

3.3

Exercise Set

FOR EXTRA HELP



- 1.–14. For Exercises 1–14, solve Exercises 47–60 from p. 185.
15. **Social Networking.** In April 2009, Facebook and MySpace together had an estimated 160 million unique users. Facebook had 8 million fewer users than twice the number of users MySpace had that same month. How many unique users did each online social network have in April 2009?
Source: www.insidefacebook.com
16. **Snowmen.** The tallest snowman ever recorded—really a snow *woman* named Olympia—was built by residents of Bethel, Maine, and surrounding towns. Her body and head together made up her total record height of 122 ft. The body was 2 ft longer than 14 times the height of the head. What were the separate heights of Olympia's head and body?
Source: Based on information from *Guinness World Records* 2010
17. **College Credits.** Each course at Mt. Regis College is worth either 3 or 4 credits. The members of the men's swim team are taking a total of 48 courses that are worth a total of 155 credits. How many 3-credit courses and how many 4-credit courses are being taken?
18. **College Credits.** Each course at Pease County Community College is worth either 3 or 4 credits. The members of the women's golf team are taking a total of 27 courses that are worth a total of 89 credits. How many 3-credit courses and how many 4-credit courses are being taken?
19. **Yellowstone Park Admissions.** Entering Yellowstone National Park costs \$25 for a car and \$20 for a motorcycle. One June day, 5950 cars or motorcycles enter and pay a total of \$137,625. How many motorcycles entered on that day?
Source: National Park Service, U.S. Department of the Interior
20. **Zoo Admissions.** During the summer months, the Bronx Zoo charges \$15 for adults and \$11 for children. One July day, a total of \$11,920 was collected from 960 adults and children. How many adult admissions were there?
Source: Bronx Zoo
21. **Printing.** King Street Printing recently charged 1.9¢ per sheet of paper, but 2.4¢ per sheet for paper made of recycled fibers. Darren's bill for 150 sheets of paper was \$3.41. How many sheets of each type were used?
22. **Photocopying.** Quick Copy recently charged 6¢ per page for copying pages that can be machine-fed and 18¢ per page for copying pages that must be hand-placed on the copier. If Lea's bill for 90 copies was \$9.24, how many copies of each type were made?
23. **Sales.** Office Depot® recently sold a black Epson® T069120-S ink cartridge for \$16.99 and a black HP C4902AN cartridge for \$25.99. At the start of a recent fall semester, a total of 50 of these cartridges was sold for a total of \$984.50. How many of each type were purchased?
24. **Office Supplies.** Hancock County Social Services is preparing materials for a seminar. They purchase a combination of 80 large and small binders. The large binders cost \$8.49 each and the small ones cost \$5.99 each. If the total cost of the binders was \$544.20, how many of each size were purchased?
25. **Blending Coffees.** The Roasted Bean charges \$13.00 per pound for Fair Trade Organic Mexican coffee and \$11.00 per pound for Fair Trade Organic Peruvian coffee. How much of each type should be used to make a 28-lb blend that sells for \$12.00 per pound?



25. **Mixed Nuts.** Oh Nuts! sells pistachio kernels for \$6.50 per pound and almonds for \$8.00 per pound. How much of each type should be used to make a 50-lb mixture that sells for \$7.40 per pound?

27. **Blending Spices.** Spice of Life sells ground sumac for \$1.35 per ounce and ground thyme for \$1.85 per ounce. Aman wants to make a 20-oz Zahtar seasoning blend using the two spices that sells for \$1.65 per ounce. How much of each spice should Aman use?



28. **Blending Coffees.** The Gathering Grounds charges \$10.00 per pound for Columbian Supreme coffee and \$12.00 per pound for Columbian Supreme decaffeinated coffee. The Lanosgas buy some of each to make their own partially-decaffeinated blend. If they pay \$53 for a 5-lb blend, how much of each did they purchase?
29. **Acid Mixtures.** Jerome's experiment requires him to mix a 50%-acid solution with an 80%-acid solution to create 200 mL of a 68%-acid solution. How much 50%-acid solution and how much 80%-acid solution should he use? Complete the following table as part of the *Translate* step.

Type of Solution	50%-Acid	80%-Acid	68%-Acid Mix
Amount of Solution	x	y	
Percent Acid	50%		68%
Amount of Acid in Solution		$0.8y$	

30. **Ink Remover.** Etch Clean Graphics uses one cleanser that is 25% acid and a second that is 50% acid. How many liters of each should be mixed to get 30 L of a solution that is 40% acid?

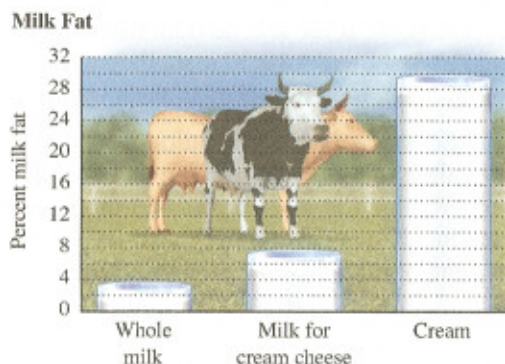
31. **Catering.** Cati's Catering is planning an office reception. The office administrator has requested a candy mixture that is 25% chocolate. Cati has available mixtures that are either 50% chocolate or 10% chocolate. How much of each type should be mixed to get a 20-lb mixture that is 25% chocolate?



32. **Livestock Feed.** Soybean meal is 16% protein and corn meal is 9% protein. How many pounds of each should be mixed to get a 350-lb mixture that is 12% protein?
33. **Student Loans.** Asel's two student loans totaled \$12,000. One of her loans was at 6.5% simple interest and the other at 7.2%. After one year, Asel owed \$811.50 in interest. What was the amount of each loan?
34. **Investments.** A self-employed contractor nearing retirement made two investments totaling \$15,000. In one year, these investments yielded \$1023 in simple interest. Part of the money was invested at 6% and the rest at 7.5%. How much was invested at each rate?
35. **Automotive Maintenance.** "Steady State" antifreeze is 18% alcohol and "Even Flow" is 10% alcohol. How many liters of each should be mixed to get 20 L of a mixture that is 15% alcohol?



36. **Chemistry.** E-Chem Testing has a solution that is 80% base and another that is 30% base. A technician needs 150 L of a solution that is 62% base. The 150 L will be prepared by mixing the two solutions on hand. How much of each should be used?
37. **Octane Ratings.** The octane rating of a gasoline is a measure of the amount of isooctane in the gas. Manufacturers recommend using 93-octane gasoline on retuned motors. How much 87-octane gas and 95-octane gas should Yousef mix in order to make 10 gal of 93-octane gas for his retuned Ford F-150? Source: Champlain Electric and Petroleum Equipment
38. **Octane Ratings.** Subaru recommends 91-octane gasoline for the 2008 Legacy 3.0 R. How much 87-octane gas and 93-octane gas should Kelsey mix in order to make 12 gal of 91-octane gas for her Legacy? Sources: Champlain Electric and Petroleum Equipment; Dean Team Ballwin
39. **Food Science.** The bar graph below shows the milk fat percentages in three dairy products. How many pounds each of whole milk and cream should be mixed to form 200 lb of milk for cream cheese?



40. **Food Science.** How much lowfat milk (1% fat) and how much whole milk (4% fat) should be mixed to make 5 gal of reduced fat milk (2% fat)?
41. **Train Travel.** A train leaves Danville Union and travels north at a speed of 75 km/h. Two hours later, an express train leaves on a parallel track and travels north at 125 km/h. How far from the station will they meet?
42. **Car Travel.** Two cars leave Salt Lake City, traveling in opposite directions. One car travels at a speed of 80 km/h and the other at 96 km/h. In how many hours will they be 528 km apart?
43. **Canoeing.** Kahla paddled for 4 hr with a 6-km/h current to reach a campsite. The return trip against the same current took 10 hr. Find the speed of Kahla's canoe in still water.
44. **Boating.** Cody motored 3 hr downstream with a 6-mph current. The return trip against the same current took 5 hr. Find the speed of the boat in still water.

45. **Point of No Return.** A plane flying the 3458-mi trip from New York City to London has a 50-mph tailwind. The flight's *point of no return* is the point at which the flight time required to return to New York is the same as the time required to continue to London. If the speed of the plane in still air is 360 mph, how far is New York from the point of no return?
46. **Point of No Return.** A plane is flying the 2553-mi trip from Los Angeles to Honolulu into a 60-mph headwind. If the speed of the plane in still air is 310 mph, how far from Los Angeles is the plane's point of no return? (See Exercise 45.)
47. **Phone Rates.** Kim makes frequent calls from the United States to Korea. Her calling plan costs \$3.99 per month plus 9¢ per minute for calls made to a landline and 15¢ per minute for calls made to a wireless number. One month her bill was \$58.89. If she talked for a total of 400 min, how many minutes were to a landline and how many minutes to a wireless number? Source: wireless.att.com



48. **Radio Airplay.** Roscoe must play 12 commercials during his 1-hr radio show. Each commercial is either 30 sec or 60 sec long. If the total commercial time during that hour is 10 min, how many commercials of each type does Roscoe play?
49. **Making Change.** Monica makes a \$9.25 purchase at the bookstore with a \$20 bill. The store has no bills and gives her the change in quarters and fifty-cent pieces. There are 30 coins in all. How many of each kind are there?
50. **Money Exchange.** Sabina goes to a bank and gets change for a \$50 bill consisting of all \$5 bills and \$1 bills. There are 22 bills in all. How many of each kind are there?
51. **TW** In what ways are Examples 3 and 4 similar? In what sense are their systems of equations similar?

- TW** 52. Write at least three study tips of your own for someone beginning this exercise set.

SKILL REVIEW

To prepare for Section 3.4, review evaluating expressions with three variables (Sections 1.1 and 1.2).

Evaluate. [1.1], [1.2]

53. $2x - 3y - z$, for $x = 5$, $y = 2$, and $z = 3$
 54. $4x + y - 6z$, for $x = \frac{1}{2}$, $y = \frac{1}{2}$, and $z = \frac{1}{3}$
 55. $x + y + 2z$, for $x = 1$, $y = -4$, and $z = -5$
 56. $3a - b + 2c$, for $a = 1$, $b = -6$, and $c = 4$
 57. $a - 2b - 3c$, for $a = -2$, $b = 3$, and $c = -5$
 58. $2a - 5b - c$, for $a = \frac{1}{4}$, $b = -\frac{1}{4}$, and $c = -\frac{3}{2}$

SYNTHESIS

- TW** 59. Suppose that in Example 3 you are asked only for the amount of almonds needed for the Market Street Blend. Would the method of solving the problem change? Why or why not?
- TW** 60. Write a problem similar to Example 2 for a classmate to solve. Design the problem so that the solution is "The florist sold 14 hanging plants and 9 flats of petunias."
61. **Metal Alloys.** In order for a metal to be labeled "sterling silver," the silver alloy must contain at least 92.5% pure silver. Mitchell has 32 oz of coin silver, which is 90% pure silver. How much pure silver must he add to the coin silver in order to have a sterling-silver alloy?
 Source: Hardy, R. Allen, *The Jewelry Repair Manual*. Courier Dover Publications, 1996, p. 271.
62. **Recycled Paper.** Unable to purchase 60 reams of paper that contains 20% post-consumer fiber, the Naylor School bought paper that was either 0% post-consumer fiber or 30% post-consumer fiber. How many reams of each should be purchased in order to use the same amount of post-consumer fiber as if the 20% post-consumer fiber paper were available?
63. **Automotive Maintenance.** The radiator in Michelle's car contains 6.3 L of antifreeze and water. This mixture is 30% antifreeze. How much of this mixture should she drain and replace with pure antifreeze so that there will be a mixture of 50% antifreeze?
64. **Exercise.** Cindi jogs and walks to school each day. She averages 4 km/h walking and 8 km/h jogging. From home to school is 6 km and Cindi makes the trip in 1 hr. How far does she jog in a trip?
65. **Book Sales.** *American Economic History* can be purchased as a three-volume set for \$88 or each volume can be purchased separately for \$39. An economics class spent \$1641 for 51 volumes. How many three-volume sets were ordered?
 Source: National History Day, www.nhd.org.
66. The tens digit of a two-digit positive integer is 2 more than three times the units digit. If the digits are interchanged, the new number is 13 less than half the given number. Find the given integer. (*Hint:* Let x = the tens-place digit and y = the units-place digit; then $10x + y$ is the number.)
67. **Wood Stains.** Williams' Custom Flooring has 0.5 gal of stain that is 20% brown and 80% neutral. A customer orders 1.5 gal of a stain that is 60% brown and 40% neutral. How much pure brown stain and how much neutral stain should be added to the original 0.5 gal in order to make up the order? (This problem was suggested by Professor Chris Burditt of Yountville, California.)
68. **Train Travel.** A train leaves Union Station for Central Station, 216 km away, at 9 A.M. One hour later, a train leaves Central Station for Union Station. They meet at noon. If the second train had started at 9 A.M. and the first train at 10:30 A.M., they would still have met at noon. Find the speed of each train.
69. **Fuel Economy.** Grady's station wagon gets 18 miles per gallon (mpg) in city driving and 24 mpg in highway driving. The car is driven 465 mi on 23 gal of gasoline. How many miles were driven in the city and how many were driven on the highway?
70. **Biochemistry.** Industrial biochemists routinely use a machine to mix a buffer of 10% acetone by adding 100% acetone to water. One day, instead of adding 5 L of acetone to create a vat of buffer, a machine added 10 L. How much additional water was needed to bring the concentration down to 10%?
71. Recently, Staples® charged \$5.99 for a 2-count pack of Bic® Round Stic Grip mechanical pencils and \$7.49 for a 12-count pack of Bic® Matic Grip mechanical pencils. Wiese Accounting purchased 138 of these two types of mechanical pencils for a total of \$157.26. How many packs of each did they buy?

Try Exercise Answers: Section 3.3

15. Facebook: 104 million users; MySpace: 56 million users
 19. 2225 motorcycles 27. Sumac: 8 oz; thyme: 12 oz
 31. 50% chocolate: 7.5 lb; 10% chocolate: 12.5 lb
 33. \$7500 at 6.5%; \$4500 at 7.2% 41. 375 km 43. 14 km/h