Algebra 1

6.1-6.3 Writing Two Variable Linear Equations to Solve Problems.

MODELING REAL-WORLD SITUATIONS When a quantity y changes at a constant rate with respect to a quantity x, you can use the equation $y = mx + b$ to model the relationship. The value of m is the constant rate of change, and the value of b is an initial, or starting, value for y.

slope
per
each

6.1 Write equations in Slope-Intercept Form

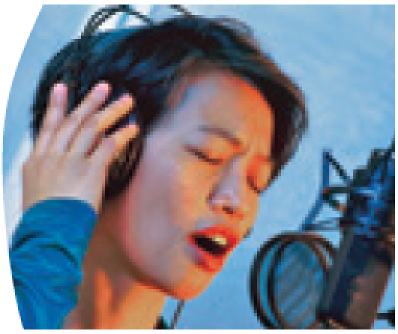
RECORDING STUDIO A recording studio charges musicians an initial fee of $50 to record an album. Studio time costs an additional $35 per hour.

y

a. Write an equation that gives the total cost of an album as a function of studio time (in hours).

x

b. Find the total cost of recording an album that takes 10 hours of studio time.



$m = 35 \quad b = 50$

a) $y = 35x + 50$

$35 \cdot 10 + 50$

b) $400

Try this:

6. **WHAT IF?** In Example 5, suppose the recording studio raises its initial fee to $75 and charges $40 per hour for studio time.

a. Write an equation that gives the total cost of an album as a function of studio time (in hours).

b. Find the total cost of recording an album that takes 10 hours of studio time.

a) $y = 40x + 75$

b) $475

BMX RACING In Bicycle Moto Cross (BMX) racing, racers purchase a one year membership to a track. They also pay an entry fee for each race at that track. One racer paid a total of $125 after 5 races. A second racer paid a total of $170 after 8 races. How much does the track membership cost? b What is the entry fee per race? m

(5, 125) (8, 170)

$$m = \frac{170 - 125}{8 - 5} = \frac{45}{3} = 15$$

$$15 \times 8 = 120$$

$170 = 15 \cdot 8 + b$

$170 = 120 + b$

$-120 \quad -120$

$50 = b$

$y = 15x + 50$

track membership $50
entry fee per race $15

Try this:

4. **GYM MEMBERSHIP** A gym charges $35 per month after an initial membership fee. A member has paid a total of $250 after 6 months. Write an equation that gives the total cost of a gym membership as a function of the length of membership (in months). Find the total cost of membership after 10 months.

$m = 35 \quad (6, 250)$

$250 = 35 \cdot 6 + b$

$250 = 210 + b$

-210

$40 = b$

$y = 35x + 40$ (x = 10)

$390

WORKING RANCH The table shows the cost of visiting a working ranch for one day and night for different numbers of people. Can the situation be modeled by a linear equation? *Explain*. If possible, write an equation that gives the cost as a function of the number of people in the group.

Number of people	4	6	8	10	12
Cost (dollars)	250	350	450	550	650

x
y

+2 +2 +2 +2

100 100 100 100

$m = \frac{100}{2} = 50$

(4, 250)

$y = mx + b$

$250 = 50 \cdot 4 + b$

$250 = 200 + b$

$-200 \quad -200$

$50 = b$

$y = 50x + 50$

Try this:

5. **MAILING COSTS** The table shows the cost (in dollars) of sending a single piece of first class mail for different weights. Can the situation be modeled by a linear equation? *Explain*. If possible, write an equation that gives the cost of sending a piece of mail as a function of its weight (in ounces).

Weight (ounces)	1	4	5	10	12
Cost (dollars)	0.37	1.06	1.29	2.44	2.90

3 1 5

.69 .23 1.15 .46

$\frac{.46}{2} = .23$

$\frac{.69}{3} = .23 \quad \frac{.23}{1} = .23 \quad \frac{1.15}{5} = .23$

$m = .23$

$.37 = .23 \cdot 1 + b$

$-.23 \quad -.23$

$.14 = b$

$y = .23x + .14$

6.2 Write equations in Point-Slope Form

Paul wants to place an ad in a newspaper. The newspaper charges $10 for the first 2 lines of text and $3 for each additional line of text. Paul's ad is 8 lines long. How much will the ad cost?

$m = 3 \quad (2, 10)$

$y - 10 = 3(x - 2)$

$y - 10 = 3(8 - 2)$

$y - 10 = 3 \cdot 6$

$y - 10 = 18$

$+10 \quad +10$

$y = \$28$

$10 + 18 = 28$ ✓

Your Turn

Daisy purchases a gym membership. She pays a signup fee and a monthly fee of $11. After 4 months, she has paid a total of $59. Use a linear equation in point-slope form to find the signup fee.

$(4, 59) \quad m = 11$

$y = mx + b$

$y - 59 = 11(x - 4)$

$y - 59 = 11x - 44$

$+59 \quad +59$

$y = 11x + 15$

$\$15$

6.3

$Ax + By = C_{total}$

LIBRARY Your class is taking a trip to the public library. You can travel in small and large vans. A small van holds 8 people and a large van holds 12 people. Your class could fill 15 small vans and 2 large vans.

a. **Write** an equation in standard form that models the possible combinations of small vans and large vans that your class could fill.

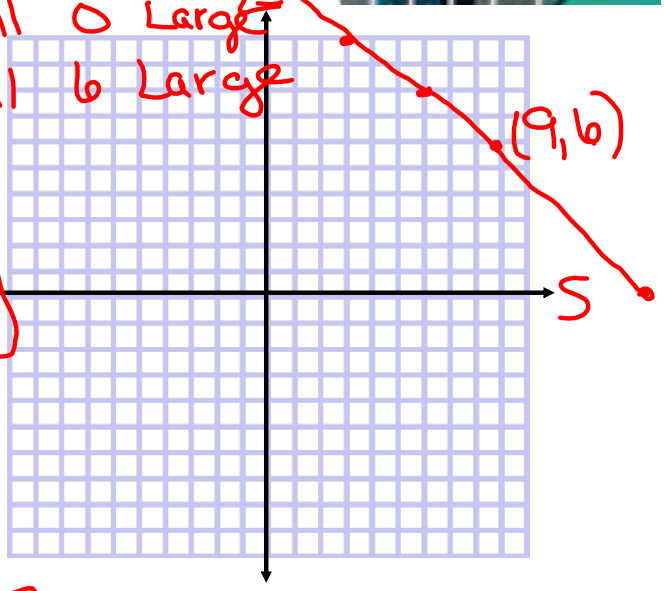
b. **Graph** the equation from part (a).

c. **List** several possible combinations.

0 small 12 Large

8ppl Sm V 18 small 0 Large

12ppl L V 9 small 6 Large



$8x + 12y =$

$8s + 12L = 144$

$8 \cdot 15 + 12 \cdot 2$

$120 + 24 = 144$

$\frac{12L}{12} = -\frac{8s}{12} + \frac{144}{12}$

Try this: $L = -\frac{2}{3}s + 12$

7. **WHAT IF?** In Example 5, suppose that 8 students decide not to go on the class trip. Write an equation that models the possible combinations of small and large vans that your class could fill. List several possible combinations.

$144 - 8 = 136$ students

$8s + 12L = 136$

Small	Large	
0	12	$(0, 11.\overline{3})$
17	0	$(17, 0)$
3	10	$(3, 9.\overline{3})$
6	8	$(6, 7.\overline{3})$

Homework

Worksheet

Algebra 1

6.1-6.3 Linear Modeling

Name: _____ Date: _____ Hr: __

1. **WEB SERVER** The initial fee to have a website set up using a server is $48. It costs $44 per month to maintain the website.

   a. Write an equation that gives the total cost of setting up and maintaining a website as a function of the number of months it is maintained.

   b. Find the total cost of setting up and maintaining the website for 6 months.

2. **TELEPHONE SERVICE** The annual household cost of telephone service in the United States increased at a relatively constant rate of $27.80 per year from 1981 to 2001. In 2001 the annual household cost of telephone service was $914.

   a. What was the annual household cost of telephone service in 1981?

   b. Write an equation that gives the annual household cost of telephone service as a function of the number of years since 1981.

   c. Find the household cost of telephone service in 2000.

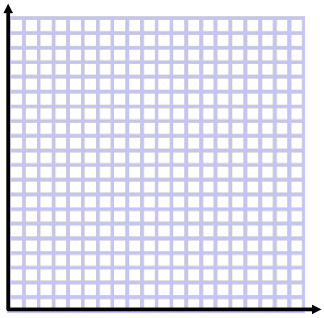
3. ★ **SHORT RESPONSE** A school district pays an installation fee and a monthly fee for Internet service. The table shows the total cost of Internet service for the school district over different numbers of months. *Explain* why the situation can be modeled by a linear equation. What is the installation fee? What is the monthly service fee?

Months of service	2	4	6	8	10	12
Total cost (dollars)	9,378	12,806	16,234	19,662	23,090	26,518

4. As the student council treasurer, you prepare the budget for your class rafting trip. Each large raft costs $100 to rent, and each small raft costs $40 to rent. You have $1600 to spend.

a. Write an equation in standard form that model the possible combination of small rafts and large rafts that you can rent.

b. Graph the equation from part a.



c. Make a table that shows several combinations of small and large rafts that you can rent.

5. A dance academy charges $20 to use the facility and $25 per hour of instruction.

a. Write an equation that gives the total cost to learn dance at the academy as a function of hours of instruction.

b. Find the total cost of 2 hours of dance instruction.

6. You have a subscription to an online magazine that allows you to view up to 25 articles from the magazine's archive. You are charged an additional fee for each article after 25 articles have been viewed. After viewing 28 articles, you paid a total of $34.80. After viewing 30 articles you paid a total of $40.70

a. What is the cost per archived article after the first 25 articles viewed?

b. What is the cost of the magazine subscription?

c. Write an equation that gives the total cost of viewing archived articles as a function of the number of archived articles viewed.

7. In order to use an excerpt from a movie in a new television show, the television producer must pay the director of the movie $790 for the first 2 minutes of the excerpt and $130 per minute after that.

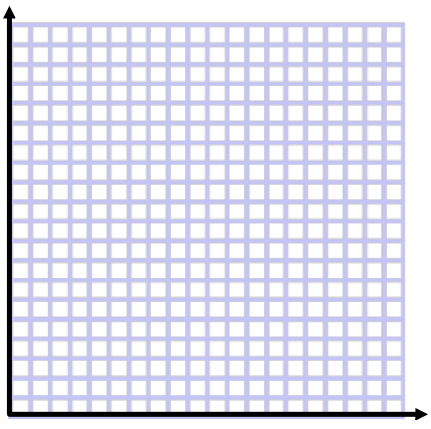
a. Write an equation that gives the total cost of using the excerpt as a function of the length of the excerpts.

b. Find the total cost of using an excerpt that is 8 minutes long?

8. T-shirts at a flea market cost $4.50 each and shorts cost $6 each. You have enough money to buy exactly 12 T-shirts and 9 pairs of shorts.

a. Write an equation in standard form that models the possible combinations of T-shirts and shorts you can buy.

b. Graph the equation from part a.



c. List several possible combinations.