

# EXERCISES

For more exercises, see *Extra Skill and Word Problem Practice*.

## Practice and Problem Solving

### A Practice by Example

Examples 1, 2  
(pages 692, 693)



Solve each equation. Check your solutions.

1.  $\frac{1}{2} + \frac{2}{x} = \frac{1}{x}$
2.  $5 + \frac{2}{p} = \frac{17}{p}$
3.  $\frac{3}{a} - \frac{5}{a} = 2$
4.  $y - \frac{6}{y} = 5$
5.  $\frac{5}{2s} + \frac{3}{4} = \frac{9}{4s}$
6.  $\frac{1}{t-2} = \frac{t}{8}$
7.  $\frac{2}{c-2} = 2 - \frac{4}{c}$
8.  $\frac{5}{3p} + \frac{2}{3} = \frac{5+p}{2p}$
9.  $\frac{8}{x+3} = \frac{1}{x} + 1$
10.  $\frac{v+2}{v} + \frac{4}{3v} = 11$
11.  $\frac{4}{3(c+4)} + 1 = \frac{2c}{c+4}$
12.  $\frac{3+a}{2a} = \frac{1}{3} + \frac{5}{6a}$
13.  $7 + \frac{3}{x} = \frac{7}{x} + 9$
14.  $\frac{a}{a+3} = \frac{2a}{a-3} - 1$
15.  $\frac{z}{z+2} - \frac{1}{z} = 1$

Example 3  
(page 693)

16. **Gardening** Marian can weed a garden in 3 hours. Robin can weed the same garden in 4 hours. How long will the weeding take them if they work together?
17. David can unload a delivery truck in 20 min. Allie can unload a delivery truck in 35 min. How long will the unloading take them if they work together?

Examples 4, 5  
(page 694)

Solve each equation. Check your solutions. If there is no solution, write *no solution*.

18.  $\frac{5}{x+1} = \frac{x+2}{x+1}$
19.  $\frac{4}{c+4} = \frac{c}{c+25}$
20.  $\frac{3}{m-1} = \frac{2m}{m+4}$
21.  $\frac{2x+4}{x-3} = \frac{3x}{x-3}$
22.  $\frac{30}{x+3} = \frac{30}{x-3}$
23.  $\frac{x+2}{x+4} = \frac{x-2}{x-1}$

### B Apply Your Skills

Solve each equation. Check your solutions.

24.  $\frac{2r}{r-4} - 2 = \frac{4}{r+5}$
25.  $6 - \frac{2}{b} = \frac{-5}{b-3}$
26.  $\frac{r+1}{r-1} = \frac{r}{3} + \frac{2}{r-1}$
27.  $\frac{3}{s-1} + 1 = \frac{12}{s^2-1}$
28.  $\frac{d}{d+2} - \frac{2}{2-d} = \frac{d+6}{d^2-4}$
29.  $\frac{u+1}{u} + \frac{1}{2u} = 4$
30.  $\frac{s}{3s+2} + \frac{s+3}{2s-4} = \frac{-2s}{3s^2-4s-4}$
31.  $\frac{u+1}{u+2} = \frac{-1}{u-3} + \frac{u-1}{u^2-u-6}$

32. Two pipes fill a storage tank in 9 hours. The smaller pipe takes 3 times as long to fill the tank as the larger pipe. How long would it take the larger pipe to fill the tank alone?

33. A teacher assigned the equation  $\frac{40}{x} = \frac{15}{x-20}$ . Carlos studied the equation and said, "I'll start by finding the LCD." Ingrid studied the equation and said, "I'll start by cross multiplying."

- a. Solve the equation using Carlos's method and then Ingrid's method.
- b. **Writing** Which method do you prefer? Explain why.
- c. **Critical Thinking** Will Ingrid's method work for all rational equations? Explain.

34. Find the value of each variable. 
$$\begin{bmatrix} \frac{5a}{3} & \frac{7}{3b} \\ \frac{2c-15}{35c} & \frac{5}{2d} + \frac{3}{4} \end{bmatrix} = \begin{bmatrix} 2 + \frac{7a}{6} & 9 \\ \frac{1}{5c} & \frac{9}{4d} \end{bmatrix}$$



35. a. Write two functions using the expressions on the two sides of the equation  $\frac{6}{x^2} + 1 = \frac{(x+7)^2}{6}$ . Graph the functions.
- b. Find the coordinates of the points of intersection.
- c. Are the  $x$ -values of the points of intersection solutions to the equation? Explain.

### GO for Help

For a guide to solving Exercise 32, see p. 698.

### GO online Homework Video Tutor

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**Electricity** Lamps can be connected to a battery in a circuit in series or in parallel. You can calculate the total resistance  $R_T$  in a circuit if you know the resistance in each lamp. Resistance is measured in ohms ( $\Omega$ ).



Circuit connected in series.

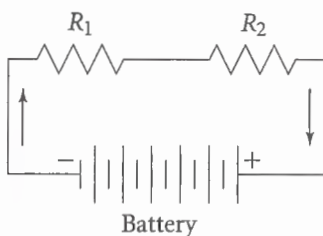


Circuit connected in parallel.

### Real-World Connection

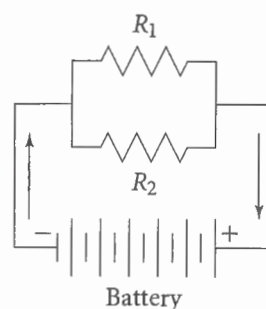
The resistance of a conductor is the opposition it gives to the flow of electrical current through it.

#### Circuit Connected in Series



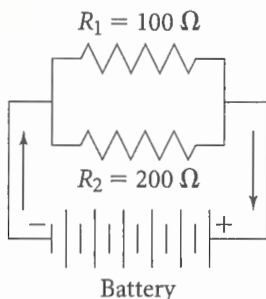
$$R_T = R_1 + R_2$$

#### Circuit Connected in Parallel

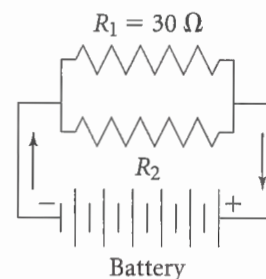


$$\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2}$$

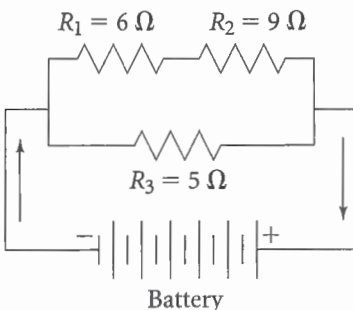
36. Find  $R_T$ .



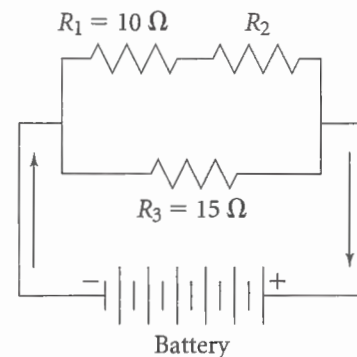
37.  $R_T = 12 \Omega$ ; find  $R_2$ .



38. Find  $R_T$ . (*Hint: The lamps in this circuit are connected in series and in parallel.*)



39.  $R_T = 10 \Omega$ ; find  $R_2$ .



40. **Open-Ended** Write a rational equation that has 3 as a solution.

41. **Travel** A plane flies 450 mi/h. It can travel 980 miles with a wind in the same amount of time as it travels 820 mi against the wind. Solve the equation  $\frac{980}{450 + s} = \frac{820}{450 - s}$  to find the speed  $s$  of the wind.

### Challenge

Solve each equation. Be sure to check your answers.

42.  $\frac{x-6}{x+3} + \frac{2x}{x-3} = \frac{4x+3}{x+3}$

43.  $\frac{n}{n-2} + \frac{n}{n+2} = \frac{n}{n^2-4}$

44.  $\frac{2}{r} + \frac{1}{r^2} + \frac{r^2+r}{r^3} = \frac{1}{r}$

45.  $\frac{3}{t} - \frac{t^2-2t}{t^3} = \frac{4}{t^2}$

46. It takes Jon 75 min to paint a room. It takes Jeff 60 min and Jackie 80 min each to paint the same room. How long will the painting take if all three work together?



### Real-World Connection

Many chemistry classes include a lab on testing acidity.

47. **Chemistry** A chemist has one solution that is 80% acid and a second solution that is 30% acid. The chemist needs to mix some of both solutions to make 50 liters of a solution that is 62% acid. Let  $s$  = the number of liters of the 80% solution used in the mixture.
- Write an expression for the amount of acid in  $s$  liters of the 80% solution.
  - Write an expression for the number of liters of the 30% acid used in the mixture.
  - Write an expression for the amount of acid in a 30% acid solution.
  - Write an equation that combines the amount of acid in each solution to make the total amount of acid in 50 liters of 62% acid solution.
  - Solve the equation you wrote in part (d).
  - How many liters of each solution will the chemist need to make 50 liters of 62% acid solution?

48. Sumi can wash the windows of an office building in  $\frac{3}{4}$  the time it takes her apprentice. One day they worked on a building together for 2 h 16 min, and then Sumi continued alone. It took 4 h 32 min more to complete the job. How long would it take her apprentice to wash all the windows alone?



### Test Prep



#### Multiple Choice

49. Which is a solution of  $\frac{2}{n} + \frac{1}{2} = \frac{1}{n}$ ?  
 A. -4                      B. -2                      C. 2                      D. 4
50. Which inequality contains both solutions of  $x = \frac{1}{2} + \frac{3}{x}$ ?  
 F.  $-1 < x < 3$       G.  $-2 < x \leq 2$       H.  $-2 \leq x < 0$       J.  $-3 \leq x \leq -1$
51. What is the least common denominator of  $\frac{1}{x}$ ,  $\frac{x}{3}$ , and  $\frac{3}{2x}$ ?  
 A.  $2x$                       B.  $3x$                       C.  $6x$                       D.  $6x^2$

#### Short Response

52. You are trying to find the number you would add to both the numerator and denominator of  $\frac{3}{16}$  to make a fraction equal to  $\frac{1}{2}$ . Write a rational equation that can be used to find this number. Then solve the equation to find the number and check your solution.

### Mixed Review



#### Lesson 12-5

Add or subtract.

53.  $\frac{5}{x^2y^2z} - \frac{8}{x^2y^2z}$                       54.  $\frac{3h^2}{2t^2 - 8} + \frac{h}{t - 2}$                       55.  $\frac{k - 11}{k^2 + 6k - 40} - \frac{5}{k - 4}$

#### Lesson 11-4

Graph each function either by translating the graph of  $y = \sqrt{x}$  or by making a table of values.

56.  $f(x) = -2\sqrt{x}$                       57.  $y = \sqrt{x + 7}$                       58.  $f(x) = \sqrt{x - 2} - 8$   
 59.  $y = \sqrt{0.25x}$                       60.  $y = \sqrt{2x} + 3$                       61.  $y = \sqrt{4x - 2} - 2$

#### Lesson 10-4

Solve each equation by factoring.

62.  $x^2 + 23x + 90 = 0$       63.  $x^2 - 19x + 88 = 0$       64.  $x^2 + 22x - 23 = 0$   
 65.  $x^2 + 2x - 48 = 0$       66.  $x^2 + 52 = -17x$       67.  $x^2 + 92x - 9 = -100$