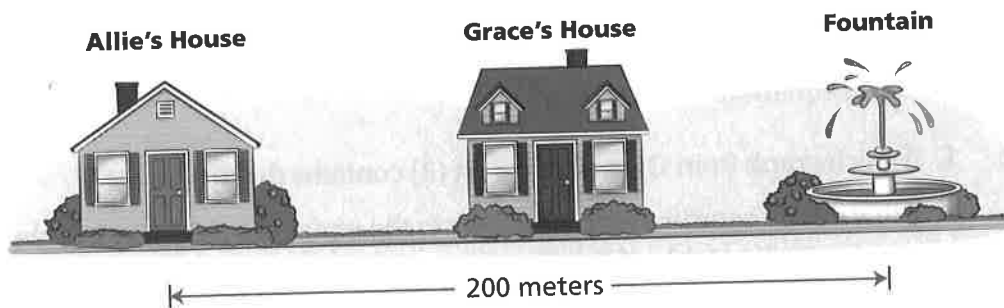




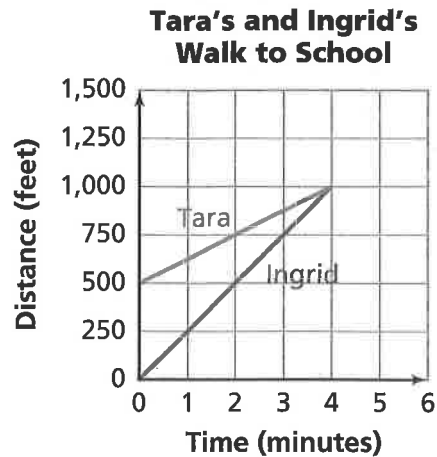
Applications

1. Grace and Allie are going to meet at the fountain near their houses. They both leave their houses at the same time. Allie passes Grace's house on her way to the fountain.
 - Allie's walking rate is 2 meters per second.
 - Grace's walking rate is 1.5 meters per second.



- a. How many seconds will it take Allie to reach the fountain?
 - b. Suppose Grace's house is 90 meters from the fountain. Who will reach the fountain first, Allie or Grace? Explain your reasoning.
2. In Problem 2.2, Emile's friend, Gilberto, joins the race. Gilberto has a head start of 20 meters and walks at 2 meters per second.
 - a. Write an equation that gives the relationship between Gilberto's distance d from where Emile starts and the time t .
 - b. How would Gilberto's graph compare to Emile's and Henri's graphs?

3. Ingrid stops at Tara's house on her way to school. Tara's mother says that Tara left 5 minutes ago. Ingrid leaves Tara's house, walking quickly to catch up with Tara. The graph below shows the distance each girl is from Tara's house, starting from the time Ingrid leaves Tara's house.



- In what way is this situation like the race between Henri and Emile? In what way is it different?
- After how many minutes does Ingrid catch up with Tara?
- How far from Tara's house does Ingrid catch up with Tara?
- Each graph intersects the distance axis (the y -axis). What information do these points of intersection give about the situation?
- Which line is steeper? How can you tell from the graph? How is the steepness of each line related to the rate at which the person travels?
- What do you think the graphs would look like if we extended them to show distance and time after the girls meet?

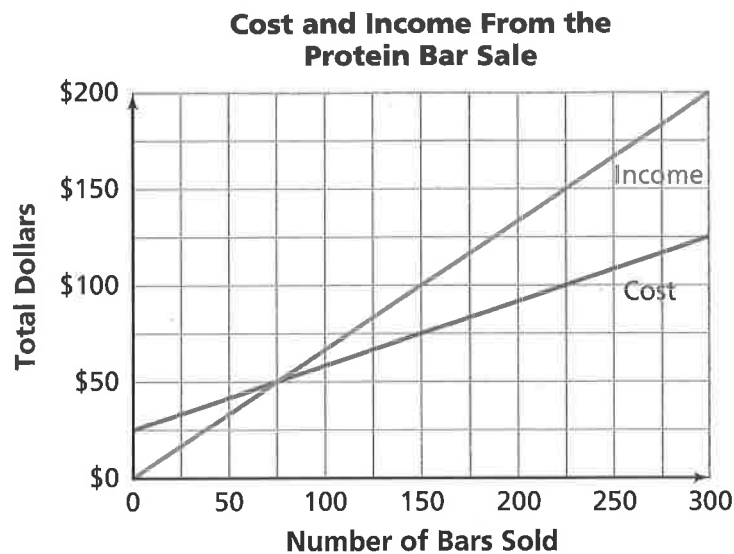
In Exercises 4 and 5, the student council asks for cost estimates for a skating party to celebrate the end of the school year.

4. The following tables represent the costs from two skating companies.

Rollaway Skates		Wheelie's Skates and Stuff	
Number of People	Cost	Number of People	Cost
0	\$0	0	\$100
1	\$5	1	\$103
2	\$10	2	\$106
3	\$15	3	\$109
4	\$20	4	\$112
5	\$25	5	\$115
6	\$30	6	\$118
7	\$35	7	\$121
8	\$40	8	\$124

- For each company, is the relationship between the number of people and cost a linear relationship? Explain.
 - For each company, write an equation that represents the relationship between the cost and the number of people. What is the dependent variable? What is the independent variable?
 - Describe how you can use the table or a graph to find when the costs of the two plans are equal. How can this information help the student council decide which company to choose?
5. A third company, Wheels to Go, gives their quote in the form of the equation $C_W = 35 + 4n$, where C_W is the cost in dollars for n students.
- What information do the numbers 35 and 4 represent in this situation?
 - For 60 students, which of the three companies is the cheapest? Explain how you could determine the answer using tables, graphs, or equations.
 - Suppose the student council wants to keep the cost of the skating party to \$500. How many people can they invite under each of the three plans?

- d. The points below lie on one or more of the graphs of the three cost plans. Decide to which plan(s) each point belongs.
- i. (20, 115) ii. (65, 295) iii. (50, 250)
- e. Pick one of the points in part (d). Write a question that could be answered by locating this point.
6. A band decides to sell protein bars to raise money for an upcoming trip. The cost (the amount the band pays for the protein bars) and the income the band receives for the protein bars are represented on the graph.



- a. How many protein bars must be sold for the cost to equal the income?
- b. What is the income from selling 50 protein bars? 125 bars?
- c. Suppose the income is \$200. How many protein bars were sold? How much of this income is profit?

7. Suppose each of the following patterns continues.
- Which represent linear relationships? Explain your answer.
 - For those that are linear relationships, write an equation that expresses the relationship.

a.

x	y
-10	-29
0	1
10	31
20	61
30	91

b.

x	y
1	9
5	17
7	21
20	47
21	49

c.

x	y
1	1
2	4
3	9
4	16
5	25

d.

x	y
1	9
5	22
7	25
20	56
21	60

8. The organizers of a walkathon get cost estimates from two printing companies to print brochures to advertise the event. The costs are given by the equations below, where C is the cost in dollars and n is the number of brochures.

Company A

$$C = 15 + 0.10n$$

Company B

$$C = 0.25n$$

- For what number of brochures are the costs the same for both companies? What method did you use to get your answer?
- The organizers have \$65 to spend on brochures. How many brochures can they have printed if they use Company A? If they use Company B?
- What information does the y -intercept of the graph represent for each equation?
- What information does the coefficient of n represent for each equation?
- For each company, describe the change in the cost as the number of brochures increases by 1.

9. A school committee is assigned the task of selecting a DJ for the end-of-school-year party. Darius obtains several quotes for the cost of three DJs.

Compare DJs		
<input checked="" type="checkbox"/>		\$60 per hour
<input checked="" type="checkbox"/>		\$100 set-up fee <i>plus</i> \$40 per hour
<input checked="" type="checkbox"/>		\$175 set-up fee <i>plus</i> \$30 per hour

- For each DJ, write an equation that shows how the total cost C relates to the number of hours x .
 - What information does the coefficient of x represent for each DJ?
 - For each DJ, what information does the y -intercept of the graph represent?
 - Suppose the DJ will need to work eight and one half hours. What is the cost of each DJ?
 - Suppose the committee has only \$450 dollars to spend on a DJ. For how many hours could each DJ play?
10. A local department store offers two installment plans for buying a \$270 skateboard.
- Plan 1** A fixed weekly payment of \$10.80
- Plan 2** A \$120 initial payment plus \$6.00 per week
- For each plan, how much money is owed after 12 weeks?
 - Which plan requires the least number of weeks to pay for the skateboard? Explain.
 - Write an equation for each plan. Explain what information the variables and numbers represent.
 - Suppose the skateboard costs \$355. How would the answers to parts (a)–(c) change?

For each equation in Exercises 11–14, answer parts (a)–(d).

- What is the rate of change?
- State whether the y -values are increasing, decreasing, or neither as x increases.
- Give the y -intercept.
- List the coordinates of two points that lie on the graph of the equation.

11. $y = 1.5x$

12. $y = -3x + 10$

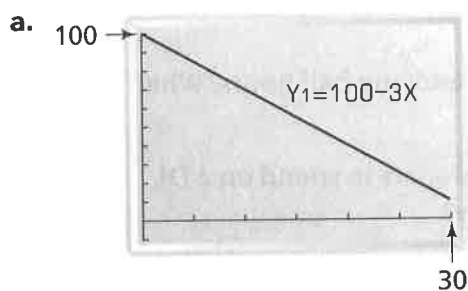
13. $y = -2x + 6$

14. $y = 2x + 5$

15. Dani earns \$7.50 per hour when she babysits.

- Draw a graph that relates the number of hours she babysits and the total amount of money she earns.
- Choose a point on the graph. Ask two questions that can be answered by finding the coordinates of this point.

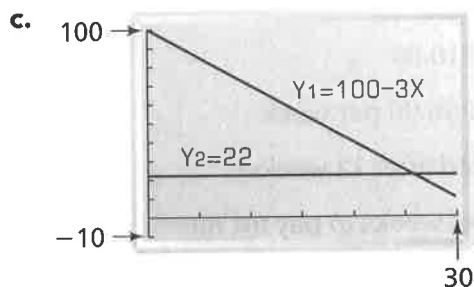
16. Martel wants to use his calculator to find the value of x when $y = 22$ in the equation $y = 100 - 3x$. Explain how he can use each table or graph to find the value of x when $100 - 3x = 22$.



b.

X	Y1
21	37
22	34
23	31
24	28
25	25
26	22

$Y1 = 100 - 3X$



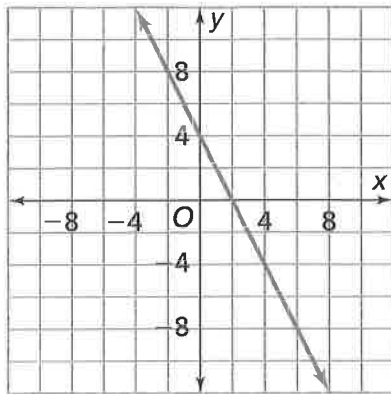
17. Match each equation to a graph.

a. $y = 3x + 5$

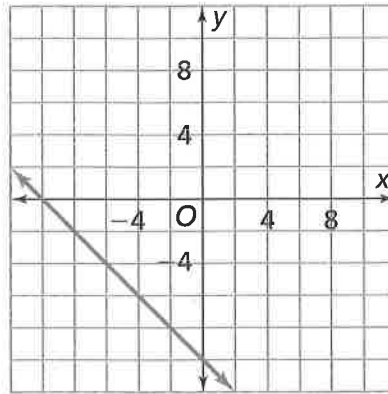
b. $y = x - 7$

c. $y = -x - 10$

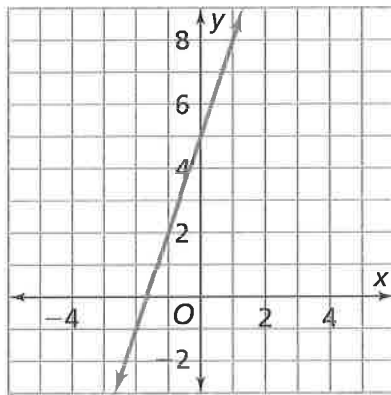
Graph 1



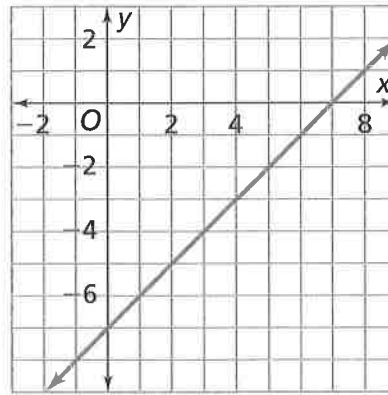
Graph 2



Graph 3



Graph 4



d. Write an equation for the graph that has no match.

For each equation in Exercises 18–21, give two values for x for which the value of y is negative.

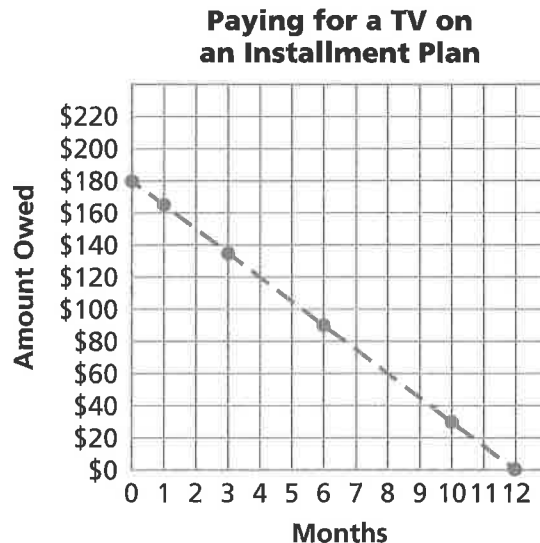
18. $y = -2x - 5$

19. $y = -5$

20. $y = 2x - 5$

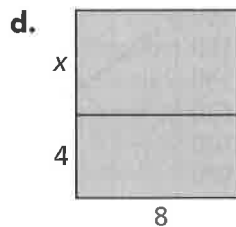
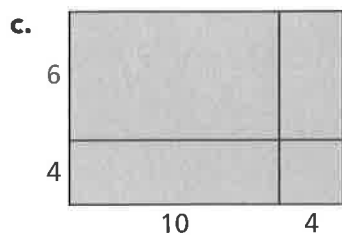
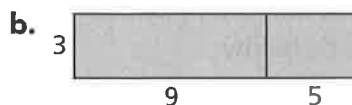
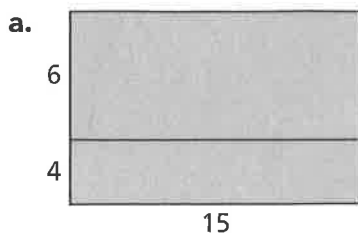
21. $y = \frac{3}{2}x - \frac{1}{4}$

31. The Ferry family decides to buy a new television that costs \$215. The store has an installment plan that allows them to make a \$35 down payment and then pay \$15 a month. Use the graph to answer the questions below.



- a. Write an equation that represents the relationship between the amount the Ferry family still owes and the number of months after the purchase. Explain what information the numbers and variables represent.
- b. The point where the graph of an equation intersects the x -axis is called the **x -intercept**. What are the x - and y -intercepts of the graph for this payment plan? Explain what information each intercept represents.
32. Shallah Middle School is planning a school trip. The cost is \$5 per person. The organizers know that three adults are going on the trip, but they do not yet know the number of students who will go. Write an expression that represents the total costs for x students and three adults.

33. Use the Distributive Property to write two expressions that show two different ways to compute the area of each rectangle.



34. Harvest Foods has apples on sale at 12 for \$3.

The Cost of Apples

Number of Apples	12	■	1	48	10	■
Cost	\$3	\$1.50	■	■	■	\$4.50

- What is the cost per apple?
 - Complete the rate table to show the costs of different numbers of apples.
 - How many apples can you buy for \$1?
 - Is the relationship between number of apples and cost linear? Explain.
35. Lamar bought some bagels for his friends. He paid \$15 for 20 bagels.
- How much did Lamar pay per bagel?
 - Write an equation relating the number of bagels, n , to the total cost, C .
 - Use your equation to find the cost of 150 bagels.

39. a. Match the following connecting paths for the last 5 minutes of Jalissa's race.



- i. Jalissa finishes running at a constant rate.
 - ii. Jalissa runs slowly at first and gradually increases her speed.
 - iii. Jalissa runs quickly and then gradually decreases her speed.
 - iv. Jalissa runs quickly and reaches the finish line early.
 - v. After falling, Jalissa runs at a constant rate.
- b. Which of the situations in part (a) was most likely to represent Jalissa's running for the entire race? Explain your answer.
40. In *Stretching and Shrinking*, you plotted the points $(8, 6)$, $(8, 22)$, and $(24, 14)$ on grid paper to form a triangle.
- a. Draw the triangle you get when you apply the rule $(0.5x, 0.5y)$ to the three points.
 - b. Draw the triangle you get when you apply the rule $(0.25x, 0.25y)$ to the three points.
 - c. How are the three triangles you have drawn related?
 - d. What are the areas of the three triangles?
 - e. Do you notice any linear relationships among the data of the three triangles, such as the area, scale factor, lengths of sides, and so on?
41. In *Covering and Surrounding*, you looked at perimeters of rectangles.
- a. Make a table of possible whole number values for the length and width of a rectangle with a perimeter of 20 meters.
 - b. Write an equation that represents the data in this table. Make sure to define your variables.
 - c. Is the relationship between length and width linear in this case? Explain.
 - d. Find the area of each rectangle.

Extensions



42. For each equation below, decide whether it models a linear relationship. Explain how you decided.
- a. $y = 2x$ b. $y = \frac{2}{x}$ c. $y = x^2$
43. a. Write equations for three lines that intersect to form a triangle.
b. Sketch the graphs and label the coordinates of the vertices of the triangle.
c. Will any three lines intersect to form a triangle? Explain.
44. a. Which one of the following points is on the line $y = 3x - 7$: (3, 3), (3, 2), (3, 1), or (3, 0)? Describe where each of the other three points is in relation to the line.
b. Find another point on the line $y = 3x - 7$ and three more points above the line.
c. The equation $y = 3x - 7$ is true for (4, 5) and (7, 14). Use this information to find two points that make the inequality $y < 3x - 7$ true and two points that make the inequality $y > 3x - 7$ true.
45. Ms. Chang's class decides to order posters that advertise the walkathon. Ichiro obtains quotes from two different companies.
- Clear Prints** charges \$2 per poster.
- Posters by Sue** charges \$15 plus \$.50 per poster.
- a. For each company, write an equation Ichiro could use to calculate the cost for any number of posters.
b. For what number of posters is the cost the same for both companies? Explain.
c. Which company do you think the class should buy posters from? Explain your reasoning.
d. If Ms. Chang's class has an \$18 budget for posters, which company do you think the class should buy posters from? If Ms. Chang donates an additional \$10 for ordering posters, does it impact the decision made? What factors influenced your decision?
e. Use the information from parts (a)–(c) to find an ordered pair that makes the inequality $C < 20$ true for Clear Prints. Find an ordered pair that makes the inequality $C > 20$ true for Posters by Sue.