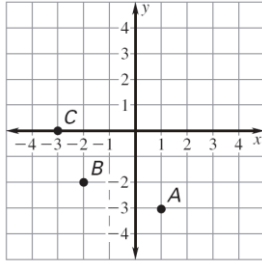 **1** *C*
  2 *D*
  3 *E*

EXAMPLE 2

Plot points in a coordinate plane

Plot the point in a coordinate plane. Describe the location of the point.
    a. $A(1, -3)$
    b. $B(-2, -2)$
    c. $C(-3, 0)$

Solution
    a. Begin at the origin. First move 1 unit to y the right, then 3 units down. Point A is in Quadrant IV.
    b. Begin at the origin. First move 2 units to the left, then 2 units down. Point B is in Quadrant III.
    c. Begin at the origin. First move 3 units to the left. Point C is on the x-axis.

Exercises for Example 2

Plot the points in a coordinate plane. Describe the location of the point.
    4. $A(3, 5)$
    5. $B(-1, -4)$
    6. $C(4, -2)$
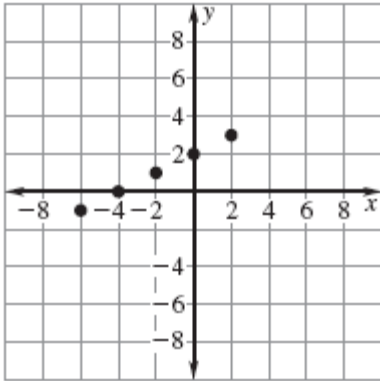
EXAMPLE 3

Graph a function

Graph the function $y = \frac{1}{2}x + 2$ with domain –6, –4, –2, 0, and 2. Then identify the range of the function.

Solution

STEP 1 Make a table by substituting the domain values into the function.

x	$y = \frac{1}{2}x + 2$
–6	$y = \frac{1}{2}(-6) + 2 = -1$
–4	$y = \frac{1}{2}(-4) + 2 = 0$
–2	$y = \frac{1}{2}(-2) + 2 = 1$
0	$y = \frac{1}{2}(0) + 2\ 5\ 2$
2	$y = \frac{1}{2}(2) + 2 = 3$

STEP 2 List the ordered pairs: (–6, –1), (–4, 0), (–2, 1), (0, 2), and (2, 3). Then graph the function.

STEP 3 Identify the range. The range consists of the *y*-values from the table: –1, 0, 1, 2, and 3.

Exercise for Example 3

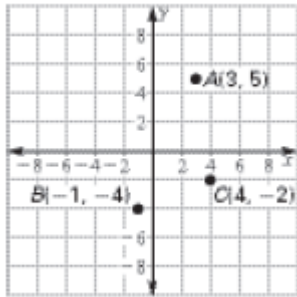7. Graph the function $y = -2x + 3$ with domain –2, –1, 0, 1, and 2. Then identify the range of the function.
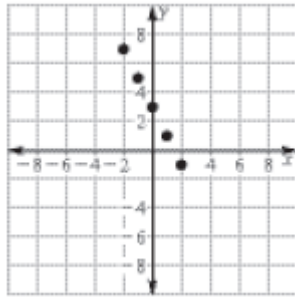
Answer Key

Lesson 3.1

Study Guide
1. $(-3, -4)$
2. $(3, 3)$
3. $(0, 0)$

4-6

4. Quadrant I
5. Quadrant III
6. Quadrant IV
7.

range: 7, 5, 3, 1 and −1