8.1 Exercises

Concept Check

Fill-in-the-Blank. Complete each sentence using information found in this section.

1. The Cartesian coordinate system has a vertical and a horizontal line that separate a plane into four _____.
2. In an ordered pair, x represents the _____ (first/second) coordinate and y represents the _____ (first/second) coordinate.
3. If an ordered pair has two negative coordinates, the graph of the corresponding point is in Quadrant _____.
4. If an ordered pair satisfies an equation, it is a/an _____ of the equation.
5. The point of intersection of the x-axis and y-axis is called the _____.
6. Linear equations have a/an _____ number of solutions.

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 graph of every ordered pair that has a positive x-coordinate and a negative y-coordinate can be found in Quadrant IV.
8. To find the y-value that corresponds with $x = 2$, substitute 2 for x into the given equation and solve for y.
9. If $(-7, 3)$ is a solution of $y = 3x + 24$, then $(-7, 3)$ satisfies $y = 3x + 24$.
10. If point $A = (0, 4)$, then point A lies on the x-axis.

Practice

For each graph, list the set of ordered pairs corresponding to the points on the graph.

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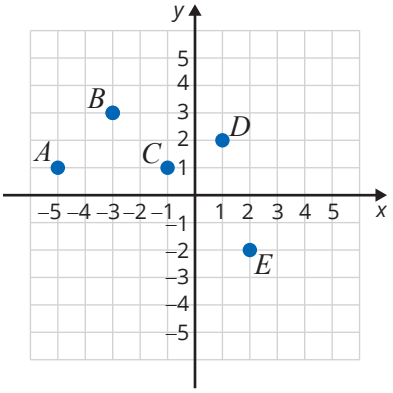

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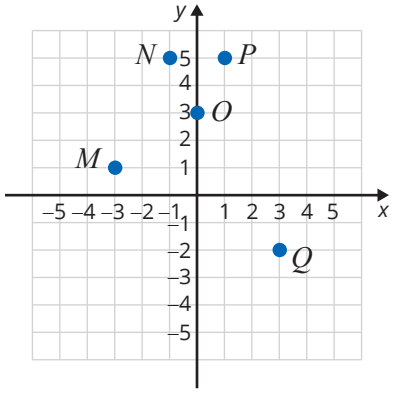

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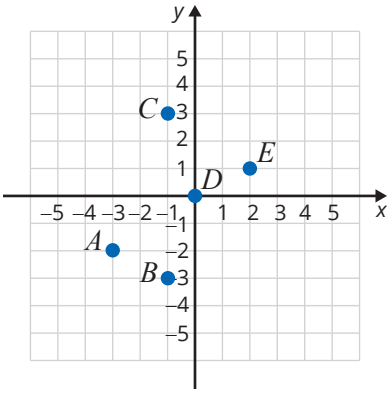

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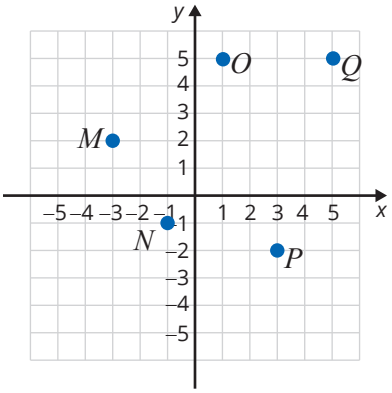

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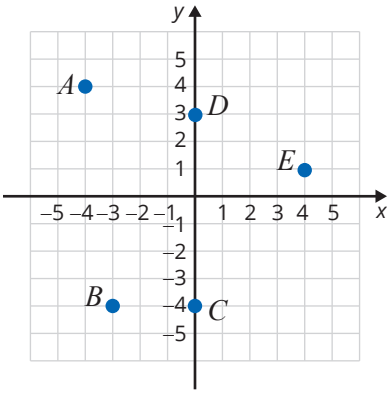

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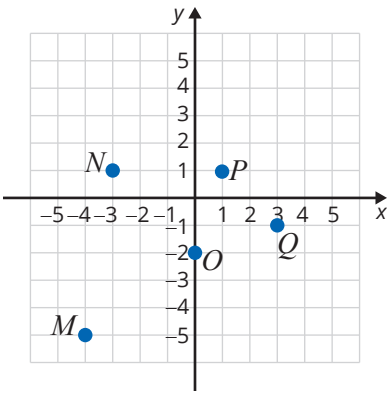

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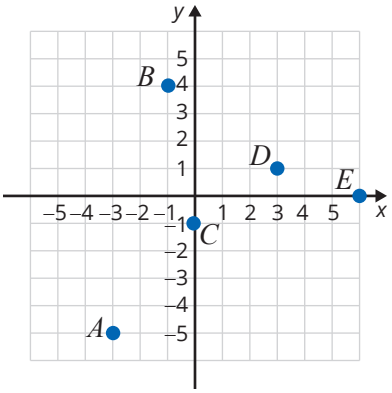

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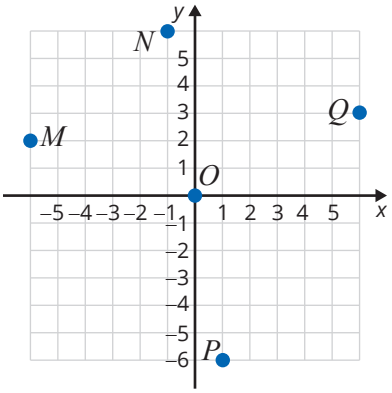

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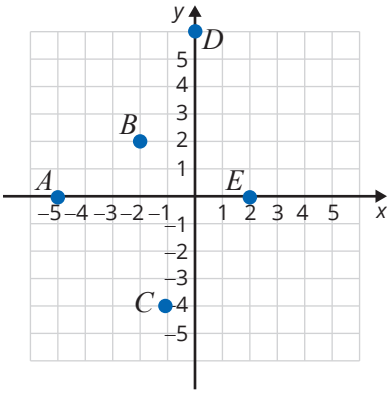

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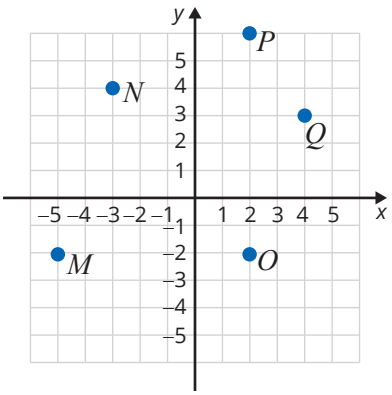

Plot each set of ordered pairs and label the points. See Examples 1 and 2.

11. $\{A(4,-1), B(3,2), C(0,5), D(1,-1), E(1,4)\}$

12. $\{A(-1,-1), B(-3,-2), C(1,3), D(0,0), E(2,5)\}$

13. $\{A(1,2), B(0,2), C(-1,2), D(2,2), E(-3,2)\}$

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

15. $\{A(1,0), B(3,0), C(-2,1), D(-1,1), E(0,0)\}$

16. $\{A(-1,-1), B(0,1), C(1,3), D(2,5), E(3,10)\}$

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

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

19. $\{A(1,4), B(-1,-2), C(0,1), D(2,7), E(-2,-5)\}$

20. $\{A(0,0), B(-1,3), C(3,-2), D(0,4), E(-7,0)\}$

21. $\left\{A(1,-3), B\left(-4,\frac{3}{4}\right), C\left(2,-2\frac{1}{2}\right), D\left(\frac{1}{2},4\right)\right\}$

22. $\left\{A\left(\frac{3}{4},\frac{1}{2}\right), B\left(2,-\frac{5}{4}\right), C\left(\frac{1}{3},-2\right), D\left(-\frac{5}{3},2\right)\right\}$

23. $\{A(1.6,-2), B(3,2.5), C(-1,1.5), D(0,-2.3)\}$

24. $\{A(-2,2), B(-3,1.6), C(3,0.5), D(1.4,0)\}$

Determine the missing coordinate in each of the ordered pairs so that the point will satisfy the equation given. See Example 3.

25. $x - y = 4$

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

b. $(2, \_\_)$

c. $(\_\_, 0)$

d. $(\_\_, -3)$

26. $x + y = 7$

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

b. $(-1, \_\_)$

c. $(\_\_, 0)$

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

27. $x + 2y = 6$

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

b. $(2, \_\_)$

c. $(\_\_, 0)$

d. $(\_\_, 4)$

28. $3x + y = 9$

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

b. $(4, \_\_)$

c. $(\_\_, 0)$

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

29. $4x - y = 8$

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

b. $(1, \_\_)$

c. $(\_\_, 0)$

d. $(\_\_, 4)$

30. $x - 2y = 2$

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

b. $(4, \_\_)$

c. $(\_\_, 0)$

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

31. $2x + 3y = 6$

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

b. $(-1, \_\_)$

c. $(\_\_, 0)$

d. $(\_\_, -2)$

32. $5x + 3y = 15$

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

b. $(2, \_\_)$

c. $(\_\_, 0)$

d. $(\_\_, 4)$

33. $3x - 4y = 7$

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

b. $(1, \_\_)$

c. $(\_\_, 0)$

d. $\left(\_\_, \frac{1}{2}\right)$

34. $2x + 5y = 6$

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

b. $\left(\frac{1}{2}, \_\_\right)$

c. $(\_\_, 0)$

d. $(\_\_, 2)$

Complete the tables so that each ordered pair will satisfy the given equation. Plot the resulting sets of ordered pairs. See Example 4.

35. $y = 3x$

x	*y*
0	
	−3
−2	
	6

36. $y = -2x$

x	*y*
0	
	4
3	
	−2

37. $y = 2x - 3$

x	*y*
0	
	−1
−2	
	3

38. $y = 3x + 5$

x	*y*
0	
	−4
−2	
	2

39. $y = 9 - 3x$

x	y
0	
	0
1	
	−3

40. $y = 6 - 2x$

x	y
0	
	0
−2	
	−2

41. $y = \frac{3}{4}x + 2$

x	y
0	
	5
−4	
	$\frac{5}{4}$

42. $y = \frac{3}{2}x - 1$

x	y
0	
	2
−2	
	$-\frac{5}{2}$

43. $3x - 5y = 9$

x	y
0	
	0
−2	
	−1

44. $4x + 3y = 6$

x	y
0	
	0
3	
	−1

45. $5x - 2y = 10$

x	y
0	
	0
−1	
	5

46. $3x - 2y = 12$

x	y
	0
0	
	−3
6	

47. $2x + 3.2y = 6.4$

x	y
0	
3.2	
	0.8
	−0.2

48. $3x + y = -2.4$

x	y
	0
0	
	0.6
1.6	

Determine which, if any, of the ordered pairs satisfy the given equation. See Example 5.

49. $y = 2x - 4$

a. $(1, 1)$

b. $(2, 0)$

c. $(1, -2)$

d. $(3, 2)$

50. $y = -4x + 5$

a. $\left(\frac{3}{4}, 2\right)$

b. $(4, 0)$

c. $(1, 1)$

d. $(0, 3)$

51. $x + 2y = -1$

a. $(1, -1)$

b. $(1, 0)$

c. $(2, 1)$

d. $(3, -2)$

52. $2x - 3y = 7$

a. $(1, 3)$

b. $\left(\frac{1}{2}, -2\right)$

c. $\left(\frac{7}{2}, 0\right)$

d. $(2, 1)$

53. $2x + 5y = 8$

a. $(4, 0)$

b. $(2, 1)$

c. $(1, 1.2)$

d. $(1.5, 1)$

54. $3x + 4y = 10$

a. $(-2, 3)$

b. $(0, 2.5)$

c. $(4, -2)$

d. $(1.2, 1.6)$

The graph of a line is shown. List any three points on each line. (There is more than one correct answer.) See Example 6.

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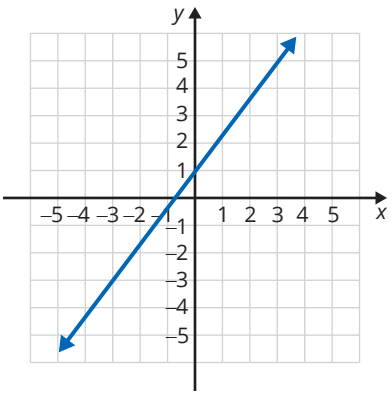

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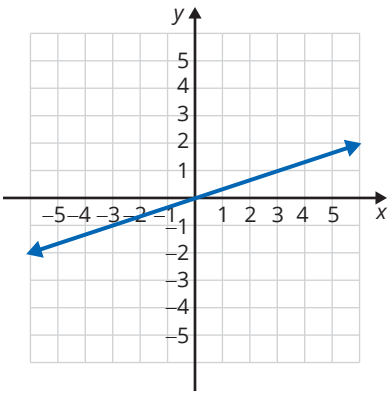

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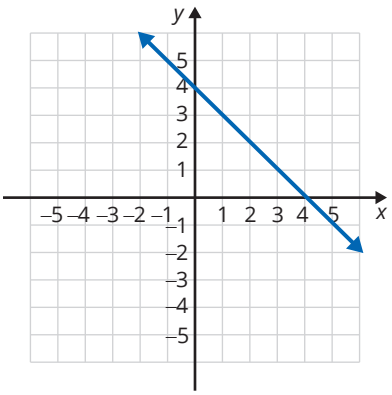

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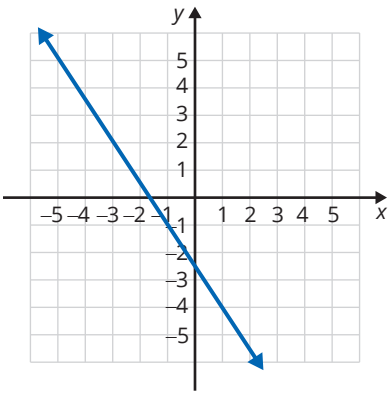

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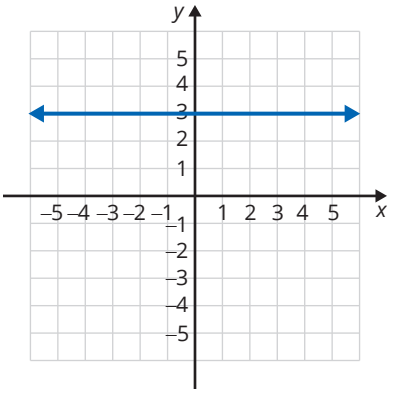

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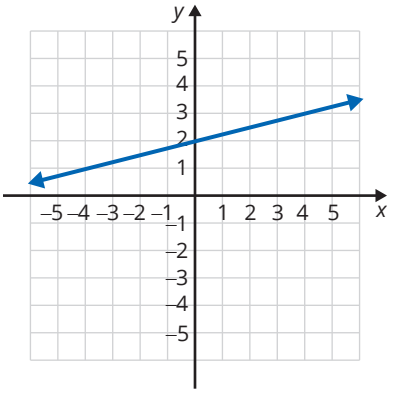

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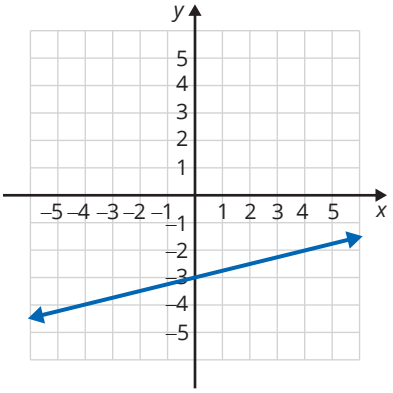

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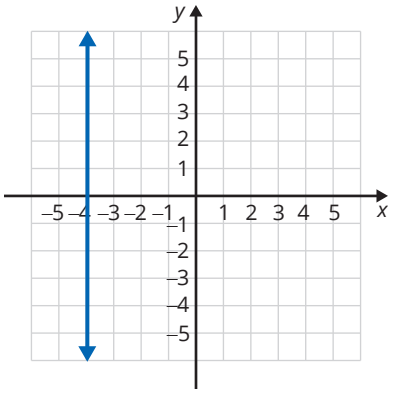

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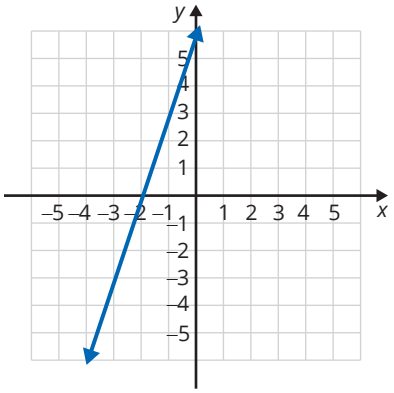

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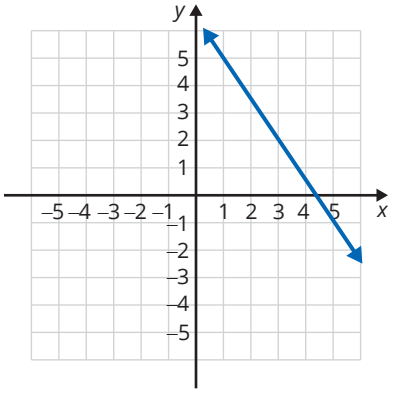


Applications

Solve.

65. At one point in 2017, the exchange rate from US dollars to Euros was $E = 0.85D$ where E is Euros and D is dollars.

a. Make a table of ordered pairs for the values of D and E if D has the values \$100, \$200, \$300, \$400, and \$500.

b. Plot the points corresponding to the ordered pairs.

66. Consider the equation $F = \frac{9}{5}C + 32$, where C is temperature in degrees Celsius and F is the corresponding temperature in degrees Fahrenheit.

a. Make a table of ordered pairs for the values of C and F if C has the values $-20°$, $-10°$, $-5°$, $0°$, $5°$, $10°$, and $15°$.

b. Plot the points corresponding to the ordered pairs.

67. Consider the equation $d = 16t^2$, where d is the distance an object falls in feet and t is the time in seconds that the object falls.

a. Make a table of ordered pairs for the values of t and d with the values of 1, 2, 3.5, 4, 4.5, and 5 seconds for t.

b. Plot the points corresponding to the ordered pairs.

c. These points do not lie on a straight line. What feature of the equation might indicate to you that the graph is not a straight line?

68. Consider the equation $V = 9h$, where V is the volume (in cubic centimeters) of a box with a variable height h in centimeters and a fixed base of area 9 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, 5 cm, 8 cm, 9 cm, and 10 cm.

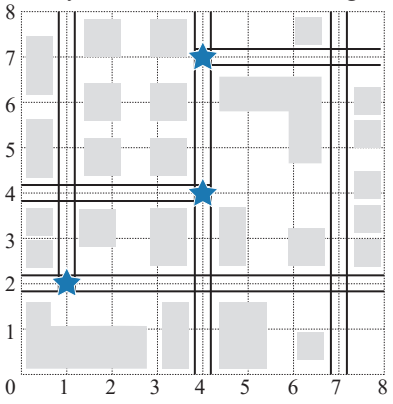
b. Plot the points corresponding to the ordered pairs.

69. A business owner records the number of customers per hour to determine peak shopping times after noon. Graph the points corresponding to the ordered pairs.

Hour of the Day	1 p.m.	2 p.m.	3 p.m.	4 p.m.	5 p.m.	6 p.m.	7 p.m.	8 p.m.
Number of Customers	500	450	200	650	900	700	550	300

70. One way to describe locations on a map is to lay a grid on top of the map and define locations with an ordered pair. A map with an overlaid grid is called a **grid reference**. Typically the origin of the coordinate system is placed at the bottom left corner of the map and vertical and horizontal lines are extended from each reference point on the axes.

A city planning committee is using a map with a grid system to plot the locations in a portion of the city where the highest frequency of traffic accidents occurs. The map is shown here with the highest accident points indicated with a star. A proposal is made to replace stop signs with electric traffic signals at every intersection that has a high frequency of accidents.



a. Will a traffic signal be placed at any of the following points? If so, which points?

$(2, 1), (4, 4), (0, 5)$

b. Which points not listed in part a. will have traffic signals?

71. The equation $t = \frac{d}{r}$ can be used to determine how long it will take you to travel a certain distance while traveling at a specified rate, or speed. Suppose you have to travel a distance of 150 miles. (**Hint:** Rate is in miles per hour, time is in hours, and distance is in miles.)

a. Complete the table of values.

r (mph)	*t* (hours)
25	
50	
60	

b. Graph the ordered pairs from the table. Try using a scale of 10 for each increment on the *r*-axis.

c. What happens to the value of time as the rate increases?

d. Complete the table of values. You may want to solve the given equation, $t = \frac{d}{r}$, for *r* first. Remember that $d = 150$ miles.

r (mph)	*t* (hours)
	5
	2.5
	1
	0.5
	0.1

e. As the value of *t* gets smaller (and closer to zero), how does the rate change?

72. Suppose you deposit \$1000 into an account that earns simple interest at a rate of 4%. Use the simple interest formula $I = Prt$ to solve the following problems.

a. Fill in the given table to determine the amount of interest earned if you keep the deposit in the account for 3 months, 6 months, 1 year, 2 years, and 3 years.

t (years)	*I* (\$)
$\frac{1}{4}$	
$\frac{1}{2}$	
1	
2	
3	

b. Plot the ordered pairs from the table in part a. on the coordinate plane and draw a line through the points.

c. Since graphs are models of situations, they can be used to predict values. Use the graph to predict the amount of interest that will be earned after 9 months. (Remember to convert the time to years.)

d. Use the graph to predict the amount of interest that will be earned after one and a half years.

Writing & Thinking

In statistics, data is sometimes given in the form of ordered pairs where each ordered pair represents two pieces of information about one person. For example, ordered pairs might represent the height and weight of a person or the person's number of years of education and that person's annual income. The ordered pairs are plotted on a graph and the graph is called a **scatter diagram (or scatter plot**). Such scatter diagrams are used to see if there is any pattern to the data and, if there is, then the diagram is used to predict the value for one of the variables if the value of the other is known. For example, if you know that a person's height is 5 ft 6 in., then his or her weight might be predicted from information indicated in a scatter diagram that has several points of known information about height and weight.

73. a. The following table of values indicates the number of push-ups and the number of sit-ups that ten students did in a physical education class. Plot these points in a scatter diagram.

Person	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10
x (push-ups)	20	15	25	23	35	30	42	40	25	35
y (sit-ups)	25	20	20	30	32	36	40	45	18	40

b. Does there seem to be a pattern in the relationship between push-ups and sit-ups? What is this pattern?

c. Using the scatter diagram in part a., predict the number of sit-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.)

74. Ask ten friends or fellow students what their heights and shoe sizes are. (You may want to ask all men or all women since the scales for men's and women's shoe sizes are different.) Organize the data in table form and then plot the corresponding scatter diagram. Knowing your own height, does the pattern indicated in the scatter diagram seem to predict your shoe size?

75. Ask ten friends or fellow students what their heights and ages are. Organize the data in table form and then plot the corresponding scatter diagram. Knowing your own height, does the pattern indicated in the scatter diagram seem to predict your age? Do you think that all scatter diagrams can be used to predict information related to the two variables graphed? Explain.