Practice by Example

1. Tyrel and Dalia bought some pens and pencils. Tyrel bought 4 pens and 5 pencils, which cost him \$6.71. Dalia bought 5 pens and 3 pencils, which cost her \$7.12. Let a equal the price of a pen. Let b equal the price of a pencil.

a. Write an equation that relates the number of pens and pencils Tyrel bought to the amount he paid for them.

b. Write an equation that relates the number of pens and pencils Dalia bought to the amount she paid for them.

c. Solve the system you wrote for parts (a) and (b) to find the price of a pen and the price of a pencil.

Example 1 (page 362)

2. Suppose you have just enough money, in coins, to pay for a loaf of bread priced at \$1.95. You have 12 coins, all quarter and dimes. Let q equal the number of quarters and d equal the number of dimes. Which system models the given information?

A. $q + d = 12$
$q + d = 1.95$

B. $25q + 10d = 195$
$q + 12 = d$

C. $10q + 25d = 12$
$q + d = 1.95$

D. $q + d = 12$
$25q + 10d = 195$

3. Suppose you want to combine two types of fruit drink to create 24 kilograms of a drink that will be 5% sugar by weight. Fruit drink A is 4% sugar by weight, and fruit drink B is 8% sugar by weight.

a. Copy and complete the table below.

	Fruit Drink A 4% Sugar	Fruit Drink B 8% Sugar	Mixed Fruit Drink 5% Sugar
Fruit Drink (kg)	■	■	■
Sugar (kg)	■	■	■

b. Write a system of equations that relates the amounts of fruit drink A and fruit drink B to the total amount of drink needed and to the total amount of sugar needed.

c. Solve the system to find how much of each type of fruit drink you need to use.

4. You have \$22 in your bank account and deposit \$11.50 each week. At the same time your cousin has \$218 but is withdrawing \$13 each week.

a. When will your accounts have the same balance?

b. How much money will each of you have after 12 weeks?

Example 2 (page 363)

5. Business Suppose you invest \$10,410 in equipment to manufacture a new board game. Each game costs \$2.65 to manufacture and sells for \$20. How many games must you make and sell before your business breaks even?

6. **Business** Several students decide to start a T-shirt company. After initial expenses of \$280, they purchase each T-shirt wholesale for \$3.99. They sell each T-shirt for \$10.99. How many must they sell to break even?

Example 3 (page 364)

7. **Travel** A family is canoeing downstream (with the current). Their speed relative to the banks of the river averages 2.75 mi/h. During the return trip, they paddle upstream (against the current), averaging 1.5 mi/h relative to the riverbank.
   a. Write an equation for the rate of the canoe downstream.
   b. Write an equation for the rate of the canoe upstream.
   c. Solve the system to find the family's paddling speed in still water.
   d. Find the speed of the current of the river.

8. **Travel** John flies from Atlanta, Georgia, to San Francisco, California. It takes 5.6 hours to travel 2100 miles against the head wind. At the same time Debby flies from San Francisco to Atlanta. Her plane travels with the same average airspeed but, with a tail wind, her flight takes only 4.8 hours.
   a. Write a system of equations that relates time, airspeed, and wind speed to distance for each traveler.
   b. Solve the system to find the airspeed.
   c. Find the wind speed.

B Apply Your Skills

Open-Ended Without solving, what method would you choose to solve each system: *graphing*, *substitution*, or *elimination*? Explain your reasoning.

9. $4s - 3t = 8$
   $t = -2s - 1$

10. $y = 3x - 1$
    $y = 4x$

11. $3m - 4n = 1$
    $3m - 2n = -1$

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

13. $2x - y = 4$
    $x + 3y = 16$

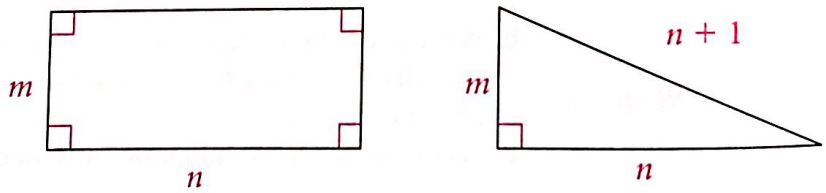
14. $u = 4v$
    $3u - 2v = 7$

Real-World Connection

Glass can be drawn into optical fibers 16 km long. One fiber can carry 20 times as many phone calls as 500 copper wires.

15. **Chemistry** A piece of glass with an initial temperature of 99°C is cooled at a rate of 3.5 degrees Celsius per minute (°C/min). At the same time, a piece of copper with an initial temperature of 0°C is heated at a rate of 2.5°C/min. Let m = the number of minutes, and t = the temperature in degrees Celsius after m minutes.
    a. Write a system of equations that relates the temperature t of each material to the time m. Solve the system.
    b. Writing Explain what the solution means in this situation.

16. **Geometry** The perimeter of the rectangle is 34 cm. The perimeter of the triangle is 30 cm. Find the values of m and n.



17. **Open-Ended** Write a problem for the total of two types of coins. Then solve the problem.

Reading Math

For help reading and solving Exercise 18, see page 369.

18. **Sales** A garden supply store sells two types of lawn mowers. Total sales of mowers for the year were \$8379.70. The total number of mowers sold was 30. The small mower costs \$249.99. The large mower costs \$329.99. Find the number sold of each type of mower.

Real-World Connection

Ultralight aircraft like the one pictured above can weigh less than 400 lb.

19. Aviation Suppose you are flying an ultralight aircraft like the one pictured at the left. You fly to a nearby town, 18 miles away. With a tail wind, the trip takes $\frac{1}{3}$ hour. Your return flight with a head wind takes $\frac{3}{5}$ hour.

a. Find the average airspeed of the ultralight aircraft.

b. Find the average wind speed.

20. Suppose the ratio of girls to boys in your school is 19 : 17. There are 1908 students altogether.

a. Solve the proportion $\frac{g}{b} = \frac{19}{17}$ for g.

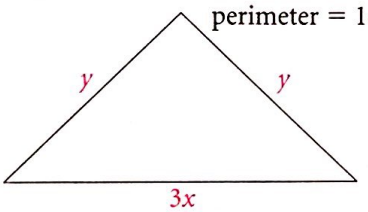
b. Write and solve the system of equations to find the total number of boys b and girls g.

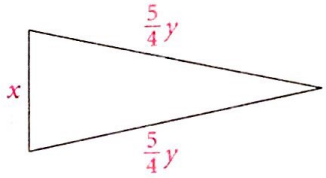
21. Consumer Decisions Suppose you are trying to decide whether to buy ski equipment. Typically, it costs you \$60 a day to rent ski equipment and buy a lift ticket. You can buy ski equipment for about \$400. A lift ticket alone costs \$35 for one day.

a. Find the break-even point.

b. Critical Thinking If you expect to ski five days a year, should you buy the ski equipment? Explain.

22. Geometry Find the values of x and y.





perimeter = 12

Challenge

23. You can represent the value of any two-digit number with the expression $10a + b$, where a is the tens' place digit and b is the ones' place digit. If a is 5 and b is 7, then the value of the number is $10(5) + 7$, or 57.

Use a system of equations to find the two-digit number described below.

- The ones' place digit is one more than twice the tens' place digit.
- The value of the number is two more than five times the ones' place digit.

24. Sales An artist sells original hand-painted greeting cards. He makes \$2.50 profit on a small card and \$4.00 profit on a large card. He generally sells 5 large cards for every 2 small cards. He wants a profit of \$10,000 from large and small cards this year.

a. Find the quantity of each card the artist needs to sell to reach his goal.

b. The artist can create a card every 12 minutes. How many hours will he need to make enough to reach his profit target if he sells them all?

c. What is the artist's hourly rate of pay?