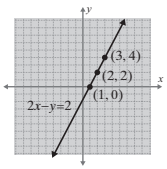
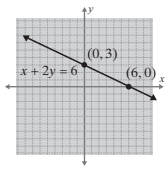
**6.**

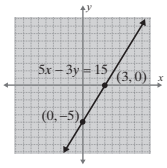



**7.**




$x$-intercept $= (6, 0)$, $y$-intercept $= (0, 3)$

**8.**




$x$-intercept $= (3, 0)$, $y$-intercept $= (0, -5)$

# 3.1 Exercises

## Concept Check

**Fill-in-the-Blank.** Complete the sentences using information found in this section.

1. In the Cartesian coordinate system, the plane is divided into _____ _____.
2. There is a one-to-one correspondence between _____ on a plane and _____ _____ of real numbers.
3. Scatter plots are used to determine whether there is any _____ to a set of data.
4. In an ordered pair $(x, y)$, the variable $x$ is called the _____ variable and the variable $y$ is called the _____ variable.
5. Every line corresponds to some linear _____.
6. If a line passes through the point (___, ___) then the $y$-intercept and the $x$-intercept are the same point.

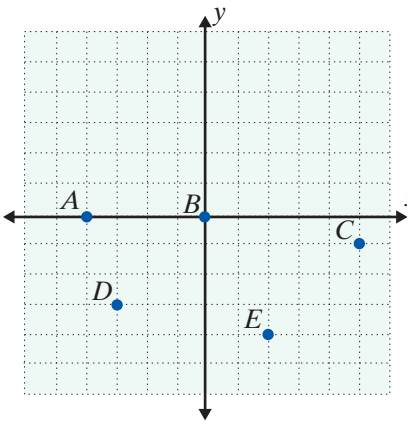
**True/False.** Determine whether each statement is true or false. If a statement is false, explain how it can be changed so the statement will be true. (**Note:** There may be more than one acceptable change.)

7. The $y$-intercept is the point where a line crosses the $y$-axis.
8. The terms ordered pair and point are used interchangeably.
9. A horizontal line does not have a $y$-intercept.
10. All $x$-intercepts correspond to an ordered pair of the form $(0, y)$.

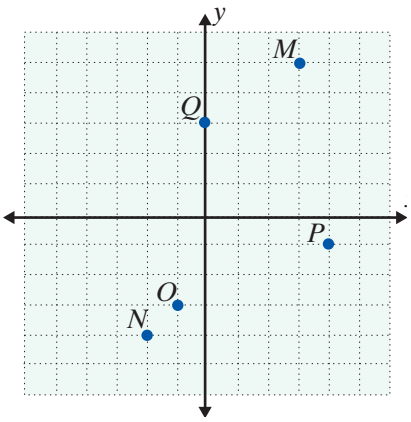
## Practice

List the sets of ordered pairs that correspond to each graph. Assume that the grid lines are marked one unit apart.

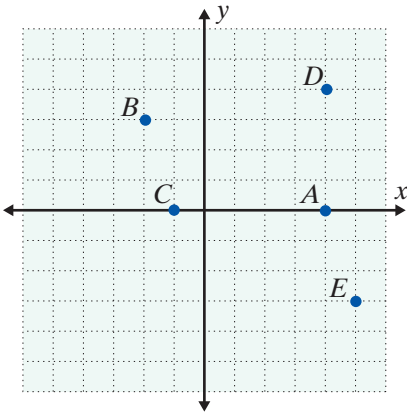
**1.**



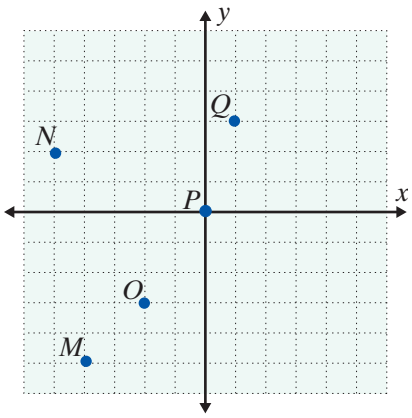

**2.**



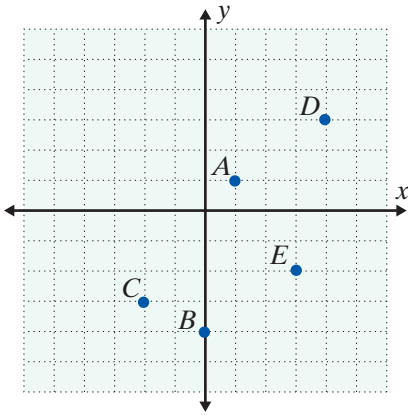

**3.**



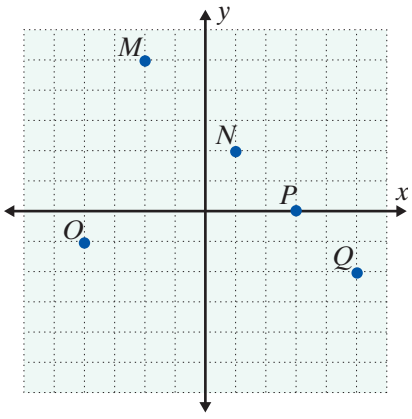

**4.**




**5.**




**6.**




Graph the sets of ordered pairs and label the points. See Example 1.

**7.** $\{A(-5,1), B(-3,4), C(-1,1), D(2,2), E(2,-2)\}$

**8.** $\{M(-4,1), N(-2,5), O(0,3), P(1,6), Q(3,2)\}$

**9.** $\{P(-3,2), Q(-1,-1), R(1,5), S(3,-2), T(6,5)\}$

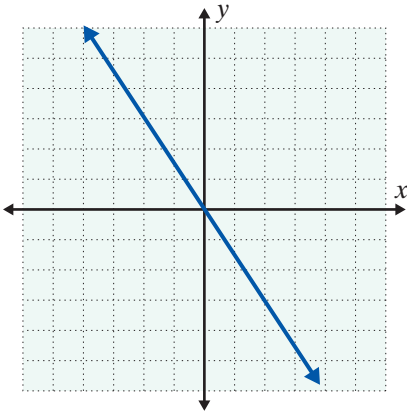
**10.** $\{C(-5,-5), D(-3,1), E(0,-2), F(3,1), G(5,0)\}$

**11.** $\{A(-3,4), B(-2,-1), C(-1,6), D(2,0), E(3,-3)\}$

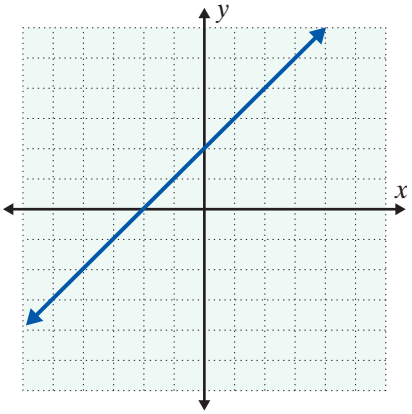
**12.** $\{M(-7,2), N(-4,5), O(0,-4), P(1,-2), Q(4,-4)\}$

List any three points on each line. (There is more than one correct answer.) See Example 2.

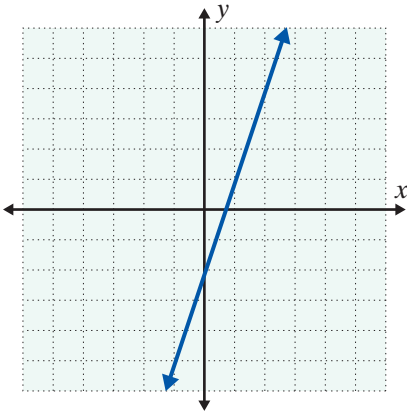
**13.**



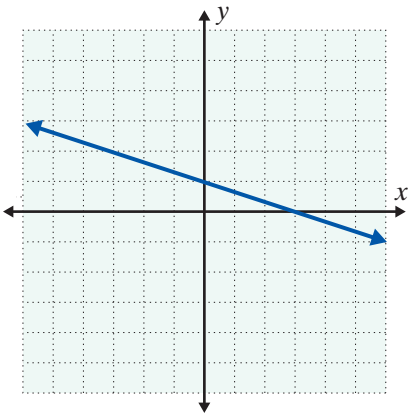

**14.**



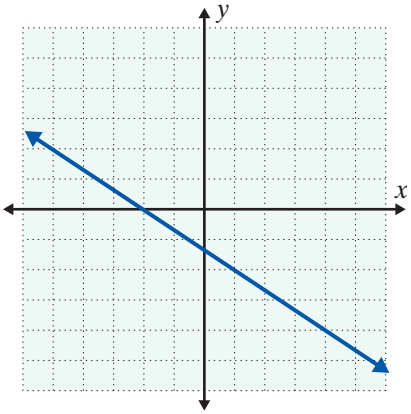

**15.**



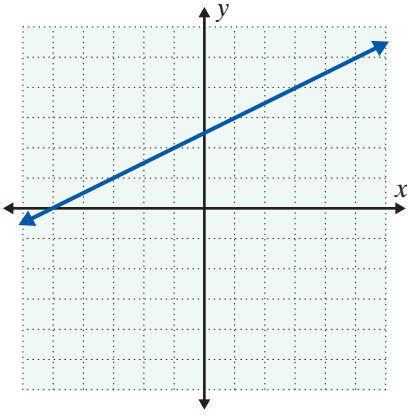

**16.**




**17.**




**18.**



For each data set, **a.** rewrite the data in the table as ordered pairs and **b.** use the data to create a scatter plot. See Example 3.

**19.** The following table gives the independent expenditures for and against candidates running for the senate and house of representatives.

Independent Expenditures Towards Senate and House for the 2017-2018 Election Cycle

| Senate Expenditures (in millions) | House Expenditures (in millions) |
|---|---|
| 67.3 | 12.0 |
| 87.2 | 44.6 |
| 70.1 | 1.5 |
| 77.9 | 0.2 |
| 44.9 | 8.0 |
| 67.0 | 22.9 |
| 18.5 | 0.3 |
| 58.0 | 0.4 |
| 15.7 | 48.1 |
| 37.1 | 4.0 |

Source: FEC

**20.** The following table gives the height and weight of NBA players who scored the most points in 2018.

Height and Weight of NBA Players

| Height (in inches) | Weight (in pounds) |
|---|---|
| 77 | 220 |
| 82 | 253 |
| 80 | 250 |
| 75 | 195 |
| 83 | 242 |
| 81 | 240 |
| 75 | 200 |
| 75 | 193 |
| 83 | 260 |
| 76 | 210 |

Source: ESPN

Use following table for Exercises 21 and 22. The table contains the in-state total cost per year, the in-state total cost per year with need-based aid, and the average debt of a student after graduation of 10 top public colleges.

Total Cost per Year (Without and With Need-Based Aid) vs. Average Debt After Graduation

| Total Cost per Year (in thousands) | Total Cost per Year after Need-Based Aid (in thousands) | Average Debt After Graduation (in thousands) |
|---|---|---|
| 22 | 5 | 21 |
| 18 | 10 | 22 |
| 29 | 8 | 25 |
| 27 | 9 | 26 |
| 31 | 14 | 19 |
| 30 | 10 | 21 |
| 24 | 9 | 22 |
| 21 | 12 | 25 |
| 21 | 11 | 22 |
| 24 | 14 | 28 |

Source: www.kiplinger.com

**21.** Create a scatter plot using the cost per year vs. average debt.

**22.** Create a scatter plot using cost after aid vs. average debt.

Find the missing coordinate of each ordered pair so that the ordered pair belongs to the solution set of the given equation.

**23.** $2x + y = 5$

| $x$ | $y$ |
|---|---|
| 0 | |
| | 0 |
| –2 | |
| | 3 |

**24.** $x + 2y = 6$

| $x$ | $y$ |
|---|---|
| 0 | |
| | 0 |
| 4 | |
| | –2 |

**25.** $3x - y = 4$

| $x$ | $y$ |
|---|---|
| 0 | |
| | 0 |
| 2 | |
| | 5 |

**26.** $x - 3y = 9$

| $x$ | $y$ |
|---|---|
| 0 | |
| | 0 |
| –3 | |
| | –1 |

**27.** $y = 5 - 2x$

**a.** $(0, \ )$

**b.** $(\ , 0)$

**c.** $(2, \ )$

**d.** $(\ , 7)$

**28.** $y = 5x - 3$

**a.** $(0, \ )$

**b.** $(\ , 0)$

**c.** $(-1, \ )$

**d.** $(\ , 7)$

**29.** $3x - 2y = 6$

**a.** $(0, \ )$

**b.** $(\ , 0)$

**c.** $(-2, \ )$

**d.** $(\ , 3)$

**30.** $5x + 2y = 10$

**a.** $(0, \ )$

**b.** $(\ , 0)$

**c.** $(4, \ )$

**d.** $(\ , 10)$

Locate at least two ordered pairs of real numbers that satisfy each linear equation and graph the corresponding line in the Cartesian coordinate system. See Examples 4 through 6.

**31.** $x + y = 3$

**32.** $x + y = 4$

**33.** $y = x$

**34.** $2y = x$

**35.** $2x + y = 0$

**36.** $3x + 2y = 0$

**37.** $2x + 3y = 7$

**38.** $4x + 3y = 11$

**39.** $3x - 4y = 12$

**40.** $2x - 5y = 10$

**41.** $-4x + y = 4$

**42.** $-3x + 3y = 6$

**43.** $3y = 2x - 4$

**44.** $4x = 3y + 8$

**45.** $3x + 5y = 6$

**46.** $2x + 7y = -4$

**47.** $2x + 3y = 1$

**48.** $5x - 3y = -1$

**49.** $5x - 2y = 7$

**50.** $3x + 4y = 7$

**51.** $\frac{2}{3}x - y = 4$

**52.** $x + \frac{3}{4}y = 6$

**53.** $2x + \frac{1}{2}y = 3$

**54.** $\frac{2}{5}x - 3y = 5$

**55.** $5x = y + 2$

**56.** $4x = 3y - 5$

Graph each linear equation by locating the *y*-intercept and the *x*-intercept. See Examples 7 and 8.

**57.** $x - 2y = 8$

**58.** $x + y = 6$

**59.** $2x + 3y = 12$

**60.** $3x - 7y = -21$

**61.** $4x - y = 10$

**62.** $\frac{1}{2}x + 2y = 3$

**63.** $3x + 2y = 15$

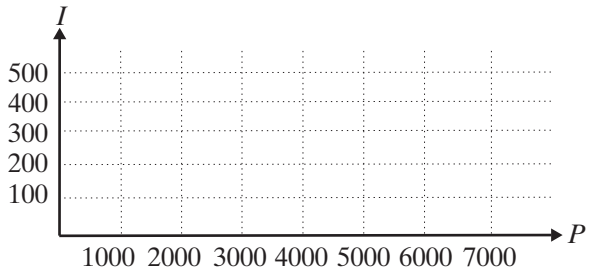
**64.** $x - 4y = -6$

**65.** Given the equation $I = 0.06P$, where $I$ is the interest earned on a principal $P$ at the rate of 6%:

**a.** Make a table of ordered pairs for the values of $P$ and $I$ if $P$ has the values \$1000, \$2000, \$4000, \$5000, and \$7000.

**b.** Graph the points corresponding to the ordered pairs.

| P | I |
|---|---|
| 1000 | |
| 2000 | |
| 4000 | |
| 5000 | |
| 7000 | |

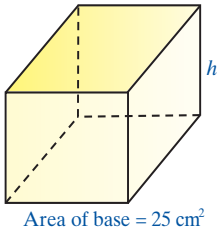


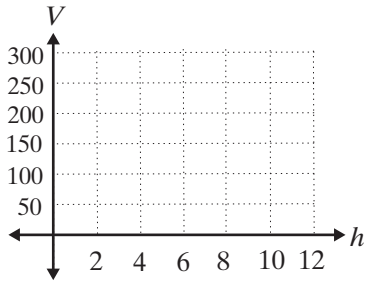

**66.** Given the equation $V = 25h$, where $V$ is the volume (in $cm^3$) of a box with a variable height $h$ in cm and a fixed base of area 25 $cm^2$:

**a.** Make a table of ordered pairs for the values of $h$ and $V$ with $h$ as the values 2 cm, 3 cm, 8 cm, 10 cm, and 12 cm.

**b.** Graph the points corresponding to the ordered pairs.

| P | I |
|---|---|
| 2 | |
| 3 | |
| 8 | |
| 10 | |
| 12 | |




## Writing & Thinking

**67.** The following table of values gives the number of push-ups and pull-ups completed by ten students in a physical education class.

**a.** Plot these points on a scatter diagram.

| Person | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| Push-ups | 20 | 15 | 25 | 23 | 35 | 30 | 42 | 40 | 25 | 35 |
| Pull-ups | 5 | 2 | 9 | 8 | 10 | 11 | 15 | 14 | 7 | 12 |

**b.** Does there seem to be a pattern in the relationship between push-ups and pull-ups? If so, what is this pattern?

**c.** Using the scatter diagram in Part a, predict the number of pull-ups that a student might be able to do if he or she has just done each of the following numbers of push-ups: 22, 32, 35, and 45. (**Note:** In each case, there is no one correct answer. The answers are only estimates based on the diagram.)

**68.** Explain in your own words why it is sufficient to find the $x$-intercept and $y$-intercept to graph a line (assuming that they are not the same point).

**69.** Explain in your own words how you can determine if an ordered pair is a solution to an equation.