

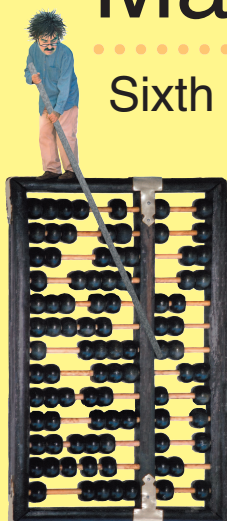
# Student Solutions Manual

for use with

.....  
Math for Business and Life  
.....

Sixth Edition

John Webber



# A Note To Students

Math skills are vital in business, investing, and everyday life as a consumer. *Math for Business and Life* was written to provide these math skills. This *Student Solutions Manual* provides written solutions to all Chapter Review Problems and Practice Tests. Here are a few suggestions for using this manual:

- While the manual is a valuable study aid, don't compromise other elements for a successful course, such as attending class regularly, reading the text, and studying with other students.
- Don't use the manual as a crutch. Try to solve the problems without referring to this manual; you will learn more by struggling a bit, trying to define the problem. Compare your answer with that found in Appendix B of the text. If your answer is wrong, compare your solution with the solution in this manual.

Best wishes for a successful course, as well as success in your business and personal ventures.



John Webber

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# Chapter I Whole Numbers and Decimals

## Unit I.1 Reading, writing, and rounding numbers

1. **Three hundred seventeen**
2. **Eight million, two hundred fifty-seven thousand, one hundred sixteen**
3. **Two and one tenth**
4. **Twelve and twelve ten-thousandths**
5. **426,000**
6. **.426**
7. **400.026**
8. **14,726,111.2**
9. 4.8 trillion  $\longrightarrow$  4,8  $\longrightarrow$  **4,800,000,000,000**
10. 76.12506  $\longrightarrow$  **76.13**
11. 123,678,499  $\longrightarrow$  **123,678,000**
12. 23,467.5000001  $\longrightarrow$  **23,468**
13. 45,951  $\longrightarrow$  **46,000**

## Unit I.2 Working with whole numbers

14.

$$\begin{array}{r} \overset{1\ 2}{123} \\ 456 \\ 54 \\ + 8 \\ \hline 641 \end{array}$$

15.

$$\begin{array}{r} \overset{1\ 2}{76} \\ 7 \\ 341 \\ + 25,018 \\ \hline 25,442 \end{array}$$

16.

$$\begin{array}{r} \overset{1\ 11}{15,000} \\ 2,111 \\ 7,085 \\ + 12,448 \\ \hline 36,644 \end{array}$$

17.

$$\begin{array}{r} 127 \\ - 12 \\ \hline 115 \end{array} \quad \begin{array}{l} \uparrow \text{Check by} \\ \text{adding up.} \\ 5 + 2 = 7, \text{ etc.} \end{array}$$

18.

$$\begin{array}{r} \overset{0\ 10\ 16\ 11}{1,171} \\ - 489 \\ \hline 682 \end{array} \quad \begin{array}{l} \uparrow \text{Check by} \\ \text{adding up.} \end{array}$$

19.

$$\begin{array}{r} \overset{5\ 12}{12,762} \\ - 1,134 \\ \hline 11,628 \end{array} \quad \begin{array}{l} \uparrow \text{Check by} \\ \text{adding up.} \end{array}$$

20.

$$\begin{array}{r} 123 \\ \times 45 \\ \hline 615 \\ 492 \\ \hline 5,535 \end{array}$$

21.

$$\begin{array}{r} 1,832 \\ \times 45 \\ \hline 9160 \\ 7328 \\ \hline 82,440 \end{array}$$

22.

$$\begin{array}{r} 1,800 \xrightarrow{\text{Pretend}} 18 \quad 2 \text{ zeros} \\ \times 120 \xrightarrow{\text{Pretend}} \times 12 + 1 \text{ zero} \\ \hline 36 \quad 3 \\ 18 \\ 216 \xrightarrow{\text{attach 3 zeros}} 216,000 \end{array}$$

23.

$$\begin{array}{r} 16 \\ 3 \overline{)48} \\ \underline{3} \phantom{0} \\ 18 \\ \underline{18} \end{array}$$

24.

$$\begin{array}{r} 147 \\ 24 \overline{)3528} \\ \underline{24} \phantom{00} \\ 112 \phantom{0} \\ \underline{96} \phantom{00} \\ 168 \\ \underline{168} \end{array}$$

25.

$$\begin{array}{r} 212 \text{ R}32 \\ 41 \overline{)8724} \\ \underline{82} \phantom{00} \\ 52 \phantom{0} \\ \underline{41} \phantom{00} \\ 114 \\ \underline{82} \\ 32 \end{array}$$

## Unit I.3 Strategy for solving word problems

26.  $\$24,300 - \$5,275 = \$19,025$

27.

$$\begin{array}{ccc} 53 & \text{pretend} & 53 \\ \times 40 & \longrightarrow & \times 4 \quad (1 \text{ zero ignored}) \\ & & 212 \longrightarrow 2,120 \text{ seats} \end{array}$$

28. Your score:  $4 + 5 + 3 + 4 + 7 + 6 + 4 + 2 + 5 = 40$

Over par:  $40 - 36 = 4$

29.

$$\begin{array}{r} 96 \\ \times 3 \\ \hline 288 \text{ cans} \end{array}$$

30.

$$\begin{array}{r} 12 \text{ cases} \\ 24 \overline{)288} \\ \underline{24} \phantom{00} \\ 48 \\ \underline{48} \end{array}$$

31.

|              |                |                                   |
|--------------|----------------|-----------------------------------|
|              | <b>Rounded</b> |                                   |
| \$ 980       | \$1,000        |                                   |
| 425          | 400            |                                   |
| <u>+ 310</u> | <u>+ 300</u>   |                                   |
|              | <b>\$1,700</b> | Think: $10 + 4 = 14$ ; $+ 3 = 17$ |

## Unit I.4 Working with decimal numbers

32. **1,128.509**

33. **451.91**

34. **24,198.4964**

35. **122.23**

36. **6.82**

37. **12,648.532**

38. **236.145**

39. **28.0101**

40. **114.68964**

41. **4.55**

42. **51.37**

43. **11.84**

44.

$$\begin{array}{ccc} 1000 & 47,000 \longrightarrow & 47,000 \\ (3 \text{ zeros}) & 3 \text{ places right} & \end{array}$$

45.

$$\begin{array}{ccc} 100 & 4.68 \longrightarrow & 04.68 \longrightarrow .0468 \\ (2 \text{ zeros}) & 2 \text{ places left} & \end{array}$$

46.  $\$77.85 + \$32 + \$450 + 92.16 = \$652.01$

47.  $\$745.26 - \$110.78 = \$634.48$

48.  $22 \text{ acres} + 105.643 \text{ acres} + .92 \text{ acres} = \mathbf{128.563 \text{ acres}}$
49.  $\$50 - \$8.52 = \mathbf{\$41.48}$
50.  $322 \text{ sq ft} \times \$9.50 \text{ per sq ft} = \mathbf{\$3,059}$
51.  $18.5 \text{ lb} \times \$0.39 \text{ per lb} = \$7.215 = \mathbf{\$7.22}$  (rounded)
52.  $1,872.4 \text{ miles} \times \$0.55 \text{ per mile} = \mathbf{\$1,029.82}$
53.  $295.75 \text{ sq ft} \div 3.5 \text{ sq ft per glove} = 84.5 \text{ gloves} = \mathbf{84 \text{ full gloves}}$

### Challenge problems

54.  $26,007.4 \text{ ending miles} - 23,578.9 \text{ beginning miles} = \mathbf{2,428.5 \text{ miles}}$
55. To figure gallons used, we must start with a full tank and end with a full tank, ignoring gallons used in the initial fill-up:  $14.6 \text{ gal} + 17.4 \text{ gal} + 11.7 \text{ gal} + 15.6 \text{ gal} + 17.1 \text{ gal} + 9.4 \text{ gal} = \mathbf{85.8 \text{ gal}}$
56. miles per gallon means “miles divided by gallons,” so:  $2,428.5 \text{ miles} \div 85.8 \text{ gal} = \mathbf{28.3 \text{ mpg}}$

57. Miles:  $34,428.3 - 34,122.8 = 305.5$   
 Charge  
     For miles:  $305.5 \text{ mi} \times \$0.24$       \$ 73.32  
     Daily charge:  $2 \text{ days} \times \$49$       + 98.00  
                                                          **\$171.32**

- 58.
- |                                |                                   |
|--------------------------------|-----------------------------------|
| Heartbeats per minute          | 73                                |
|                                | <u><math>\times 60</math></u>     |
| a. Heartbeats per hour         | <b>4,380</b>                      |
|                                | <u><math>\times 24</math></u>     |
| b. Heartbeats per day          | <b>105,120</b>                    |
|                                | <u><math>\times 365.25</math></u> |
| c. Heartbeats per year         | <b>38,395,080</b>                 |
|                                | <u><math>\times 70</math></u>     |
| d. Heartbeats per 70-year life | <b>2,687,655,600</b>              |

59.  $\$3,450 \times 12 \text{ months} = \mathbf{\$41,400}$
60. Rent per square foot means “rent divided by square feet,” so  $\$41,400 \div 9,720 \text{ sq ft} = \mathbf{\$4.26 \text{ per sq ft}}$
61.  $151 \text{ lb} - 124 \text{ lb} = \mathbf{27 \text{ lb}}$
62. Pounds per month means “pounds divided by months,” so:  $27 \text{ lb} \div 3 \text{ months} = \mathbf{9 \text{ lb per month}}$

- 63.
- |                    |                               |
|--------------------|-------------------------------|
| $10 \times \$700$  | \$7,000                       |
| $4 \times \$725$   | 2,900                         |
| $2 \times \$750$   | <u>1,500</u>                  |
| Total monthly rent | \$11,400                      |
|                    | <u><math>\times 12</math></u> |
| Total annual rent  | <b>\$136,800</b>              |

- 64.
- |                                             |                 |
|---------------------------------------------|-----------------|
| Total annual rent                           | \$136,800       |
| Less expenses                               | <u>- 41,000</u> |
| Amount after expenses                       | \$ 95,800       |
| Less mortgage payments: $12 \times \$7,730$ | <u>- 92,760</u> |
| Amount after mortgage payments              | <b>\$ 3,040</b> |

65.

|                                                                        |                   |
|------------------------------------------------------------------------|-------------------|
| Lodging: 14 nights $\times$ \$85 =                                     | \$1,190.00        |
| Meals:                                                                 |                   |
| Cost per day: 4 people $\times$ \$24 per day = \$96                    |                   |
| Cost for 15 days: \$96 per day $\times$ 15 days =                      | 1,440.00          |
| Gas:                                                                   |                   |
| Gallons required: 3,300 miles $\div$ 15 miles per gallon = 220 gallons |                   |
| Cost of gas: 220 gallons $\times$ \$4.19 per gallon                    | 628.50            |
| Entertainment: 15 days $\times$ \$60 =                                 | <u>+ 900.00</u>   |
| Total budget                                                           | <b>\$4,158.50</b> |

66. Staples:  $4 \times \$33.50 =$  **\$134.00**  $\leftarrow$  This is the better deal  
 Central Supply:  $3 \times \$46.89 =$  \$140.67

67. Extra cost of upgrade plan:  $\$74.95 - \$43.95 = \$31$   
 Number of texts available:  $\$31 \div \$0.20$  per text = **155 text messages**

## Practice Test

- Eighty-seven thousand, twenty-two and thirty-five hundredths
- 300.084**
- 26.1 billion  $\longrightarrow$  26,1  $\longrightarrow$  **26,100,000,000**
- 618.7665  $\longrightarrow$  **618.77**
- \$28,958  $\longrightarrow$  **\$29,000**
- 3,275**
- 126**
- 322,000**
- 127.4**
- $\$4 + \$5 + \$2 =$  **\$11**
- $\$22,400 - \$4,200 + \$1,228.50 + \$135 =$  **\$19,563.50**
- 112 acres + 84.625 acres + .82 acres = **197.445 acres**

13.

|                      |                                                          |
|----------------------|----------------------------------------------------------|
| Carpet               | \$21.25                                                  |
| Pad                  | 4.65                                                     |
| Installation         | <u>4.00</u>                                              |
| Total cost per sq yd | $\$29.90 \times 182.5 \text{ sq yd} =$ <b>\$5,456.75</b> |

14.

### word problem guide

|                |                                                                                                                               |
|----------------|-------------------------------------------------------------------------------------------------------------------------------|
| 1. Solving for | Miles per gallon                                                                                                              |
| 2. Known facts | Traveled 1,051.6 miles (13,904.2 miles - 12,852.6 miles = 1,051.6 miles)<br>Used 53.82 gallons of gas                         |
| 3. Procedure   | Miles per gallon means "miles divided by gallons," so<br>$1,051.6 \text{ miles} \div 53.82 \text{ gallons} =$ <b>19.5 mpg</b> |

## Chapter 2 Fractions

### Unit 2.1 Types of fractions and modifying fractions

1. **The top number (3) is the numerator. The bottom number (4) is the denominator.**

2. (proper) 3. (mixed) 4. (improper) 5. (improper)

$$6. = \frac{(5 \times 4) + 3}{4} = \frac{23}{4}$$

$$7. = \frac{(2 \times 8) + 7}{8} = \frac{23}{8}$$

$$8. = \frac{(2 \times 6) + 5}{6} = \frac{17}{6}$$

$$9. \quad \begin{array}{r} 1 \\ 2 \overline{)3} \longrightarrow 2 \overline{)3} \\ \underline{2} \\ 1 \end{array} \quad \begin{array}{r} 1\frac{1}{2} \\ \text{(remainder)} \\ \text{(divisor)} \\ \underline{2} \\ 1 \end{array}$$

$$10. \quad \begin{array}{r} 2 \\ 3 \overline{)8} \longrightarrow 3 \overline{)8} \\ \underline{6} \\ 2 \end{array} \quad \begin{array}{r} 2\frac{2}{3} \\ \underline{6} \\ 2 \end{array}$$

$$11. \rightarrow \frac{3}{4} = \frac{?}{12} \rightarrow \frac{3}{4} = \frac{9}{12}$$

$$12. \rightarrow \frac{7}{6} = \frac{?}{30} \rightarrow \frac{7}{6} = \frac{35}{30}$$

$$13. = \frac{8 \div 4}{12 \div 4} = \frac{2}{3}$$

$$14. = \frac{76 \div 19}{437 \div 19} = \frac{4}{23}$$

$$\begin{array}{r} 5 \\ 76 \overline{)437} \\ \underline{380} \\ 57 \end{array} \quad \begin{array}{r} 1 \\ 57 \overline{)57} \\ \underline{57} \\ 0 \end{array} \quad \begin{array}{r} 3 \\ 19 \overline{)57} \\ \underline{57} \\ 0 \end{array}$$

### Unit 2.2 Working with fractions and mixed numbers

$$15. = \frac{2+3}{7} = \frac{5}{7}$$

$$16. = \frac{3-1}{5} = \frac{2}{5}$$

$$17. = \frac{2+5-1}{11} = \frac{6}{11}$$

$$18. = \frac{8}{12} + \frac{3}{12} = \frac{11}{12}$$

$$19. = \frac{20}{15} - \frac{3}{15} = \frac{17}{15}$$

$$20. = \frac{9}{24} + \frac{6}{24} - \frac{4}{24} = \frac{9+6-4}{24} = \frac{11}{24}$$

$$21. = \frac{2}{3} \times \frac{3}{5} = \frac{2}{5}$$

$$22. = \frac{3}{5} \times \frac{3}{8} = \frac{9}{40}$$

$$23. = \frac{4 \times 2}{3 \times 5} = \frac{8}{15}$$

$$24. = \frac{3}{5} \times \frac{3}{4} = \frac{3 \times 3}{5 \times 4} = \frac{9}{20}$$

$$25. \quad \begin{array}{r} \rightarrow 4\frac{1}{4} \rightarrow 4\frac{3}{12} \\ + 2\frac{1}{3} \rightarrow + 2\frac{4}{12} \\ \hline \text{Need LCD} \quad 6\frac{7}{12} \end{array}$$

$$26. \quad \begin{array}{r} \rightarrow 2\frac{3}{4} \rightarrow 2\frac{9}{12} \\ + 2\frac{2}{3} \rightarrow + 2\frac{8}{12} \\ \hline \text{Need LCD} \quad 4\frac{17}{12} = 4 + 1\frac{5}{12} = 5\frac{5}{12} \end{array}$$

$$27. \quad \begin{array}{r} \rightarrow 4\frac{3}{4} \rightarrow 4\frac{3}{4} \\ - 2\frac{1}{2} \rightarrow - 2\frac{2}{4} \\ \hline \text{Need LCD} \quad 2\frac{1}{4} \end{array}$$

$$28. \quad \begin{array}{r} \rightarrow 4\frac{1}{4} \rightarrow 4\frac{3}{12} \rightarrow 3\frac{15}{12} \\ - 2\frac{1}{3} \rightarrow - 2\frac{4}{12} \rightarrow - 2\frac{4}{12} \\ \hline \text{Need LCD} \quad \text{Must borrow} \quad 1\frac{11}{12} \end{array}$$

$$29. = \frac{17}{4} \times \frac{7}{3} = \frac{17 \times 7}{4 \times 3} = \frac{119}{12} = 9\frac{11}{12}$$

$$30. = \frac{17}{4} \div \frac{7}{3} = \frac{17}{4} \times \frac{3}{7} = \frac{51}{28} = 1\frac{23}{28}$$

$$31. \quad \begin{array}{r} 9\frac{1}{2} \rightarrow 9\frac{2}{4} \\ + \frac{3}{4} \rightarrow + \frac{3}{4} \\ + \frac{1}{2} \rightarrow + \frac{2}{4} \\ \hline \text{Need LCD} \quad 9\frac{7}{4} = 9 + \frac{7}{4} = 9 + 1\frac{3}{4} = 10\frac{3}{4} \text{ inches} \end{array}$$

$$32. 3\frac{2}{3} \div \frac{1}{3} = \frac{11}{3} \div \frac{1}{3} = \frac{11}{3} \times \frac{3}{1} = 11 \text{ loaves}$$

$$33. 7 \times \frac{1}{5} = \frac{7}{1} \times \frac{1}{5} = \frac{7}{5} = 1\frac{2}{5} \text{ acres}$$

$$34. \$250,000 \times \frac{4}{5} = \frac{\$50,000}{1} \times \frac{4}{5} = \$200,000 \quad \$250,000 \text{ Price} - \$200,000 \text{ Loan} = \$50,000$$

35.  $150 \div 1\frac{1}{4} = 150 \div \frac{5}{4} = \frac{150}{1} \times \frac{4}{5} = \mathbf{120 \text{ days}}$
36.  $\$120 \times 2\frac{1}{2} = \$120 \times \frac{5}{2} = \frac{\$120}{1} \times \frac{5}{2} = \mathbf{\$300}$
37.  $\frac{1}{5} + \frac{1}{3} = \frac{3}{15} + \frac{5}{15} = \frac{8}{15}$  Daniel must buy:  $\frac{15}{15} - \frac{8}{15} = \frac{7}{15}$  **interest**
38. Saturday rate:  $\$14 \times 1\frac{1}{2} = \frac{\$14}{1} \times \frac{3}{2} = \$21$  per hour      5 hours  $\times$  \$21 per hour = **\$105**
39.  $2\frac{3}{4} \div \frac{1}{4} = \frac{11}{4} \div \frac{1}{4} = \frac{11}{4} \times \frac{4}{1} = \mathbf{11 \text{ feet}}$
40. Discount:  $\$44 \times \frac{1}{4} = \frac{\$44}{1} \times \frac{1}{4} = \$11$       Sale price:  $\$44 - \$11 = \mathbf{\$33}$
41.  $85 \div 2\frac{1}{3} = 85 \div \frac{7}{3} = \frac{85}{1} \times \frac{3}{7} = \frac{255}{7} = 36\frac{3}{7} = \mathbf{36 \text{ whole shirts}}$

### Unit 2.3 Fraction/decimal conversions

42. Fifteen and twenty-two hundredths =  $15\frac{22}{100} = \mathbf{15\frac{11}{50}}$
43. Three tenths =  $\frac{3}{10}$
44. Three hundred seventy-five thousandths =  $\frac{375}{1,000} = \frac{375 \div 125}{1,000 \div 125} = \frac{3}{8}$

45. 
$$\begin{array}{r} 3125 \\ 16 \overline{)5.0000} \\ \underline{48} \phantom{00} \\ 20 \phantom{00} \\ \underline{16} \phantom{00} \\ 40 \phantom{00} \\ \underline{32} \phantom{00} \\ 80 \phantom{00} \\ \underline{80} \phantom{00} \\ 0 \end{array}$$

46. 
$$\begin{array}{r} .66 \\ 3 \overline{)2.00} \\ \underline{18} \phantom{00} \\ 20 \phantom{00} \\ \underline{18} \phantom{00} \\ 2 \text{ (repeating)} \end{array}$$

47. 
$$\begin{array}{r} 4545 \\ 11 \overline{)5.0000} \\ \underline{44} \phantom{00} \\ 60 \phantom{00} \\ \underline{55} \phantom{00} \\ 50 \phantom{00} \\ \underline{44} \phantom{00} \\ 60 \phantom{00} \\ \underline{55} \phantom{00} \\ 5 \end{array}$$

48. 
$$\begin{array}{r} .8 \\ 5 \overline{)4.0} \\ \underline{40} \\ 0 \end{array}$$

49. **Problems 45 and 48 are terminating; 46 and 47 are repeating.**
50.  $\frac{1}{2} \times .57 = .5 \times .57 = \mathbf{.285 \text{ acres}}$
51.  $\frac{1}{7} \times \frac{\$12,320,000}{1} = \frac{\$12,320,000}{7} = \mathbf{\$1,760,000}$
52. **Yes.** Both fractions can be converted to terminating decimals:  $.25 + .20 = .45$
53. **No.**  $\frac{1}{3}$  cannot be converted to a terminating decimal.

### Challenge problems

54. Length of fence (inches):  $118 \times 12 = 1,416$  inches  
 Number of slats:  $1,416 \div 3\frac{3}{4} = 1,416 \div 3.75 = 377.6 = 378$  full slats  
 Cost:  $378 \text{ slats} \times \$1.25 = \mathbf{\$472.50}$
55. Flour:  $1\frac{2}{3} \times 3\frac{1}{2} = \frac{5}{3} \times \frac{7}{2} = \frac{5 \times 7}{3 \times 2} = \frac{35}{6} = \mathbf{5\frac{5}{6} \text{ cups}}$   
 Peanut butter:  $\frac{1}{3} \times 3\frac{1}{2} = \frac{1}{3} \times \frac{7}{2} = \frac{7}{6} = \mathbf{1\frac{1}{6} \text{ cups}}$   
 Eggs:  $2 \times 3\frac{1}{2} = \frac{2}{1} \times \frac{7}{2} = \mathbf{7 \text{ eggs}}$
56.  $\frac{1}{4} + \frac{1}{5} + \frac{1}{8} = \frac{10}{40} + \frac{8}{40} + \frac{5}{40} = \frac{10+8+5}{40} = \frac{23}{40} \rightarrow \frac{40}{40} - \frac{23}{40} = \frac{17}{40}$  **for other things**



57. Housing:  $\frac{1}{4} \times \$68,400 = .25 \times \$68,400 =$  **\$17,100**  
 Food:  $\frac{1}{5} \times \$68,400 = .20 \times \$68,400 =$  **\$13,680**  
 Transportation:  $\frac{1}{8} \times \$68,400 = .125 \times \$68,400 =$  **\$ 8,550**  
 Other:  $\frac{17}{40} \times \$68,400 = .425 \times \$68,400 =$  **\$29,070**  
**\$68,400**

58.  $\frac{1}{3} \times 252 = \frac{1}{3} \times \frac{252}{1} = \frac{252}{3} = 84$  acres  $\rightarrow 252 - 84 =$  **168 acres available**

59.  $168 \div \frac{3}{8} = \frac{168}{1} \times \frac{8}{3} =$  **448 homesites**

60. Revenue:  $448 \times \$125,000$  **\$56,000,000**  
 Costs:  $\$30,000,000 + \$12,000,000$  **-42,000,000**  
 Projected profit **\$14,000,000**

61.  $2\frac{1}{4} \longrightarrow 2\frac{2}{8}$   
 $1\frac{3}{8} \longrightarrow 1\frac{3}{8}$   
 $+4\frac{1}{2} \longrightarrow +4\frac{4}{8}$   
*Need LCD*  $7\frac{9}{8} = 7 + \frac{9}{8} = 7 + 1\frac{1}{8} =$   **$8\frac{1}{8}$  yards**

62.  $195 \div 8\frac{1}{8} = 195 \div \frac{65}{8} = \frac{195}{1} \times \frac{8}{65} =$  **24 suits**

63.  $\$3,000 \div 24$  suits = **\$125 per suit**

64.  $\$125 + \$120 + \$75 =$  **\$320**

65. **Corner B is the lowest**, since it is  $60\frac{3}{8}$  inches below the builder's level.

Corner A.  $60\frac{3}{8} - 59\frac{1}{2} = 60\frac{3}{8} - 59\frac{4}{8} = 59\frac{11}{8} - 59\frac{4}{8} = \frac{7}{8}$  inch. **Point A is  $\frac{7}{8}$  of an inch higher than B.**

Corner C.  $60\frac{3}{8} - 58\frac{3}{16} = 60\frac{6}{16} - 58\frac{3}{16} = 2\frac{3}{16}$  inch. **Point C is  $2\frac{3}{16}$  inches higher than B.**

Corner D.  $60\frac{3}{8} - 59\frac{11}{16} = 60\frac{6}{16} - 59\frac{11}{16} = 59\frac{22}{16} - 59\frac{11}{16} = \frac{11}{16}$  inch. **Point D is  $\frac{11}{16}$  of an inch higher than B.**

## Practice Test

1.  $3\frac{5}{8} = \frac{(3 \times 8) + 5}{8} =$   **$\frac{29}{8}$**

2.  $\frac{13}{3} =$   **$4\frac{1}{3}$**

3.  $\frac{21}{27} = \frac{21 \div 3}{27 \div 3} =$   **$\frac{7}{9}$**

4.  $\frac{153}{198} = \frac{153 \div ?}{198 \div ?} = \frac{153 \div 9}{198 \div 9} =$   **$\frac{17}{22}$**   

$$\begin{array}{r} 1 \\ 153 \overline{)198} \\ \underline{153} \phantom{00} \\ 45 \phantom{00} \end{array} \quad \begin{array}{r} 3 \\ 45 \overline{)153} \\ \underline{135} \phantom{00} \\ 18 \phantom{00} \end{array} \quad \begin{array}{r} 2 \\ 18 \overline{)45} \\ \underline{36} \phantom{00} \\ 9 \phantom{00} \end{array} \quad \begin{array}{r} 2 \\ 9 \overline{)18} \\ \underline{18} \\ 0 \end{array}$$

5.  $\frac{2}{5} + \frac{2}{3} - \frac{1}{4} = \frac{24}{60} + \frac{40}{60} - \frac{15}{60} = \frac{24+40-15}{60} =$   **$\frac{49}{60}$**

6.  $1\frac{2}{3} \times \frac{5}{4} = \frac{5}{3} \times \frac{5}{4} = \frac{5 \times 5}{3 \times 4} = \frac{25}{12} =$   **$2\frac{1}{12}$**

7.  $2\frac{1}{4} \div \frac{5}{7} = \frac{9}{4} \div \frac{5}{7} = \frac{9}{4} \times \frac{7}{5} = \frac{9 \times 7}{4 \times 5} = \frac{63}{20} =$   **$3\frac{3}{20}$**

8.  $3\frac{2}{3} \longrightarrow 3\frac{8}{12} \longrightarrow 2\frac{20}{12}$   
 $-1\frac{3}{4} \longrightarrow -1\frac{9}{12} \longrightarrow -1\frac{9}{12}$   
*Need LCD* *Must borrow*  **$1\frac{11}{12}$**

9.  $.625$  = six hundred twenty-five thousandths  $= \frac{625}{1,000} = \frac{625 \div 125}{1,000 \div 125} =$   **$\frac{5}{8}$**

10.  $\begin{array}{r} .6875 \\ 16 \overline{)11.0000} \\ \underline{96} \phantom{0000} \\ 140 \phantom{000} \\ \underline{128} \phantom{000} \\ 120 \phantom{00} \\ \underline{112} \phantom{00} \\ 80 \\ \underline{80} \\ 0 \end{array} + 4 =$  **4.6875**

11.  $3\frac{1}{2} \longrightarrow 3\frac{4}{8}$   
 $\frac{5}{8} \longrightarrow \frac{5}{8}$   
 $\frac{5}{8} \longrightarrow \frac{5}{8}$   
 Need LCD  $3\frac{14}{8} = 3 + \frac{14}{8} = 3 + 1\frac{6}{8} = 4\frac{6}{8} = 4\frac{3}{4}$  inches
12. Length of fence (inches):  $155 \times 12 = 1,860$  inches  
 Number of slats:  $1,860 \div 3.75 = 496$  slats  
 Cost:  $496 \text{ slats} \times \$1.45 = \$719.20$

## Chapter 3 Equations: A Guide to Finding the Unknown

### Unit 3.1 Mathematical symbols and expressions

- False.**  $\neq$  means "is not equal to"
- $7 \times 12$   $7 \cdot 12$   $7(12)$
- False.** Means 17 divided by 13.
- a. **Yes** b. **No** c. **Yes**
- $7^5$
- $3^5 = 3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 = 243$
- $= 4 + 10 = 14$
- $= (11)^2 = 121$
- $= 8 + 9 = 17$
- $= 5[2 + 3(2) - 5] + 3 = 5[2 + 6 - 5] + 3 = 5[3] + 3 = 15 + 3 = 18$
- $= 3 + (+5) + (-2) - (+2) - (-6) = 3 + 5 - 2 - 2 + 6 = 10$
- $= 12$
- $= -7$
- $(2)(-3) = -6$ ;  $(-6)(2) = -12$ ;  $(-12)(4) = -48$ ;  $(-48)(-3) = 144$ ;  $(144)(-2) = -288$
- $= 6$
- $= 2m + 2n$
- $= 15a + 10b$
- $= 2y - y + 2 = y + 2$
- $= 3m + 4m + 2 - 3m + 6 = 4m + 8$
- Cannot simplify**

### Unit 3.2 Equations: Solving for the unknown

21. **b is an equation;** the other two are expressions (no equal sign).

$$\begin{array}{r} x - 8 = 27 \\ +8 \quad +8 \\ \hline x = 35 \end{array}$$

$$\begin{array}{r} y + 17 = 23 \\ -17 \quad -17 \\ \hline y = 6 \end{array}$$

$$\begin{array}{r} 3a = 15 \\ \frac{3a}{3} = \frac{15}{3} \\ \hline a = 5 \end{array}$$

$$\begin{array}{r} \frac{t}{8} = 3 \\ \frac{8}{1} \left( \frac{t}{8} \right) = 8(3) \\ \hline t = 24 \end{array}$$

$$\begin{array}{r} \frac{2}{7}y = 3 \\ \frac{7}{2} \left( \frac{2}{7}y \right) = \frac{7}{2} \left( \frac{3}{1} \right) \\ \hline y = \frac{21}{2} \end{array}$$

$$\begin{array}{r} 2b + 7 = 43 \\ -7 \quad -7 \\ \hline 2b = 36 \\ \frac{2b}{2} = \frac{36}{2} \\ \hline b = 18 \end{array}$$

$$28. 3m - (m - 4) = 14$$

$$3m - m + 4 = 14$$

$$2m + 4 = 14$$

$$\underline{-4} \quad \underline{-4}$$

$$2m = 10$$

$$\underline{\frac{2m}{2}} = \underline{\frac{10}{2}}$$

$$m = 5$$

$$29. 2p - 4 = 5p + 8$$

$$\underline{-2p} \quad \underline{-2p}$$

$$-4 = 3p + 8$$

$$\underline{-8} \quad \underline{-8}$$

$$-12 = 3p$$

$$\underline{\frac{-12}{3}} = \underline{\frac{3p}{3}}$$

$$-4 = p$$

$$30. 3(3x + 5) - 19 = 2(x + 5)$$

$$9x + 15 - 19 = 2x + 10$$

$$9x - 4 = 2x + 10$$

$$\underline{-2x} \quad \underline{-2x}$$

$$7x - 4 = 10$$

$$\underline{+4} \quad \underline{+4}$$

$$7x = 14$$

$$\underline{\frac{7x}{7}} = \underline{\frac{14}{7}}$$

$$x = 2$$

$$31. 3(3x + 5) - 19 = 2(x + 5)$$

$$\downarrow \quad \downarrow$$

$$3(3(2) + 5) - 19 = 2(2 + 5)$$

$$3(6 + 5) - 19 = 2(7)$$

$$3(11) - 19 = 14$$

$$33 - 19 = 14$$

$$14 = 14$$

$$32. FV = PV(1 + i)^n = \$500(1 + .04)^5 = \$500(1.04)^5 \approx \$500(1.21665290) \approx \mathbf{\$608.33}$$

$$33. FV = PV(1 + i)^n \quad \text{The compound interest formula}$$

$$\frac{FV}{(1 + i)^n} = PV \quad \text{Divide each side by } (1 + i)^n$$

$$PV = \frac{FV}{(1 + i)^n} \quad \text{Rearrange so PV is on the left}$$

### Unit 3.3 Guideline for solving word problems

$$34. 4m$$

$$35. x + 12 \text{ or } 12 + x$$

$$36. a - 8$$

$$37. 2(x + y + z)$$

$$38. y = x + 4$$

$$39. r + 2 = t + 4$$

$$40. \frac{n}{3} = 18$$

$$41. ? = \$65,000$$

$$B + M = \$65,000$$

$$\downarrow$$

$$B + B + \$8,000 = \$65,000$$

$$2B + \$8,000 = \$65,000$$

$$2B = \$57,000$$

$$B = \$28,500$$

$$\text{Britney} \quad \$28,500$$

$$\text{Megan: } \$28,500 + \$8,000 \quad \underline{\underline{\$36,500}}$$

$$\$65,000$$

42. Note: Because the letter "O" resembles the number zero, let's use "F" for offices.

$$? = 6,100$$

$$F + W + S = 6,100$$

$$\downarrow \quad \downarrow \quad \downarrow$$

$$1,300 + 2S + S = 6,100$$

$$1,300 + 3S = 6,100$$

$$3S = 4,800$$

$$S = 1,600$$

$$\text{Offices} \quad 1,300 \text{ sq ft}$$

$$\text{Showroom} \quad \underline{\underline{1,600 \text{ sq ft}}}$$

$$\text{Warehouse: } 2(1,600 \text{ sq ft}) \quad \underline{\underline{3,200 \text{ sq ft}}}$$

$$6,100 \text{ sq ft}$$

$$43. ? = \$280,000$$

$$L + H = \$280,000$$

$$\downarrow$$

$$L + 2.5L = \$280,000$$

$$3.5L = \$280,000$$

$$L = \$80,000$$

$$\text{Land} \quad \$80,000$$

$$\text{Home: } 2.5(\$80,000) \quad \underline{\underline{200,000}}$$

$$\$280,000$$

44.  $? = \$350,000$

$$\begin{array}{rcl}
 2C + W & = & \$350,000 \\
 \downarrow & & \\
 2\left(\frac{2}{3}W\right) + W & = & \$350,000 \\
 \frac{4}{3}W + W & = & \$350,000 \\
 \frac{4}{3}W + \frac{3}{3}W & = & \$350,000
 \end{array}$$

$\frac{7}{3}W = \$350,000$   
 $\frac{3}{3}\left(\frac{3}{7}\right)W = \frac{3}{7}(\$350,000)$   
 $W = \$150,000$

|                                          |                  |
|------------------------------------------|------------------|
| Wife                                     | <b>\$150,000</b> |
| Child #1: $\$150,000 \times \frac{2}{3}$ | <b>100,000</b>   |
| Child #2: $\$150,000 \times \frac{2}{3}$ | <b>100,000</b>   |
|                                          | <b>\$350,000</b> |

45.  $? = 238$

$$\begin{array}{rcl}
 C + T & = & 238 \\
 \downarrow & & \\
 6T + T & = & 238 \\
 7T & = & 238 \\
 T & = & 34
 \end{array}$$

|               |            |
|---------------|------------|
| Trucks        | <b>34</b>  |
| Cars: $6(34)$ | <b>204</b> |
|               | <b>238</b> |

46.  $? = \$58$

$$\begin{array}{rcl}
 P - D & = & \$58 \\
 \downarrow & & \\
 P - \frac{1}{3}P & = & \$58 \\
 \frac{2}{3}P & = & \$58 \\
 \frac{3}{3}\left(\frac{3}{2}\right)P & = & \frac{3}{2}(\$58) \\
 P & = & \$87
 \end{array}$$

|                               |             |
|-------------------------------|-------------|
| Original price                | <b>\$87</b> |
| Discount: $\frac{1}{3}(\$87)$ | <b>-29</b>  |
| Amount after discount         | <b>\$58</b> |

### Challenge problems

47. a.  $1.5 (4,000 \text{ lb}) = \mathbf{6,000 \text{ lb}}$

b.  $? = 6,000 \text{ lb}$

$$\begin{array}{rcl}
 S + C + G + W & = & 6,000 \text{ lb} \\
 \downarrow \quad \downarrow \quad \downarrow & & \\
 5W + 2W + 7W + W & = & 6,000 \text{ lb} \\
 15W & = & 6,000 \text{ lb} \\
 W & = & 400 \text{ lb}
 \end{array}$$

|                             |                 |
|-----------------------------|-----------------|
| Water                       | <b>400 lb</b>   |
| Sand: $5(400 \text{ lb})$   | <b>2,000 lb</b> |
| Cement: $2(400 \text{ lb})$ | <b>800 lb</b>   |
| Gravel: $7(400 \text{ lb})$ | <b>2,800 lb</b> |
|                             | <b>6,000 lb</b> |

48.

|            |                  |
|------------|------------------|
| Home       | <b>\$190,000</b> |
| Additional | <b>+ 19,000</b>  |
| Total      | <b>\$209,000</b> |

49. The \$190,000 guess is too high, because it results in total coverage of \$209,000 instead of \$198,000. So, try a lower guess. If that guess results in total coverage that is too low, try a higher guess; if that guess results in total coverage that is too high, try a lower guess. Keep narrowing down the guess until total coverage is \$198,000.

|            |                           |
|------------|---------------------------|
| Home       | <b>\$180,000</b>          |
| Additional | <b>+ 18,000</b>           |
| Total      | <b>\$198,000</b> (works!) |

50.  $? = \$3,590$

$$\begin{array}{rcl}
 P + T & = & \$3,590 \\
 \downarrow & & \\
 P + .07P & = & \$3,590 \\
 1.07P & = & \$3,590 \\
 P & = & \$3,355.14
 \end{array}$$

|                                    |                   |
|------------------------------------|-------------------|
| Price of products                  | <b>\$3,355.14</b> |
| Sales tax: $\$3,355.14 \times .07$ | <b>+ 234.86</b>   |
| Total collected from customers     | <b>\$3,590.00</b> |

51.  $\quad ? = 18 \text{ oz}$

$$\begin{array}{rcl} C + A + M & = & 18 \text{ oz} \\ \downarrow \quad \downarrow & & \\ 2M + 3C + M & = & 18 \text{ oz} \\ \downarrow & & \\ 2M + 3(2M) + M & = & 18 \text{ oz} \\ 2M + 6M + M & = & 18 \text{ oz} \\ 9M & = & 18 \text{ oz} \\ M & = & 2 \text{ oz} \end{array}$$

There are twice as many cashews as macadamia nuts ( $C = 2M$ )

Macadamia nuts **2 oz**  
Cashews:  $2(2 \text{ oz})$  **4 oz**  
Almonds:  $3(4 \text{ oz})$  **12 oz**  
18 oz

52.  $\quad ? = \$180,000$   
 $L - F - A = \$180,000$

$$\begin{array}{rcl} L - F - A & = & \$180,000 \\ \downarrow \quad \downarrow & & \\ L - .0225L - \$3,200 & = & \$180,000 \\ .9775L - \$3,200 & = & \$180,000 \\ .9775L & = & \$183,200 \\ L & = & \mathbf{\$187,416.88} \end{array}$$

Loan amount **\$187,416.88**  
Fee to lender:  $\$187,416.68 \times .0225$  **- 4,216.88**  
Additional fees **- 3,200.00**  
Net proceeds **\$180,000.00**

53.  $F + V = R$   
 $\downarrow \quad \downarrow \quad \downarrow$   
 $\$13,000 + \$8C = \$28C$   
 $\$13,000 = \$20C$   
**650 = C**

Fixed costs **\$13,000**  
Variable costs:  $650(\$8)$  **+ 5,200**  
Total costs **\$18,200**  
Revenues:  $650(\$28)$  **\$18,200**

54.  $650 \text{ customers} \div 25 \text{ days} = \mathbf{26 \text{ customers per day}}$

## Practice Test

1. **False**    2.  $4^3 = 4 \cdot 4 \cdot 4 = \mathbf{64}$     3.  $2 + 8 \times 4 = 2 + 32 = \mathbf{34}$     4.  $= 2 + 3(7 - 4)^2 = 2 + 3(3)^2 = 2 + 3(9) = 2 + 27 = \mathbf{29}$

5.  $(2)(-3) = -6$ ;  $(-6)(-2) = 12$ ;  $\frac{12}{-4} = \mathbf{-3}$     6.  $= 5 - 6a + 8 + 3a = \mathbf{-3a + 13}$     7.  $\frac{+12}{m} = \frac{+12}{m} = \mathbf{40}$

8.  $\frac{5}{4} \cdot \frac{4}{5} y = \frac{5}{4} \left( \frac{28}{1} \right)$     9.  $3p = 12$     10.  $8p - 4 - 3p + 4 = 2p + 5$     11.  $m + 4 = n + 3$   
 $y = \mathbf{35}$      $p = \mathbf{4}$      $5p = 2p + 5$   
 $3p = 5$   
 $p = \frac{5}{3}$

12.  $\quad ? = \$30,000$   
 $B + C = \$30,000$   
 $\downarrow$   
 $B + B + \$5,000 = \$30,000$   
 $2B + \$5,000 = \$30,000$   
 $2B = \$25,000$   
 $B = \$12,500$

Brandy **\$12,500**  
Carlos:  $\$12,500 + \$5,000$  **17,500**  
**\$30,000**

13.  $F + V = R$   
 $\downarrow \quad \downarrow \quad \downarrow$   
 $\$4,800 + \$0.015C = \$0.06C$   
 $\$4,800 = \$0.045C$   
 $\frac{\$4,800}{\$0.045} = C$   
**106,667  $\approx C$**

Fixed costs **\$4,800**  
Variable costs:  $106,667(\$0.015) \approx$  **+1,600**  
Total costs **\$6,400**  
Revenues:  $106,667(\$0.06) \approx$  **\$6,400**

# Chapter 4 Percents

## Unit 4.1 Percent conversions

1.  $= .079 = 7.9\%$

3.  $= 52.1\% = .521$

5.  $= 137.5\% = 1.375$

7.  $= .875 = 87.5\%$

9.  $= 36 \times \frac{1}{100} = \frac{36}{100} = \frac{9}{25}$

2.  $= 1.35 = 135\%$

4.  $= 08.3\% = .083$

6.  $= 00.625\% = .00625$

8.  $= 1.25 = 125\%$

10.  $= 62\frac{1}{2}\% = \frac{125}{2} \times \frac{1}{100} = \frac{125}{200} = \frac{5}{8}$

## Unit 4.2 The percent formulas

11. Portion = Base  $\times$  Rate =  $\$500 \times 8\% = \$500 \times .08 = \$40$

12. Portion = Base  $\times$  Rate =  $250 \times 35\% = 250 \times .35 = 87.5$

13. Base =  $\frac{\text{Portion}}{\text{Rate}} = \frac{60}{40\%} = \frac{60}{.40} = 150$

Check answer:  $150 \times 40\% = 60$

14. Base =  $\frac{\text{Portion}}{\text{Rate}} = \frac{240}{75\%} = \frac{240}{.75} = 320$

Check answer:  $320 \times 75\% = 240$

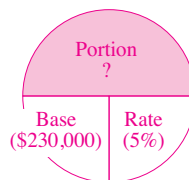
15. Rate =  $\frac{\text{Portion}}{\text{Base}} = \frac{25}{50} = .50 = 50\%$

Check answer:  $50 \times 50\% = 25$

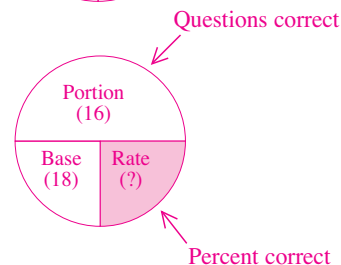
16. Rate =  $\frac{\text{Portion}}{\text{Base}} = \frac{117}{90} = 1.30 = 130\%$

Check answer:  $90 \times 130\% = 117$

17. Portion = Base  $\times$  Rate =  $\$230,000 \times 5\% = \$230,000 \times .05 = \$11,500$



18. You get 16 correct, so: Rate =  $\frac{\text{Portion}}{\text{Base}} = \frac{16}{18} \approx .889 \approx 88.9\%$



19. Matt: Portion = Base  $\times$  Rate =  $\$42,700 \times 60\% = \$42,700 \times .60 = \$25,620$

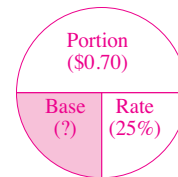
Robbie: Portion = Base  $\times$  Rate =  $\$42,700 \times 40\% = \$42,700 \times .40 = \$17,080$

20. Questions you must answer correctly: Portion = Base  $\times$  Rate =  $35 \times 85\% = 35 \times .85 = 29.75$

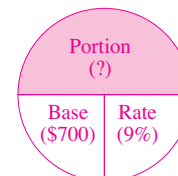
Because it is not possible to get .75 of a question correct, you must get at least 30 questions correct to get at least 85%. This means **you can miss no more than 5 questions** to get a B.

21. Base =  $\frac{\text{Portion}}{\text{Rate}} = \frac{\$0.70}{25\%} = \frac{\$0.70}{.25} = \$2.80$

Check answer:  $\$1.75 \times 40\% = \$0.70$

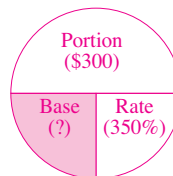


22. Portion = Base  $\times$  Rate =  $\$700 \times 9\% = \$700 \times .09 = \$63$



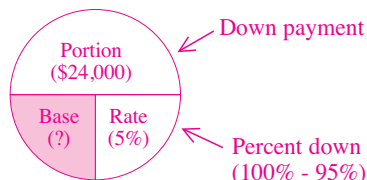
23.  $\text{Base} = \frac{\text{Portion}}{\text{Rate}} = \frac{\$300}{350\%} = \frac{\$300}{3.50} = \mathbf{\$85.71}$

Check answer:  $\$85.71 \times 350\% = \$299.99$  (penny difference due to rounding cost to exactly \$85.71)

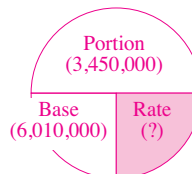


24.  $\text{Base} = \frac{\text{Portion}}{\text{Rate}} = \frac{\$24,000}{5\%} = \frac{\$24,000}{.05} = \mathbf{\$480,000}$

Check answer:  $\$480,000 \times 5\% = \$24,000$



25.  $\text{Rate} = \frac{\text{Portion}}{\text{Base}} = \frac{3,450,000}{6,010,000} \approx .574 \approx \mathbf{57.4\%}$



### Unit 4.3 Increase and decrease problems

26. Sales tax:  $\text{Portion} = \text{Base} \times \text{Rate} = \$970 \times 6.75\% = \$970 \times .0675 = \mathbf{\$65.48}$   
Total amount due:  $\$970$  (original amount) +  $\$65.48$  (increase) =  $\mathbf{\$1,035.48}$

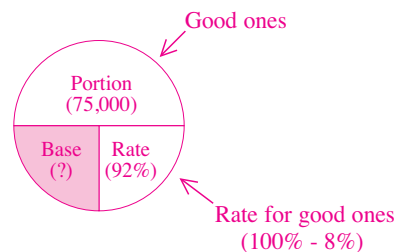
27. Amount of decrease:  $\text{Portion} = \text{Base} \times \text{Rate} = \$872 \times 3\% = \$872 \times .03 = \$26.16$   
New amount:  $\$872$  (original amount) -  $\$26.16$  (decrease) =  $\mathbf{\$845.84}$

28. Pay raise:  $\text{Portion} = \text{Base} \times \text{Rate} = \$13.70 \times 10\% = \$13.70 \times .10 = \$1.37$   
New hourly rate:  $\$13.70$  (original amount) +  $\$1.37$  (increase) =  $\mathbf{\$15.07}$

29.  $\text{Base} = \frac{\text{Portion}}{\text{Rate}} = \frac{75,000}{92\%} = \frac{75,000}{.92} \approx 81,521.74 \approx \mathbf{81,522 \text{ batteries}}$

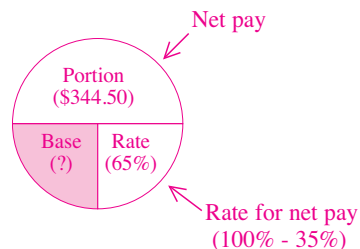
Note: .74 of a battery is not much good, so we round up to 81,522.

Check answer:  $81,522 - 8\%(81,522) \approx 75,000$



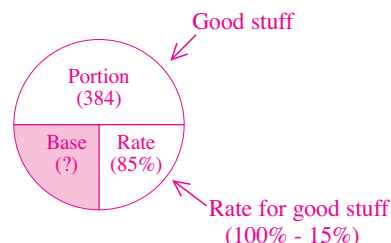
30.  $\text{Base} = \frac{\text{Portion}}{\text{Rate}} = \frac{\$344.50}{65\%} = \frac{\$344.50}{.65} = \mathbf{\$530}$

Check answer:  $\$530 - 35\%(\$530) = \$344.50$



31.  $\text{Base} = \frac{\text{Portion}}{\text{Rate}} = \frac{384}{85\%} = \frac{384}{.85} \approx 451.76 \text{ sq ft} \approx \mathbf{452 \text{ sq ft}}$

Check answer:  $451.76 - 15\%(451.76) = 384.00$



32. Percent increase =  $\frac{\text{Amount of increase}}{\text{Original amount}} = \frac{14,817 - 13,577}{13,577} = \frac{1,240}{13,577} \approx .091 \approx \mathbf{9.1\%}$
33. Percent increase =  $\frac{\text{Amount of increase}}{\text{Original amount}} = \frac{\$479 - \$429}{\$429} = \frac{\$50}{\$429} \approx .117 \approx \mathbf{11.7\%}$
34. Percent decrease =  $\frac{\text{Amount of decrease}}{\text{Original amount}} = \frac{433 - 402}{433} = \frac{31}{433} \approx .072 \approx \mathbf{7.2\%}$
35. Percent increase =  $\frac{\text{Amount of increase}}{\text{Original amount}} = \frac{\$750 - \$675}{\$675} = \frac{\$75}{\$675} \approx .111 \approx \mathbf{11.1\%}$
36. Percent increase =  $\frac{\text{Amount of increase}}{\text{Original amount}} = \frac{11,844.22 - 10,242.53}{10,242.53} = \frac{1,601.69}{10,242.53} \approx .156 \approx \mathbf{15.6\%}$
37. Percent decrease =  $\frac{\text{Amount of decrease}}{\text{Original amount}} = \frac{\$2,200 - \$1,477}{\$2,200} = \frac{\$723}{\$2,200} \approx .329 \approx \mathbf{32.9\%}$
38. Percent increase =  $\frac{\text{Amount of increase}}{\text{Original amount}} = \frac{43.5 - 31.9}{31.9} = \frac{11.6}{31.9} \approx .364 \approx \mathbf{36.4\%}$

**The article is incorrect.** Loan volume has increased 36.4% not 26.7%. Whoever prepared the article made a mistake by dividing the increase (\$11.6 million) by the *new* amount (\$43.5 million).

39. Percent decrease =  $\frac{\text{Amount of decrease}}{\text{Original amount}} = \frac{\$45.95 - \$24.99}{\$45.95} = \frac{\$20.96}{\$45.95} \approx .456 \approx \mathbf{45.6\%}$

### Challenge problems

40. Total commission:  $\$235,000 \times 7\% = \$235,000 \times .07 = \$16,450$   
 Company share:  $\$16,450 \times 60\% = \$16,450 \times .60 = \$9,870$   
 Your share:  $\$9,870 \times 70\% = \$9,870 \times .70 = \mathbf{\$6,909}$
41. Portion = Base  $\times$  Rate =  $\$42,378 \times 13\% = \$42,378 \times .13 = \mathbf{\$5,509.14}$
42. Rate =  $\frac{\text{Portion}}{\text{Base}} = \frac{\$2,000}{\$28,000} \approx .071 \approx \mathbf{7.1\%}$
43. Base =  $\frac{\text{Portion}}{\text{Rate}} = \frac{\$8,718.45}{13\%} = \frac{\$8,718.45}{.13} = \mathbf{\$67,065}$
44. Cost of meal  $\$55.00$   
 Sales tax:  $\$55 \times 7\%$   $+ 3.85$   
 Cost, including sales tax  $\$58.85$   
 Tip:  $\$58.85 \times 15\%$   $+ 8.83$   
 Total cost  $\mathbf{\$67.68}$
- No**, the total cost is more than you have.
45. Amount of increase: Portion = Base  $\times$  Rate =  $\$1,250 \times 20\% = \$250$   
 New amount:  $\$1,250$  (original amount) +  $\$250$  (increase) =  $\mathbf{\$1,500}$
46. Rate =  $\frac{\text{Portion}}{\text{Base}} = \frac{\$2,450}{\$1,500} \approx 1.6333 \approx \mathbf{163.3\%}$
47. Base =  $\frac{\text{Portion}}{\text{Rate}} = \frac{\$422,500}{9.5\%} = \frac{\$422,500}{.095} = \$4,447,368.42 \approx \mathbf{\$4,447,000}$
48. Base =  $\frac{\text{Portion}}{\text{Rate}} = \frac{\$1,200}{70\%} = \frac{\$1,200}{.70} = \mathbf{\$1,714.29}$
- Check answer:  $\$1,714.29 - 30\%(\$1,714.29) = \$1,200.00$
49. Percent decrease =  $\frac{\text{Amount of decrease}}{\text{Original amount}} = \frac{\$24.99 - \$8.99}{\$24.99}$   
 $= \frac{\$16.00}{\$24.99} \approx .640 \approx \mathbf{64\%}$
50. Percent decrease =  $\frac{\text{Amount of decrease}}{\text{Original amount}} = \frac{68.8 - 56.5}{68.8}$   
 $= \frac{12.3}{68.8} \approx .1788 \approx \mathbf{17.88\%}$
51. Rate =  $\frac{\text{Portion}}{\text{Base}} = \frac{7.33}{8.85} \approx .83 \approx \mathbf{83\%}$



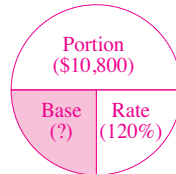
52. Mr. Ely received only \$650.50 back from his original \$1,000 investment! This happened because Volatile always increased from lower prices and dropped 20% from higher prices. For example, on the first day, the stock value increased 20%, turning it into \$1,200. But on the second day, the value decreased \$240 (20% × \$1,200), turning it into only \$960. Then the cycle kept repeating, sending the price lower and lower.

### Practice Test

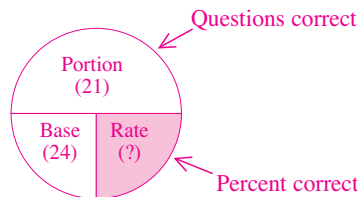
1.  $.065 = \underline{.065} = \mathbf{6.5\%}$     2.  $87\frac{1}{2}\% = \underline{87.5\%} = \mathbf{.875}$     3.  $\frac{5}{16} = \underline{.3125} = \mathbf{31.25\%}$
4.  $12.5\% = 12\frac{1}{2}\% = \frac{25}{2}\% = \frac{25}{2} \times \frac{1}{100} = \frac{25}{200} = \mathbf{\frac{1}{8}}$
5. Portion = Base × Rate = \$210,000 × 20% = \$210,000 × .20 = **\$42,000**

6. Base =  $\frac{\text{Portion}}{\text{Rate}} = \frac{\$10,800}{120\%} = \frac{\$10,800}{1.20} = \mathbf{\$9,000}$

Check answer: \$9,000 + 20%(\$9,000) = \$10,800



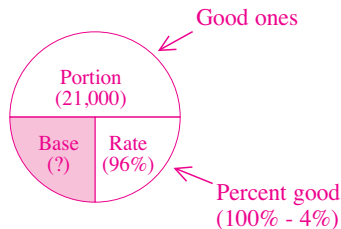
7. Rate =  $\frac{\text{Portion}}{\text{Base}} = \frac{21}{24} \approx .875 = \mathbf{87.5\%}$



8. Sales tax : Portion = Base × Rate = \$750 × 7% = \$750 × .07 = \$52.50  
Total amount: \$750 (original amount) + \$52.50 (increase) = **\$802.50**

9. Base =  $\frac{\text{Portion}}{\text{Rate}} = \frac{21,000}{96\%} = \frac{21,000}{.96} = \mathbf{21,875 \text{ tires}}$

Check answer: 21,875 - 4%(21,875) = 21,000



10. Percent decrease =  $\frac{\text{Amount of decrease}}{\text{Original amount}} = \frac{8,422 - 8,318}{8,422} = \frac{104}{8,422} \approx .012 \approx \mathbf{1.2\%}$

## Chapter 5 Trade and Cash Discounts

### Unit 5.1 Trade discounts

|    | Product      | List price | Trade discount rate | Trade discount amount                  | Net price                          |
|----|--------------|------------|---------------------|----------------------------------------|------------------------------------|
| 1. | Computer     | \$1,200    | 30%                 | $\$1,200 \times 30\% = \mathbf{\$360}$ | $\$1,200 - \$360 = \mathbf{\$840}$ |
| 2. | Copy machine | \$700      | 25%                 | $\$700 \times 25\% = \mathbf{\$175}$   | $\$700 - \$175 = \mathbf{\$525}$   |

|    | Product      | List price | Trade discount rate | Complement of rate    | Net price                              |
|----|--------------|------------|---------------------|-----------------------|----------------------------------------|
| 3. | Computer     | \$1,200    | 30%                 | $100\% - 30\% = 70\%$ | $\$1,200 \times 70\% = \mathbf{\$840}$ |
| 4. | Copy machine | \$700      | 25%                 | $100\% - 25\% = 75\%$ | $\$700 \times 75\% = \mathbf{\$525}$   |

5. **Answers are the same, confirming both approaches work.**

|                                        |                |
|----------------------------------------|----------------|
| 6. List price                          | \$6,400        |
| First discount: $\$6,400 \times 25\%$  | <u>-1,600</u>  |
| Price after first discount             | \$4,800        |
| Second discount: $\$4,800 \times 10\%$ | <u>- 480</u>   |
| Price after second discount            | \$4,320        |
| Third discount: $\$4,320 \times 10\%$  | <u>- 432</u>   |
| Net price                              | <b>\$3,888</b> |

| 7. Step 1 (complements) | Step 2 (multiply complements)   | Step 3 (complement of Step 2) |
|-------------------------|---------------------------------|-------------------------------|
| 25% 10% 10%             | 75% $\times$ 90% $\times$ 90%   | 100.00%                       |
| ↓ ↓ ↓                   | = .75 $\times$ .90 $\times$ .90 | <u>- 60.75%</u>               |
| 75% 90% 90%             | = .6075                         | <b>39.25%</b>                 |
|                         | = 60.75%                        |                               |

8. It means that a **39.25% single discount is identical to a 25/10/10 series discount.**

|                                          |                |
|------------------------------------------|----------------|
| 9. List price                            | \$6,400        |
| Trade discount: $\$6,400 \times 39.25\%$ | <u>-2,512</u>  |
| Net price                                | <b>\$3,888</b> |

## Unit 5.2 Cash discounts

|                                          |                 |
|------------------------------------------|-----------------|
| 10. List price                           | \$800.00        |
| Less returned goods                      | <u>- 50.00</u>  |
| Price of goods after returns             | \$750.00        |
| Less trade discount: $\$750 \times 20\%$ | <u>- 150.00</u> |
| Net price                                | \$600.00        |
| Less cash discount: $\$600 \times 4\%$   | <u>- 24.00</u>  |
| Net price, less cash discount            | \$576.00        |
| Add freight                              | <u>+ 20.00</u>  |
| Net amount due                           | <b>\$596.00</b> |

11. a. Cash discount:  $\$240 \times 3\% = \mathbf{\$7.20}$   
b. Net amount due:  $\$240 - \$7.20 = \mathbf{\$232.80}$   
c. Last day of discount period: October 7 + 20 = **October 27**  
d. Last day of credit period: October 7 is day 280;  $280 + 45 = 325$ . Day 325 is **November 21**.
12. Discount =  $\$75.20 \times 1\% = \$0.75$ ; net amount due =  $\$75.20 - \$0.75 = \mathbf{\$74.45}$
13. a. Last day of discount period: The credit period begins on July 23, the date the goods were received. July 23 is day 204;  $204 + 15 = 219$ ; day 219 is **August 7**.  
b. Last day of credit period:  $204 + 45 = 249$ ; day 249 is **September 6**.
14. a. Last day of discount period: The credit period does not begin until the last day of August (because the invoice is dated after the 25th of the month). The last day of the discount period is 10 days beyond August 31, which is **September 10**.  
b. The last day of credit period: Because the invoice does not specify when the credit period ends, we assume the credit period extends 20 days past the last day of the discount period, which is **September 30**.
15. The discount period ends 100 days ( $10 + 90 = 100$ ) after the date of the invoice. February 5 is day 36. The last day of the discount period is day 136 ( $36 + 100 = 136$ ). Day 136 is **May 15** (remember, because the year is a leap year, 1 must be added to each day after February 28: so May 16 is day 137 and May 15 is day 136).
16. Amount credited =  $\frac{\text{Amount paid}}{\text{Complement of cash discount rate}} = \frac{\$10,000}{100\% - 3\%} = \frac{\$10,000}{97\%} = \frac{\$10,000}{.97} = \mathbf{\$10,309.28}$
17.  $\frac{6}{94} \times \frac{365}{30 - 10} = \frac{6}{94} \times \frac{365}{20} = \frac{6 \times 365}{94 \times 20} = \frac{2,190}{1,880} \approx 1.1649 \approx \mathbf{116.49\%}$

## Challenge problems

18. **Cash discount**
19. **True**
20. **False.** Trade discounts are given as an incentive to buy the product, regardless of whether the invoice is paid within the discount period.

21. Company A:  $\$3,200 - 30\%(\$3,200) = \$2,240.00$   
**Company B:**  $\$2,900 - 20\%(\$2,900) = \$2,320$ ;  $\$2,320 - 10\%(\$2,320) = \mathbf{\$2,088.00}$   
 Company C:  $\$3,450 - 20\%(\$3,450) = \$2,760$ ;  $\$2,760 - 15\%(\$2,760) = \$2,346$ ;  $\$2,346 - 5\%(\$2,346) = \$2,228.70$

|     | Product      | List price | Trade discount rate | Net price       | Cash discount | Net amount due  |
|-----|--------------|------------|---------------------|-----------------|---------------|-----------------|
| 22. | Tent         | \$600      | 30%                 | <b>\$420.00</b> | 2%            | <b>\$411.60</b> |
| 23. | Backpack     | \$400      | 30/10               | <b>\$252.00</b> | 8%            | <b>\$231.84</b> |
| 24. | Sleeping Bag | \$500      | 25/15/5             | <b>\$302.81</b> | 4%            | <b>\$290.70</b> |

25. List price  $\$455.00$   
 Trade discount amount:  $\$455 \times 25\%$   $\underline{-113.75}$   
 Net price **\$341.25**

26. October 3 + 15 = **October 18**

27. Net price  $\$341.25$   
 Cash discount:  $\$341.25 \times 3\%$   $\underline{-10.24}$   
 Net amount due **\$331.01**

28. October 3 is day number 276;  $276 + 45 = 321$ . Day 321 is **November 17**.

29.  $\frac{3}{97} \times \frac{365}{45-15} = \frac{3}{97} \times \frac{365}{30} = \frac{3 \times 365}{97 \times 30} = \frac{1,095}{2,910} \approx .3763 \approx \mathbf{37.63\%}$

30.  $15 \times \$183.25 = \mathbf{\$2,748.75}$   
 $3 \times \$195.50 = \mathbf{\$586.50}$   
 $24 \times \$34.98 = \mathbf{\$839.52}$

31. **No.** There is an error for the Sub-Zero Sleeping Bags:

|                                        |                       |
|----------------------------------------|-----------------------|
| Subtotal                               | \$586.50              |
| First discount: $\$586.50 \times 20\%$ | $\underline{-117.30}$ |
| Price after first discount             | \$469.20              |
| Second discount: $\$469.20 \times 5\%$ | $\underline{-23.46}$  |
| Net price                              | <b>\$445.74</b>       |

32. Total Net Prices:  $\$2,199.00 + \$445.74 + \$671.62 = \$3,316.36$   
 Balance Due:  $\$3,316.36 + \$182.00 = \mathbf{\$3,498.36}$

33. **a.** Last day of discount period: March 13 + 15 = **March 28**  
**b.** Last day of credit period: March 13 is day 72;  $72 + 45 = 117$ . Day 117 is **April 27**.

34. Total Net price (from Problem 32)  $\$3,316.36$   
 Cash discount:  $\$3,316.36 \times 3\%$   $\underline{-99.49}$  *Remember, the discount does not apply to freight*  
 Net price, less cash discount  $\$3,216.87$   
 Add freight  $\underline{+182.00}$   
 Net amount due **\$3,398.87**

35. Let's use our equation-solving skills from Chapter 3.

|                        |                                                                    |
|------------------------|--------------------------------------------------------------------|
| $? = \$8.78$           | <i>Something = \$8.78</i>                                          |
| $P - D = \$8.78$       | <i>Price - trade discount = \$8.78</i>                             |
| $P - 30\%P = \$8.78$   | <i>Substitute: <math>D = 30\%P</math></i>                          |
| $70\%P = \$8.78$       | <i>Combine terms on left (<math>100\%P - 30\%P = 70\%P</math>)</i> |
| $P = \mathbf{\$12.54}$ | <i>Divide both sides of equation by 70% (or .70)</i>               |

36. List price  $\$12.54$   
 Trade discount:  $\$12.54 \times 30\%$   $\underline{-3.76}$   
 Net price **\$8.78**

## Practice Test

- List price \$820.00  
 Trade discount amount:  $\$820 \times 25\%$  - 205.00  
 Net price **\$615.00**
- List price \$22.00  
 First discount:  $\$22 \times 20\%$  - 4.40  
 Price after first discount \$17.60  
 Second discount:  $\$17.60 \times 10\%$  - 1.76  
 Net price **\$15.84**
- Step 1 (complements)    Step 2 (multiply complements)    Step 3 (complement of Step 2)**

|                                                                                                               |                                                                                           |                                         |
|---------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|-----------------------------------------|
| $20\% \quad 15\% \quad 5\%$<br>$\downarrow \quad \downarrow \quad \downarrow$<br>$80\% \quad 85\% \quad 95\%$ | $80\% \times 85\% \times 95\%$<br>$= .80 \times .85 \times .95$<br>$= .646$<br>$= 64.6\%$ | $100.0\%$<br>$- 64.6\%$<br><b>35.4%</b> |
|---------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|-----------------------------------------|
- October 28 is day 301;  $301 + 20 = 321$ . Day 321 is **November 17**.
- List price \$820.00  
 Trade discount:  $\$820 \times 25\%$  - 205.00  
 Net price \$615.00  
 Cash discount:  $\$615 \times 2\%$  - 12.30  
 Net amount due **\$602.70**
- Amount credited =  $\frac{\text{Amount paid}}{\text{Complement of cash discount rate}} = \frac{\$11,500}{100\% - 5\%} = \frac{\$11,500}{95\%} = \frac{\$11,500}{.95} = \mathbf{\$12,105.26}$
- $\frac{8}{92} \times \frac{365}{60 - 10} = \frac{8}{92} \times \frac{365}{50} = \frac{8 \times 365}{92 \times 50} = \frac{2,920}{4,600} \approx .6348 \approx \mathbf{63.48\%}$

## Chapter 6 Markup and Markdown

### Unit 6.1 Markup

|    | Cost         | Markup(\$)  | Selling price  |
|----|--------------|-------------|----------------|
| 1. | \$2450       | \$800       | <b>\$3,250</b> |
| 2. | \$1.57       | \$0.50      | <b>\$2.07</b>  |
| 3. | \$100        | <b>\$70</b> | \$170          |
| 4. | <b>\$300</b> | \$200       | \$500          |

5. **\$0. Selling price is the same as cost.**      6. **False**

7.

$$S = C + M$$

$$S = \$700 + 20\%(\$700)$$

$$S = \$700 + \$140$$

$$S = \mathbf{\$840}$$

8.

$$S = C + M$$

$$\$360 = 100\%C + 20\%C$$

$$\$360 = 120\%C$$

$$\$360 = 1.20C$$

$$\frac{\$360}{1.20} = \frac{1.20}{1.20}C$$

$$\mathbf{\$300 = C}$$

9.

$$S = C + M$$

$$\$250 = C + 30\%(\$250)$$

$$\$250 = C + \$75$$

$$\mathbf{\$175 = C}$$

$$\begin{aligned}
 10. \quad S &= C + M \\
 100\%S &= \$168 + 30\%(S) \\
 70\%S &= \$168 \\
 .70S &= \$168 \\
 \frac{.70S}{.70} &= \frac{\$168}{.70} \\
 S &= \$240
 \end{aligned}$$

$$\begin{aligned}
 11. \quad S &= C + M \\
 S &= \$18 + 20\%(\$18) \\
 S &= \$18 + \$3.60 \\
 S &= \$21.60
 \end{aligned}$$

$$\begin{aligned}
 12. \quad S &= C + M \\
 \$21 &= 100\%C + 20\%C \\
 \$21 &= 120\%C \\
 \$21 &= 1.20C \\
 \frac{\$21}{1.20} &= \frac{1.20C}{1.20} \\
 \$17.50 &= C
 \end{aligned}$$

## Unit 6.2 Percent markup

13. a.  $M = S - C = \$72 - \$48 = \$24$   
 b. Percent markup on cost  $= \frac{M}{C} = \frac{\$24}{\$48} = .50 = 50\%$   
 c. Percent markup on selling price  $= \frac{M}{S} = \frac{\$24}{\$72} \approx .333 \approx 33.3\%$

|     | Percent markup on cost                                                                        | Percent markup on selling price                                                                 |
|-----|-----------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| 14. | 40%                                                                                           | $\frac{40\%}{100\% + 40\%} = \frac{40\%}{140\%} = \frac{.40}{1.40} \approx .286 \approx 28.6\%$ |
| 15. | 25%                                                                                           | $\frac{25\%}{100\% + 25\%} = \frac{25\%}{125\%} = \frac{.25}{1.25} = .20 = 20\%$                |
| 16. | $\frac{30\%}{100\% - 30\%} = \frac{30\%}{70\%} = \frac{.30}{.70} \approx .429 \approx 42.9\%$ | 30%                                                                                             |
| 17. | $\frac{25\%}{100\% - 25\%} = \frac{25\%}{75\%} = \frac{.25}{.75} \approx .333 \approx 33.3\%$ | 25%                                                                                             |

18. Markup  $= 60\%(\$40) = .60(\$40) = \$24$   
 19.  $S = C + M = \$40 + \$24 = \$64$   
 20.  $\frac{60\%}{100\% + 60\%} = \frac{60\%}{160\%} = \frac{.60}{1.60} = .375 = 37.5\%$   
 21. Markup  $= 37.5\%(\$64) = .375(\$64) = \$24$  (This is the same dollar amount of markup found in Problem 18)

## Unit 6.3 Markdown

22. **False**

23.  $\$250 - \$50 = \$200$

24. Original marked price \$900  
 Dollar markdown:  $\$900 \times 15\%$  - 135  
 Reduced price **\$765**

25. Original marked price \$870  
 Dollar markdown:  $\$870 \times 10\%$  - 87  
 Reduced price **\$783**

26. **Dependable Appliance Company (\$765)**

27. Original marked price \$500  
 Markdown 1:  $\$500 \times 25\%$  - 125  
 Reduced price, after markdown 1 \$375  
 Markdown 2:  $\$375 \times 20\%$  - 75  
 Reduced price, after markdown 2 **\$300**

28. **Step 1 Find dollar markdown:**  $\$9,500 - \$8,250 = \$1,250$

**Step 2 Find percent markdown:**  $\frac{\$1,250}{\$9,500} \approx .132 \approx 13.2\%$

29. **Step 1 Determine desired sales proceeds from entire stock**

$$\begin{aligned} S &= C + M \\ S &= \$120 + 25\%(\$120) \quad (C = 200 \times \$0.60 = \$120) \\ S &= \$120 + \$30 \\ S &= \$150 \end{aligned}$$

**Step 2 Deduct proceeds from products sold at a discount**

|                                                                                                  |             |
|--------------------------------------------------------------------------------------------------|-------------|
| Desired sales proceeds (from Step 1)                                                             | \$150       |
| Less proceeds from those sold at cost: $30 \text{ mangos } (200 \times 15\% = 30) \times \$0.60$ | <u>- 18</u> |
| Proceeds required from top-quality mangos                                                        | \$132       |

**Step 3 Find original marked price**

200 total mangos - 30 sold at cost - 40 discarded ( $200 \times 20\% = 40$ ) = 130 mangos  
 130 mangos will sell at original marked price, so:  $\$132 \div 130 \approx \$1.015 \approx \mathbf{\$1.02 \text{ each}}$  (Always round *up*.)

|     |                                               |                 |                                                                                                                                   |
|-----|-----------------------------------------------|-----------------|-----------------------------------------------------------------------------------------------------------------------------------|
| 30. | 130 mangos at full price: $130 \times \$1.02$ | \$132.60        |                                                                                                                                   |
|     | 30 mangos at cost: $30 \times \$0.60$         | 18.00           |                                                                                                                                   |
|     | <u>+40 mangos discarded</u>                   | <u>+ 0.00</u>   |                                                                                                                                   |
|     | 200                                           | <b>\$150.60</b> | ← Total sales proceeds are slightly more than the desired \$150 because we rounded <i>up</i> the original marked price to \$1.02. |

31. Price/cost ratio =  $\frac{\text{Price}}{\text{Cost}} = \frac{\$1.02}{\$0.60} = 1.70$

32.  $\$0.70 \times 1.70 = \mathbf{\$1.19 \text{ each}}$

## Unit 6.4 Break-even analysis

|     |                                     |                 |
|-----|-------------------------------------|-----------------|
| 33. | List price                          | \$620.00        |
|     | Trade discount: $\$620 \times 20\%$ | <u>- 124.00</u> |
|     | Cost                                | <b>\$496.00</b> |

|     |                             |                 |
|-----|-----------------------------|-----------------|
| 34. | Cost                        | \$496.00        |
|     | Markup: $\$496 \times 45\%$ | <u>+223.20</u>  |
|     | Original marked price       | <b>\$719.20</b> |

|     |                                                         |                 |
|-----|---------------------------------------------------------|-----------------|
| 35. | Cost                                                    | \$496.00        |
|     | Amount to cover operating expenses: $\$496 \times 28\%$ | <u>+138.88</u>  |
|     | Break-even price                                        | <b>\$634.88</b> |

36. Because he sold the table for more than the break-even price (\$634.88), he has a *profit*:  $\$710 - \$634.88 = \mathbf{\$75.12 \text{ profit}}$

37. Because he sold the table for less than the break-even price (\$634.88), but more than cost (\$496), he has an *operating loss*:  $\$634.88 - \$615 = \mathbf{\text{operating loss of } \$19.88}$ .

38. Because he sold the table for less than cost (\$496), he has an *absolute loss*:  $\$496 - \$440 = \mathbf{\text{absolute loss of } \$56}$

39. Number of units needed =  $\frac{\text{Fixed costs}}{\text{Selling price per unit} - \text{Variable cost per unit}} = \frac{\$5,300}{\$68.50 - \$26.75} = \frac{\$5,300}{\$41.75} = 126.95 = \mathbf{127 \text{ cutting boards}}$

|     |                                                       |                    |
|-----|-------------------------------------------------------|--------------------|
| 40. | Revenues: $282 \text{ cutting boards} \times \$68.50$ | \$19,317.00        |
|     | Less fixed costs                                      | - 5,300.00         |
|     | Less variable costs: $282 \times \$26.75$             | <u>- 7,543.50</u>  |
|     | Projected profit                                      | <b>\$ 6,473.50</b> |

## Challenge problems

|     | Cost              | Markup       |                 |                    | Selling price  |
|-----|-------------------|--------------|-----------------|--------------------|----------------|
|     |                   | % of cost    | Dollar amount   | % of selling price |                |
| 41. | \$1,300           | 40%          | <b>\$520</b>    | —                  | <b>\$1,820</b> |
| 42. | \$180             | <b>97.2%</b> | <b>\$175</b>    | <b>49.3%</b>       | \$355          |
| 43. | <b>\$2,550</b>    | —            | <b>\$850</b>    | 25%                | \$3,400        |
| 44. | \$28.50           | —            | —               | 30%                | <b>\$40.71</b> |
| 45. | <b>\$3,913.04</b> | 15%          | <b>\$586.96</b> | <b>13.0%</b>       | \$4,500        |
| 46. | —                 | 20%          | —               | <b>16.7%</b>       | —              |
| 47. | —                 | <b>150%</b>  | —               | 60%                | —              |

48.  $\$165 - \$95 = \$70$

49.  $\frac{\$70}{\$95} \approx .737 \approx \mathbf{73.7\%}$

50.  $\frac{\$70}{\$165} \approx .424 \approx \mathbf{42.4\%}$

51. Original marked price  $\$165.00$   
 Markdown 1:  $\$165 \times 20\%$   $-\underline{33.00}$   
 Reduced price, after markdown 1  $\$132.00$   
 Markdown 2:  $\$132 \times 15\%$   $-\underline{19.80}$   
 Reduced price, after markdown 2  $\$112.20$   
 Markdown 3:  $\$112.20 \times 10\%$   $-\underline{11.22}$   
 Reduced price, after markdown 3  $\mathbf{\$100.98}$

52.  $\$100.98$  reduced price -  $\$95.00$  cost = **\$5.98**

53.  $\frac{\$5.98}{\$95} \approx .063 \approx \mathbf{6.3\%}$

54.  $\$165$  original marked price -  $\$100.98$  reduced price = **\$64.02**

55.  $\frac{\$64.02}{\$165} = .388 = \mathbf{38.8\%}$

56.  $M = S - C = 4.90 - 1.25 = 3.65$  Percent markup on cost =  $\frac{3.65}{1.25} = 2.92 = \mathbf{292\%}$

57. The 100% markup is based on the \$20 cost. The 50% markdown is based on the \$40 retail price.

|                                 |                      |
|---------------------------------|----------------------|
| Cost                            | \$20.00              |
| Markup: $\$20 \times 100\%$     | $+\underline{20.00}$ |
| Original marked price           | \$40.00              |
| Markdown: $\$40.00 \times 50\%$ | $-\underline{20.00}$ |
| Reduced price                   | <b>\$20.00</b>       |

58. Cost to manufacturer  $\$192.45$   
 Markup:  $\$192.45 \times 30\%$   $+\underline{57.74}$   
 Manufacturer's list price  $\$250.19$   
 Less trade discount:  $\$250.19 \times 15\%$   $-\underline{37.53}$   
 Net price to wholesaler  $\$212.66$   
 Less cash discount:  $\$212.66 \times 1\%$   $-\underline{2.13}$   
 Net amount due  $\$210.53$   
 Markup:  $\$210.53 \times 35\%$   $+\underline{73.69}$   
 Wholesaler's list price  $\$284.22$   
 Less trade discount:  $\$284.22 \times 10\%$   $-\underline{28.42}$   
 Net price to retailer  $\$255.80^*$   
 Less cash discount:  $\$255.80 \times 2\%$   $-\underline{5.12}$   
 Net amount due  $\$250.68$

Retailer's original marked price:

$$\begin{aligned} S &= C + M \\ S &= \$250.68 + 30\%S \\ 70\%S &= \$250.68 \\ S &= \$358.11^* \end{aligned}$$

|                                  |                      |
|----------------------------------|----------------------|
| Original marked price            | \$358.11             |
| Markdown: $\$358.11 \times 25\%$ | $-\underline{89.53}$ |
| Reduced price                    | <b>\$268.58</b>      |

\*Note: Round intermediate results to the nearest penny (don't use chain calculations).

## Practice Test

1.  $S = C + M$   
 $S = \$525 + 60\%(\$525)$   
 $S = \$525 + \$315$   
 $S = \mathbf{\$840}$

2.  $S = C + M$   
 $\$45 = 100\%C + 125\%C$   
 $\$45 = 225\%C$   
 $\$45 = 2.25C$

3.  $S = C + M$   
 $\$200 = C + 40\%(\$200)$   
 $\$200 = C + \$80$   
 $\mathbf{\$120 = C}$

4.  $M = S - C = \$77 - \$55 = \$22$   
 Percent markup on cost =  $\frac{\$22}{\$55} = .40 = \mathbf{40\%}$

$\frac{\$45}{2.25} = \frac{\cancel{2.25}}{\cancel{2.25}} C$   
 $\mathbf{\$20 = C}$

5.  $\frac{40\%}{100\% + 40\%} = \frac{40\%}{140\%} = \frac{.40}{1.40} \approx .286 \approx \mathbf{28.6\%}$

6. Original marked price  $\$5,500$   
 Markdown 1:  $\$5,500 \times 10\%$   $-\underline{550}$   
 Reduced price, after markdown 1  $\$4,950$   
 Markdown 2:  $\$4,950 \times 10\%$   $-\underline{495}$   
 Reduced price, after markdown 2  $\mathbf{\$4,455}$

7. **Step 1 Find dollar markdown:**  $\$1,200 - \$780 = \$420$

**Step 2 Find percent markdown:**  $\frac{\$420}{\$1,200} = .35 = \mathbf{35\%}$

8. **Step 1 Determine desired sales proceeds from entire stock**

$$\begin{aligned}
 S &= C + M \\
 S &= \$96 + 25\%(\$96) \quad (C = 300 \text{ lb} \times \$0.32 = \$96) \\
 S &= \$96 + \$24 \\
 S &= \$120
 \end{aligned}$$

**Step 2 Deduct proceeds from products sold at a discount**

|                                                                                      |             |
|--------------------------------------------------------------------------------------|-------------|
| Desired sales proceeds (from Step 1)                                                 | \$120       |
| Less proceeds from those sold at 75% of cost:                                        |             |
| 75 lb (300 lb $\times$ 25% = 75) $\times$ \$0.24 (\$0.32 cost $\times$ 75% = \$0.24) | <u>- 18</u> |
| Proceeds required from top-quality bananas                                           | \$102       |

**Step 3 Find original marked price**

300 lb - 75 lb sold at discount - 45 lb discarded (300 lb  $\times$  15% = 45) = 180 lb  
 180 lb will sell at original marked price, so:  $\$102 \div 180 \approx \$0.567 \approx \text{\$0.57 per pound}$  (Always round *up*.)

**Check answer**

|                                           |               |
|-------------------------------------------|---------------|
| 180 lb at full price: 180 $\times$ \$0.57 | \$102.60      |
| 75 lb at 75% of cost: 75 $\times$ \$0.24  | 18.00         |
| <u>+ 45 lb discarded</u>                  | <u>+ 0.00</u> |
| 300                                       | \$120.60      |

↑  
 Total sales proceeds are slightly more than the desired \$120 because we rounded *up* the original marked price to \$0.57.

9. Price/Cost ratio =  $\frac{\text{Price}}{\text{Cost}} = \frac{\$157.50}{\$90} = 1.75$

10. Break-even price:  $\$22 + 25\%(\$22) = \$22 + \$5.50 = \$27.50$

Because the product is sold for more than cost (\$22), but less than the breakeven point (\$27.50), **there is an operating loss** (\$27.50 - \$24 = \$3.50 operating loss).

11. Number of units needed =  $\frac{\text{Fixed costs}}{\text{Selling price per unit} - \text{Variable cost per unit}} = \frac{\$4,910}{\$0.06 - \$0.02} = \frac{\$4,910}{\$0.04} = 122,750 \text{ copies}$

## Chapter 7 Checking Accounts

### Unit 7.1 Checking account balance

1. **True**
2. **(c)** from bank statement
3. **(a)** debit memo
4. **(c)** from bank statement
5. **(b)** credit memo
6.  $\$2,450.00 + \$18,422.00 - \$17,948.00 = \text{\$2,924.00}$
7. **False.** If your deposit is made late in the day, after the bank teller starts a new day's business, your deposit will be dated with a later date.
8. **(b)** August
9. **B-** As of September 30, the bank does not know about check 474. If that check had been paid by the bank during September, the bank balance would be less.
10. **C-** As of September 30, you did not know about the service charge; you find out a few days later, when the bank statement arrives. If the service charge had been entered, your checkbook balance would be less.
11. **C-** As of September 30, your checkbook balance does not reflect this automatic withdrawal. If it did, the balance would be \$225 less.
12. **C-** Your checkbook balance does not reflect the transaction. If you had entered the transaction, your checkbook balance would be \$100 less.



13. **None** As of September 30, both the bank balance and your checkbook balance reflect the correct amount of the deposit. If your checkbook had *not* been corrected during September, a \$50 addition must be made on the checkbook balance side of the reconciliation.
14. **None** The deposit would appear as an addition to the bank balance side of the *August* reconciliation, but by September 30, the bank balance reflects the deposit.
15. **B-** The bank still does not know about check 457. If check 457 had been paid, the bank balance would be less.
16. **B+** As of September 30, the bank balance does not reflect this deposit. If the deposit were reflected, the bank balance would be greater.
17. **C-** Your records do not reflect the debit memo. If entered, your balance would be less.
18. **C+** As of September 30, you did not know about the interest; you find out a few days later, when the bank statement arrives. If entered, your balance would be greater.
19. **C-** As of September 30, your checkbook reflects a wrong amount. If the check had been recorded correctly, your balance would be less.

20. Reconciliation Period Ending June 30, 20xx

| CHECKBOOK BALANCE                        |                    | BANK STATEMENT                      |                    |
|------------------------------------------|--------------------|-------------------------------------|--------------------|
| 1. Ending balance in your check register | \$12,434.74        | 1. Ending balance on bank statement | \$13,556.25        |
| 2. Add:                                  |                    | 2. Add: Outstanding deposits        |                    |
| June interest                            | 12.51              | June 30                             | 900.00             |
| Error ck 579                             | 20.00              |                                     |                    |
| 3. Subtotal                              | \$12,467.25        | 3. Subtotal                         | \$14,456.25        |
| 4. Subtract:                             |                    | 4. Subtract: Outstanding checks     |                    |
| Check printing charges                   | 82.00              | ck 583                              | 220.00             |
|                                          |                    | ck 585                              | 1,851.00           |
| 5. <b>TOTAL</b>                          | <b>\$12,385.25</b> | 5. <b>TOTAL</b>                     | <b>\$12,385.25</b> |

21. Reconciliation Period Ending October 31, 20xx

| CHECKBOOK BALANCE                        |                    | BANK STATEMENT                      |                    |
|------------------------------------------|--------------------|-------------------------------------|--------------------|
| 1. Ending balance in your check register | \$18,837.00        | 1. Ending balance on bank statement | \$18,443.18        |
| 2. Add:                                  |                    | 2. Add: Outstanding deposits        |                    |
| October interest                         | 32.18              | October 31                          | 1,400.00           |
| Ck 858 error                             | 27.00              |                                     |                    |
| 3. Subtotal                              | \$18,896.18        | 3. Subtotal                         | \$19,843.18        |
| 4. Subtract:                             |                    | 4. Subtract: Outstanding checks     |                    |
| Debit memo (October 18)                  | 11.00              | ck 844                              | 180.00             |
|                                          |                    | ck 863                              | 778.00             |
| 5. <b>TOTAL</b>                          | <b>\$18,885.18</b> | 5. <b>TOTAL</b>                     | <b>\$18,885.18</b> |

### Challenge problems

22.

| Check Number | Date  | Description of Transaction             | (-) Payment/Debit | (+) Deposit/Credit | Balance         |
|--------------|-------|----------------------------------------|-------------------|--------------------|-----------------|
|              | 10-5  | Open account                           |                   | 700.00             | <b>700.00</b>   |
| 101          | 10-8  | Friendly Grocery                       | 150.00            |                    | <b>550.00</b>   |
| 102          | 10-14 | The Car Doctor; car repair             | 176.00            |                    | <b>374.00</b>   |
|              | 10-15 | Paycheck                               |                   | 1,800.00           | <b>2,174.00</b> |
| 103          | 10-15 | Security Mortgage Co; mortgage payment | 1,322.00          |                    | <b>852.00</b>   |
| 104          | 10-29 | Friendly Grocery                       | 327.25            |                    | <b>524.75</b>   |
|              | 10-31 | Paycheck                               |                   | 1,800.00           | <b>2,324.75</b> |

23.

| BANK STATEMENT                   |        |                 |            |                  |            |
|----------------------------------|--------|-----------------|------------|------------------|------------|
| Statement Date: October 31, 20xx |        |                 |            |                  |            |
| Previous Balance:                | \$0.00 | Total Deposits: | \$2,511.32 | Total Checks:    | \$1,639.00 |
|                                  |        |                 |            | Other Debits:    | \$28.75    |
|                                  |        |                 |            | Current Balance: | \$843.57   |
| Deposits and other credits:      |        |                 |            |                  |            |
| Deposit                          | 10-5   | 700.00          |            |                  |            |
| Deposit                          | 10-15  | 1,800.00        |            |                  |            |
| Interest                         | 10-31  | 11.32           |            |                  |            |
| Checks:                          |        |                 |            |                  |            |
| 101                              | 10-9   | 150.00          |            |                  |            |
| 102                              | 10-17  | 167.00          |            |                  |            |
| 103                              | 10-19  | 1,322.00        |            |                  |            |
| Other debits:                    |        |                 |            |                  |            |
| Ck printing                      |        | 28.75           |            |                  |            |

$\$0.00$  (previous balance) +  $\$2,511.32$  (total deposits) -  $\$1,639.00$  (total checks) -  $\$28.75$  (other debits) = **\$843.57**

24. Reconciliation Period Ending October 31, 20xx

| CHECKBOOK BALANCE                        |            | BANK STATEMENT                      |            |
|------------------------------------------|------------|-------------------------------------|------------|
| 1. Ending balance in your check register | \$2,324.75 | 1. Ending balance on bank statement | \$843.57   |
| 2. Add:                                  |            | 2. Add: Outstanding deposits        |            |
| ck 102 (written for \$167, not \$176)    | 9.00       | October 31                          | 1,800.00   |
| October interest                         | 11.32      |                                     |            |
| 3. Subtotal                              | \$2,345.07 | 3. Subtotal                         | \$2,643.57 |
| 4. Subtract:                             |            | 4. Subtract: Outstanding checks     |            |
| ck printing charges                      | 28.75      | ck 104                              | 327.25     |
| 5. TOTAL                                 | \$2,316.32 | 5. TOTAL                            | \$2,316.32 |

25. **Step 1 (review outstanding deposits):** Determine if the \$1,800 deposit (October 31) has been credited to the account.  
**Step 2 (review outstanding checks):** Check 104 has not been outstanding very long.  
**Step 3 (enter adjustments):** There are three adjustments on the left side of the reconciliation form that must be entered in the checkbook records. (1) \$9 must be added to reflect the correct amount of check 102; (2) October interest of \$11.32 must be added; (3) check printing charges of \$28.75 must be deducted.

26.  $\$2,324.75$  (checkbook balance, before adjustments—see Problem 22) +  $\$9.00$  +  $\$11.32$  -  $\$28.75$  = **\$2,316.32**

### Practice Test

- (a) **Debit memo.** Your checking account balance must be *decreased* to reflect the correct amount of the deposit.
- $\$482.33 + \$700 + \$145.45 + \$1,200 - \$228 - \$145.22 - \$950 - \$45 =$  **\$1,159.56**
- Reconciliation Period Ending April 30, 20xx

| CHECKBOOK BALANCE                        |            | BANK STATEMENT                      |            |
|------------------------------------------|------------|-------------------------------------|------------|
| 1. Ending balance in your check register | \$5,545.90 | 1. Ending balance on bank statement | \$5,466.35 |
| 2. Add:                                  |            | 2. Add: Outstanding deposits        |            |
| April interest                           | 18.45      | April 30                            | 650.00     |
| 3. Subtotal                              | \$5,564.35 | 3. Subtotal                         | \$6,116.35 |
| 4. Subtract:                             |            | 4. Subtract: Outstanding checks     |            |
| Check printing charges                   | 78.00      | ck 928                              | 320.00     |
| Cash withdrawal April 22                 | 200.00     | ck 930                              | 510.00     |
| 5. TOTAL                                 | \$5,286.35 | 5. TOTAL                            | \$5,286.35 |

4. **False;** you will discover the error when you do your bank reconciliation.
5. **Add \$9.22 for March interest and deduct \$48.25 for check printing fees.**

## Chapter 8 Payroll

### Unit 8.1 Gross pay: Wages and incentive plans

1. **False;** Some employees are exempt, including many managers and seasonal workers.
2. **True**
- 3.

| Name    | M | T | W | Th | F | S   | Total hours | Regular hours | Overtime hours | Reg. rate per hour | Overtime rate | Regular pay | Overtime pay | Gross pay |
|---------|---|---|---|----|---|-----|-------------|---------------|----------------|--------------------|---------------|-------------|--------------|-----------|
| Don Day | 8 | 8 | 8 | 10 | 8 | 4.5 | 46.5        | 40            | 6.5            | 8.00               | 12.00         | 320.00      | 78.00        | 398.00    |
| Joy Erb | 8 | 8 | 8 | 8  | 8 | 8   | 48          | 40            | 8              | 8.25               | 12.375        | 330.00      | 99.00        | 429.00    |
| Bo Hart | 8 | 8 | 8 | 8  | 8 | 0   | 40          | 40            | 0              | 7.25               | 10.875        | 290.00      | 0.00         | 290.00    |
| Thu Ho  | 8 | 8 | 8 | 10 | 4 | 0   | 38          | 38            | 0              | 8.25               | 12.375        | 313.50      | 0.00         | 313.50    |

4.
 

|                                            |                    |
|--------------------------------------------|--------------------|
| You: $\$1,295 \times 12$                   | \$15,540.00        |
| Betty: $\$640 \times 24$                   | \$15,360.00        |
| <b>Brad:</b> $\$310 \times 52.14$ weeks    | <b>\$16,163.40</b> |
| Meg: $\$600 \times 26.07$ biweekly periods | \$15,642.00        |
5.  $8 \text{ cars} \times \$150 = \mathbf{\$1,200}$
6.
 

|                                                     |                 |
|-----------------------------------------------------|-----------------|
| Base salary: $40 \text{ hours} \times \$5.50$       | \$220.00        |
| Piecework: $32 \text{ sleeping bags} \times \$1.50$ | <u>+ 48.00</u>  |
| Gross pay                                           | <b>\$268.00</b> |
7.
 

|                                        |              |  |
|----------------------------------------|--------------|--|
| 100 $\times$ \$1.75                    | \$175        |  |
| 100 $\times$ \$2.00                    | 200          |  |
| <u>+144 <math>\times</math> \$2.25</u> | <u>+324</u>  |  |
| 344                                    | <b>\$699</b> |  |
8. Net sales:  $\$125,800 - \$2,592 \text{ returns} = \$123,208$ 

|                                             |                   |
|---------------------------------------------|-------------------|
| Commission: $\$123,208 \times 3\%$          | \$3,696.24        |
| Less draw: $2 \text{ draws} \times \$1,200$ | <u>- 2,400.00</u> |
| Commission still due                        | <b>\$1,296.24</b> |
9.
 

|                                  |                                 |
|----------------------------------|---------------------------------|
| Salary: $2 \times \$800$         | \$1,600                         |
| Commission:                      |                                 |
| Net sales: $\$128,300 - \$3,400$ | \$124,900                       |
| Base amount                      | <u>- 80,000</u>                 |
| Overage                          | \$ 44,900 $\times$ 3%           |
| Total earnings                   | <u>+1,347</u><br><b>\$2,947</b> |

### Unit 8.2 Payroll deductions for employees

10. **(b)** is true.
11. **False**

12.

| Employee     | W-4 form | Prior YTD earnings | Gross pay this period | Gross pay this period subject to: |       | Deductions from employee's pay |       |        |        |       |         |        | Net pay  |
|--------------|----------|--------------------|-----------------------|-----------------------------------|-------|--------------------------------|-------|--------|--------|-------|---------|--------|----------|
|              |          |                    |                       | SS                                | MED   | SS                             | MED   | FIT    | SIT    | Other | Explain | Total  |          |
| Dan Bevan    | M-1      | 63,750             | 1,275                 | 1,275                             | 1,275 | 79.05                          | 18.49 | 137.22 | 63.75  | 50.00 | Savings | 348.51 | 926.49   |
| Ashlie Dobbs | S-1      | 14,580             | 810                   | 810                               | 810   | 50.22                          | 11.75 | 94.47  | 40.50  | —     | —       | 196.94 | 613.06   |
| Ian Rice     | M-3      | 6,500              | 1,140                 | 1,140                             | 1,140 | 70.68                          | 16.53 | 93.90  | 57.00  | —     | —       | 238.11 | 901.89   |
| Totals       | —        | 84,830             | 3,225                 | 3,225                             | 3,225 | 199.95                         | 46.77 | 325.59 | 161.25 | 50.00 | —       | 783.56 | 2,441.44 |

13. Dario's employer had to withhold:  $(\$230,000 - \$200,000) \times 0.9\% = \$30,000 \times 0.9\% = \$270$

Maria's employer withheld: **None** (because her wages did not exceed \$200,000)

Household earned income:  $\$230,000 + \$48,000 = \$278,000$

Amount subject to Additional Medicare tax:  $\$278,000 - \$250,000$  (threshold) =  $\$28,000$

Tax:  $\$28,000 \times 0.9\% = \$252$

*Note:* The \$252 Additional Medicare tax will be added to their overall tax liability; they will get credit for the \$270 withheld by Dario's employer.

14. Social Security:

Limit 118,500

Prior earnings -117,000

Amount subject to Social Security tax \$ 1,500  $\times 6.2\% = \$93.00$

Medicare:  $\$2,600 \times 1.45\% = \$37.70$

### Unit 8.3 Employer taxes and settling up with the IRS

15. **True** 16. **False.** Unemployment tax is an expense of employers.

17. **\$199.95.** American must pay a matching amount; because \$199.95 was withheld from employee's pay, American must pay an additional \$199.95 for Social Security.

18. **\$46.77.** American must pay a matching amount.

19.

| Employee     | Prior YTD Earnings | Gross pay this period | Gross pay this pay period subject to |       |
|--------------|--------------------|-----------------------|--------------------------------------|-------|
|              |                    |                       | FUT                                  | SUT   |
| Dan Bevan    | 63,750             | 1,275                 | 0                                    | 0     |
| Ashlie Dobbs | 14,580             | 810                   | 0                                    | 420   |
| Ian Rice     | 6,500              | 1,140                 | 500                                  | 1,140 |
| Total        | —                  | 3,225                 | 500                                  | 1,560 |

|           |                |                |
|-----------|----------------|----------------|
| Tax rates | $\times 0.6\%$ | $\times 2.5\%$ |
| Tax       | <b>\$3.00</b>  | <b>\$39.00</b> |

20. Gross pay (from Problem 12) \$3,225.00  
Employer's share of Social Security tax (from Problem 17) 199.95  
Employer's share of Medicare tax (from Problem 18) 46.77  
FUT (from Problem 19) 3.00  
SUT (from Problem 19) 39.00  
Health insurance premiums: 3 employees  $\times$  \$100 300.00  
Contribution to employees' retirement plans:  $\$3,225 \times 8\%$  + 258.00  
Total payroll expenses **\$4,071.72**

21. **True** 22. **True**

23. **Step 1**  $\$140,000 \times 92.35\% = \$129,290$

**Step 2** FICA tax on first \$118,500:  $\$118,500 \times 15.3\%$  \$18,130.50

FICA tax on remainder:  $2.9\%(\$129,290 - \$118,500)$  + 312.91

Total, rounded **\$18,443.00**

24. Federal income tax \$17,211

Self-employment FICA tax (from Problem 23) + 18,443

Total tax liability **\$35,654**

25. Total tax liability (from Problem 24) \$35,654  
 Amounts already paid to IRS:  $4 \times \$9,000$  \$36,000  
 Lee has paid too much to the IRS; he will get a **refund of \$346** (\$36,000 - \$35,654).

### Challenge problems

26. Base salary: 40 hours  $\times$  \$8.50 \$340.00  
 Piecework: 48 tents  $\times$  \$2.50 +120.00  
 Gross pay **\$460.00**
27.  $\$460 \text{ gross pay} \div 40 \text{ hours} = \text{\$11.50 per hour}$
28. Social Security tax:  $\$2,500 \times 6.2\% = \text{\$155.00}$   
 Medicare tax:  $\$2,500 \times 1.45\% = \text{\$36.25}$   
 Federal income tax:  
     **Step 1** Illustration 8-2, semimonthly:  $\$166.70 \times 2 = \$333.40$   
     **Step 2**  $\$2,500 - \$333.40 = \$2,166.60$   
     **Step 3** Illustration 8-3, Table 3 (semimonthly), married, over \$1,127 but not over \$3,479:  
      $\$76.90 + 15\%(\$2,166.60 - \$1,127) = \$76.90 + 15\%(\$1,039.60) = \$76.90 + \$155.94 = \text{\$232.84}$   
     State income tax:  $\$2,500 \times 6.5\% = \text{\$162.50}$
29. Gross pay \$2,500.00  
 Less deductions:  
     Social Security tax \$155.00  
     Medicare tax 36.25  
     Federal income tax 232.84  
     State income tax 162.50  
     Savings plan deduction + 75.00  
     Total deductions - 661.59  
 Net pay **\$1,838.41**
30. a. Social security tax: Matching amount from Problem 28 **\$155.00**  
 b. Medicare tax: Matching amount from Problem 28 **\$36.25**  
 c. FUT:  
     Limit: \$7,000  
     Prior year-to-date earnings - 5,000  
     Amount subject to FUT  $\$2,000 \times 0.6\%$  **\$12.00**  
 d. SUT:  $\$2,500 \times 2\%$  **\$50.00**
31. 

| Amounts owed to IRS          |                | Amounts already paid to IRS            |                |
|------------------------------|----------------|----------------------------------------|----------------|
| Income tax liability         | \$16,378       | Federal income tax w/h Galey's pay     | \$ 4,940       |
| Connie's self-employment tax | <u>+ 7,489</u> | Estimated payments: $4 \times \$4,500$ | <u>+18,000</u> |
| Total tax liability          | \$23,867       | Total already paid to IRS              | \$22,940       |

 Galey and Connie have not paid enough. **They owe an additional \$927** (\$23,867 - \$22,940).

### Practice Test

1. Overtime hours: 44 total hours - 40 regular hours = 4 overtime hours  
 Overtime rate:  $\$9.75 \text{ regular rate} \times 1.5 = \$14.625$   
     Pay for regular hours: 40 hours  $\times$  \$9.75 \$390.00  
     Pay for overtime: 4 hours  $\times$  \$14.625 + 58.50  
     Gross pay for week **\$448.50**
2. Monthly:  $\$3,500 \times 12$  \$42,000.00  
 Weekly:  $\$820 \times 52.14$  **\$42,754.80**

3. Base salary: 40 hours  $\times$  \$7.50 \$300.00  
 Piecework: 63 coats  $\times$  \$2.50 +157.50  
 Gross pay **\$457.50**
4. Social Security tax:  
 Limit \$118,500  
 Prior earnings -117,500  
 Amount subject to Social Security tax \$ 1,000  $\times$  6.2% \$62.00  
 Medicare tax: \$2,000  $\times$  1.45% + 36.25  
 Total FICA tax **\$98.25**
5. **Step 1** Using Illustration 8-2, weekly: \$76.90  $\times$  1 allowance = \$76.90  
**Step 2** \$800.00 - \$76.90 = \$723.10  
**Step 3** Using Illustration 8-3, Table 1 (weekly), single person, over \$222 but not over \$764:  
 $\$17.80 + 15\%(\$723.10 - \$222) = \$17.80 + 15\%(\$501.10) = \$17.80 + \$75.17 = \mathbf{\$92.97}$
6. **False**
7. Limit: \$7,000  
 Prior earnings - 6,400  
 Amount subject to FUT \$ 600  $\times$  0.6% = **\$3.60**
8. **Step 1** \$105,200  $\times$  92.35% = \$97,152 (rounded)  
**Step 2** FICA tax: \$97,152  $\times$  15.3% = **\$14,864** (rounded)
9. **Amounts owed to IRS** **Amounts already paid to IRS**  
 Income tax liability \$13,280 Federal income tax w/h Margie's pay \$ 7,970  
 Terry's self-employment tax + 4,192 Estimated payments: 4  $\times$  \$2,500 +10,000  
 Total tax liability \$17,472 Total already paid to IRS \$17,970
- Terry and Margie have paid too much. **They will get a refund of \$498** (\$17,970 - \$17,472).

## Chapter 9 Simple and Compound Interest

### Unit 9.1 Computing simple interest and maturity value

1. **\$10,000**    2. **1 year**    3. **October 1, 2018**
4.  $I = PRT = \$10,000 \times 8\% \times 1 = \mathbf{\$800}$     5.  $M = P + I = \$10,000 + \$800 = \mathbf{\$10,800}$
6.  $I = PRT = \$10,000 \times 8\% \times \frac{8}{12} = \$533.33$      $M = P + I = \$10,000 + \$533.33 = \mathbf{\$10,533.33}$
7.  $I = PRT = \$10,000 \times 8\% \times \frac{14}{12} = \$933.33$      $M = P + I = \$10,000 + \$933.33 = \mathbf{\$10,933.33}$
8. **False.**  $I$  stands for the dollar amount of interest;  $R$  stands for interest rate.
9. **False.**  $T$  stands for time, in years.

|     | Date of loan  | Date of payment           | Number of days  |
|-----|---------------|---------------------------|-----------------|
| 10. | Jan. 11, 2017 | Oct. 28, 2017             | <b>290 days</b> |
| 11. | July 13, 2017 | Feb. 21, 2018             | <b>223 days</b> |
| 12. | Dec. 18, 2015 | Mar. 23, 2016 (leap year) | <b>96 days</b>  |

10. Oct. 28  $\rightarrow$  Day 301  
 Jan. 11  $\rightarrow$  Day - 11  
**290**

11. Number of days left in first year: 365 - 194 (day number for July 13) = 171  
 Number of days in next year: Feb. 21  $\rightarrow$  + 52  
**223**

12. Number of days left in first year: 365 - 352 (day number for Dec. 18) = 13  
 Number of days in next year: Mar. 23  $\rightarrow$  82 + 1 (for leap year) = + 83  
**96**

|     | Date of loan  | Term     | Maturity date                                                         |
|-----|---------------|----------|-----------------------------------------------------------------------|
| 13. | May 15, 2017  | 60 days  | $135 + 60 = 195 \rightarrow$ <b>July 14, 2017</b>                     |
| 14. | Aug. 2, 2017  | 180 days | $214 + 180 = 394$ ; $394 - 365 = 29 \rightarrow$ <b>Jan. 29, 2018</b> |
| 15. | Jan. 18, 2016 | 90 days  | $18 + 90 = 108 \rightarrow$ <b>Apr. 17, 2016 (leap year)</b>          |

16.  $I = PRT = \$15,000 \times 13\% \times \frac{90}{360} = \$487.50$

17.  $I = PRT = \$15,000 \times 13\% \times \frac{90}{365} = \$480.82$

18. **False**

19. **False**; the law does not apply to business loans, loans over \$25,000 (unless they are secured by real estate), most public utility fees, and student loan programs.

20. **True**

21.  $I = PRT = \$25,000 \times 11.5\% \times \frac{120}{365} = \$945.21$

22.  $I = PRT = \$25,000 \times 11.5\% \times \frac{89}{365} = \$701.03$

23.

| Day number | Total payment      | Interest        | Principal          | Balance            |
|------------|--------------------|-----------------|--------------------|--------------------|
| 0          | —                  | —               | —                  | \$25,000.00        |
| 24         | \$8,000.00         | <b>\$189.04</b> | <b>\$7,810.96</b>  | <b>\$17,189.04</b> |
| 89         | <b>\$17,541.06</b> | <b>\$352.02</b> | <b>\$17,189.04</b> | \$0.00             |
| Totals     | <b>\$25,541.06</b> | <b>\$541.06</b> | <b>\$25,000.00</b> | —                  |

**Procedure for payment on day 24**

$$I = PRT = \$25,000.00 \times 11.5\% \times \frac{24}{365} = \$189.04$$

$$\text{Principal} = \$8,000.00 - \$189.04 = \$7,810.96$$

$$\text{Balance} = \$25,000.00 - \$7,810.96 = \$17,189.04$$

**Procedure for payment on day 89**

$$I = PRT = \$17,189.04 \times 11.5\% \times \frac{65}{365} = \$352.02 \quad (89 \text{ days} - 24 \text{ days} = 65 \text{ days})$$

$$\text{Principal} = \$17,189.04 \text{ (previous balance)}$$

$$\text{Total payment} = \$352.02 + \$17,189.04 = \$17,541.06$$

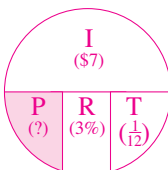
24. Problem 21: **\$945.21**    Problem 22: **\$701.03**    Problem 23: **\$541.06**

## Unit 9.2 Solving for principal, rate, and time

25.  $P = \frac{I}{RT}$        $R = \frac{I}{PT}$        $T = \frac{I}{PR}$

|     | $I$             | $P$            | $R$           | $T$                         |
|-----|-----------------|----------------|---------------|-----------------------------|
| 26. | <b>\$320.83</b> | \$5,000        | 11%           | 7 months                    |
| 27. | \$63.75         | <b>\$4,500</b> | 8.5%          | 2 months                    |
| 28. | 2,964.75        | \$35,400       | <b>16.75%</b> | 6 months                    |
| 29. | \$275           | \$2,000        | 11%           | <b>1.25 yrs = 15 months</b> |

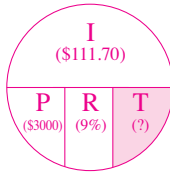
30.



$$P = \frac{I}{RT} = \frac{\$7}{3\% \times \frac{1}{12}} = \frac{\$7}{.03 \times 1 + 12} = \frac{\$7}{.0025} = \$2,800$$

$$\text{Check answer: } I = PRT = \$2,800 \times 3\% \times \frac{1}{12} = \$7.00$$

31.

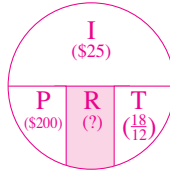


$$T = \frac{I}{PR} = \frac{\$111.70}{\$3,000 \times 9\%} = \frac{\$111.70}{\$270} \approx .4137037$$

$$365 \text{ days} \times .4137037 = \mathbf{151 \text{ days}}$$

$$\text{Check answer: } I = PRT = \$3,000 \times 9\% \times \frac{151}{365} = \$111.70$$

32.



$$R = \frac{I}{PT} = \frac{\$25}{\$200 \times \frac{18}{12}} = \frac{\$25}{\$300} \approx .0833 \approx \mathbf{8.33\%}$$

33.

Principal ( $P$ ) for APR purposes is the amount of money you have use of:  $\$5,000 - \$100 \text{ fee} = \$4,900$

Interest ( $I$ ) for APR purposes is total finance charges:

$$\begin{array}{rcl} I = PRT = \$5,000 \times 9\% \times \frac{180}{365} & = & \$221.92 \\ \text{Set-up fee} & & + 100.00 \\ \text{Total finance charges} & & \$321.92 \end{array}$$

$$R = \frac{I}{PT} = \frac{\$321.92}{\$4,900 \times \frac{180}{365}} \approx \frac{\$321.92}{\$2,416.44} \approx .1332 \approx \mathbf{13.32\%}$$

34.

$$I = PRT = \$3,500 \times 13\% \times \frac{90}{360} = \$113.75$$

$$R = \frac{I}{PT} = \frac{\$113.75}{\$3,500 \times \frac{90}{365}} \approx \frac{\$113.75}{\$863.01} \approx .1318 \approx \mathbf{13.18\%}$$

← Even though interest is calculated using a 360-day year, an APR always uses a 365-day year

35.

Interest will be  $\$40 \text{ per week} \times 2 \text{ weeks} = \$80$

$$R = \frac{I}{PT} = \frac{\$80}{\$500 \times \frac{14}{365}} \approx \frac{\$80}{\$19.17808219} \approx 4.1714 \approx \mathbf{417.14\%}$$

36.

$$D = MRT = \$2,000 \times 15\% \times \frac{60}{360} = \$50$$

← Remember, the discount method uses a 360-day year to calculate interest

Proceeds =  $M - D = \$2,000 - \$50 = \$1,950$  (this is money you have use of)

$$R = \frac{I}{PT} = \frac{\$50}{\$1,950 \times \frac{60}{365}} \approx \frac{\$50}{\$320.55} \approx .1560 \approx \mathbf{15.60\%}$$

← Even though interest is calculated using a 360-day year, an APR always uses a 365-day year

### Unit 9.3 Compound interest

$$37. \frac{8}{2} = 4(\%) \quad 38. \frac{7}{4} = 1.75(\%) \quad 39. \frac{7.5}{12} = .625(\%)$$

$$40. I = PRT = \$700 \times 5\% \times 3 = \$105$$

$$M = P + I = \$700 + \$105 = \mathbf{\$805}$$

41.

|           | Interest                        | Balance         |
|-----------|---------------------------------|-----------------|
| Beginning | —                               | \$700.00        |
| 1 year    | $\$700 \times 5\% = \$35.00$    | \$735.00        |
| 2 years   | $\$735 \times 5\% = \$36.75$    | \$771.75        |
| 3 years   | $\$771.75 \times 5\% = \$38.59$ | <b>\$810.34</b> |



42.

|                  | Interest                          | Balance         |
|------------------|-----------------------------------|-----------------|
| <i>Beginning</i> | —                                 | \$700.00        |
| 6 months         | $\$700 \times 2.5\% = \$17.50$    | \$717.50        |
| 12 months        | $\$717.50 \times 2.5\% = \$17.94$ | \$735.44        |
| 18 months        | $\$735.44 \times 2.5\% = \$18.39$ | \$753.82*       |
| 24 months        | $\$753.82 \times 2.5\% = \$18.85$ | \$772.67        |
| 30 months        | $\$772.67 \times 2.5\% = \$19.32$ | \$791.99        |
| 36 months        | $\$791.99 \times 2.5\% = \$19.80$ | <b>\$811.79</b> |

\*Note: Without rounding intermediate results,  
 $\$735.4375 + \$18.3859375 = \$753.8234375$

43. **George Lavin (Problem 42) ended up with the most. The more often interest is compounded, the more interest is earned.**

44. 6.125% compounded semiannually. Periodic rate =  $\frac{6.125}{2} = 3.0625\%$ :

6 months:  $\$100 + 3.0625\% = \$103.06$

12 months:  $+ 3.0625\% = \$106.22 \rightarrow \text{APY} = \mathbf{6.22\%}$

6% compounded monthly. Periodic rate =  $\frac{6}{12} = 0.50\%$ . *Tip:* Be sure to use chain calculations (don't round intermediate results).

1 months:  $\$100 + 0.50\% = \$100.50$

7 months:  $+ 0.50\% = \$103.55$

2 months:  $+ 0.50\% = \$101.00$

8 months:  $+ 0.50\% = \$104.07$

3 months:  $+ 0.50\% = \$101.51$

9 months:  $+ 0.50\% = \$104.59$

4 months:  $+ 0.50\% = \$102.02$

10 months:  $+ 0.50\% = \$105.11$

5 months:  $+ 0.50\% = \$102.53$

11 months:  $+ 0.50\% = \$105.64$

6 months:  $+ 0.50\% = \$103.04$

12 months:  $+ 0.50\% = \$106.17 \rightarrow \text{APY} = \mathbf{6.17\%}$

**Your bank (6.125% compounded semiannually) provides the greater return (6.22% APY vs. 6.17% APY).**

45. Periodic rate =  $\frac{5.75}{2} = 2.875\%$ . *Tip:* Be sure to use chain calculations (don't round intermediate results).

6 months:  $\$100 + 2.875\% = \$102.88$

12 months:  $+ 2.875\% = \$105.83 \rightarrow \text{APY} = \mathbf{5.83\%}$

### Challenge problems

46. Number of days: Oct. 16  $\rightarrow$  Day 289  $I = PRT = \$285 \times 18\% \times \frac{54}{365} = \$7.59$   
 Aug. 23  $\rightarrow$  Day  $\frac{-235}{54}$   $M = P + I = \$285 + \$7.59 = \mathbf{\$292.59}$

47. Invoice amount \$2,450  
 Discount:  $\$2,450 \times 4\%$   $\frac{-98}{}$   
 Net amount due \$2,352

If Alyce fails to pay the invoice within the discount period she is, in effect, borrowing \$2,352 for 20 days and paying an extra \$98 as interest, so:

$$R = \frac{I}{PT} = \frac{\$98}{\$2,352 \times \frac{20}{365}} = \frac{\$98}{\$128.88} \approx .7604 \approx \mathbf{76.04\%}$$

48.  $R = \frac{I}{PT} = \frac{\$15}{\$150 \left( \frac{30}{365} \right)} \approx \frac{\$15}{\$12.3288} \approx 1.21666 \approx \mathbf{121.67\%}$

49. Number of days left in first year:  $365 - 334$  (day number for Nov. 30) = 31  
 Number of days in next year: May 4  $\rightarrow$  +  $\frac{124}{155}$

$$I = PRT = \$845.23 \times 12\% \times \frac{155}{365} = \mathbf{\$43.07}$$

50.  $\$845.23 \times 6\% = \mathbf{\$50.71}$       51.  $\$845.23 + \$43.07 \text{ interest} + \$50.71 \text{ penalty} = \mathbf{\$939.01}$

52.  $R = \frac{I}{PT} = \frac{\$43.07 + \$50.71}{\$845.23 \times \frac{155}{365}} \approx \frac{\$93.78}{\$358.93} \approx .2613 \approx \mathbf{26.13\%}$

- Periodic rate =  $\frac{8.35}{2} = 4.175(\%)$ ; using chain calculations:

The APY for the first bond is 8.52%, greater than the 8.5% provided by the second bond.

**54. 10.69% simple interest**

$$I = PRT = \$1,000 \times 10.69\% \times 5 = \$534.50$$

$$M = P + I = \$1,000 + \$534.50 = \$1,534.50$$

**8.75% compounded semiannually**

Balance in 6 months:  $\$1,000 + 4.375\% = \$1,043.75$

Balance in 12 months: + 4.375% = \$1,089.41

Balance in 18 months: + 4.375% = \$1,137.08

Balance in 24 months: + 4.375% = \$1,186.82

Balance in 30 months: + 4.375% = \$1,238.75

|                                  |            |
|----------------------------------|------------|
| Balance in 36 months: + 4.375% = | \$1,292.94 |
|----------------------------------|------------|

|                                  |            |
|----------------------------------|------------|
| Balance in 36 months: + 4.375% = | \$1,322.14 |
| Balance in 42 months: + 4.375% = | \$1,349.51 |

Balance in 48 months: + 4.375% = \$1,408.55

Balance in 18 months:  $+4.375\% \equiv$  \$1,188.33

Balance in 54 months:  $+4.375\% \equiv$  \$1,470.17

Balance in 54 months: + 4.375% = \$1,476.17

Balance in 60 months: + 4.375% = \$1,534.49

The ending balances are almost identical, showing that, for a 5-year period, 8.75% compounded semiannually is equivalent to 10.69% simple interest.

## Practice Test

**1. False.**  $I$  stands for the dollar amount of interest;  $R$  stands for interest rate.

$$\mathbf{2. \quad I = PRT = \$12,000 \times 9.5\% \times \frac{8}{12} = \$760 \qquad M = P + I = \$12,000 + \$760 = \$12,760}$$

**3. June 22  $\rightarrow$  Day 173 + 120 = 293  $\rightarrow$  Oct. 20**

$$\begin{array}{rcl} 4. & \text{Number of days left in first year: } 365 - 357 \text{ (day number for Dec. 23)} & 8 \\ & \text{Number of days in next year: Apr. 10} \rightarrow 100 + 1 \text{ (for leap year)} & + \underline{101} \\ & & 109 \end{array}$$

$$I = PRT = \$1,500 \times 9\% \times \frac{109}{365} = \$40.32$$

5.

| Day number | Total payment | Interest | Principal  | Balance            |
|------------|---------------|----------|------------|--------------------|
| 0          | —             | —        | —          | \$15,000.00        |
| 22         | \$3,000.00    | \$81.37  | \$2,918.63 | <b>\$12,081.37</b> |

$$I = PRT = \$15,000.00 \times 9\% \times \frac{22}{365} = \$81.37$$

$$\text{Principal} = \$3,000.00 - \$81.37 = \$2,918.63$$

Balance = \$15,000.00 - \$2,918.63 = **\$12,081.37**

6. Principal ( $P$ ) for APR purposes is the amount of money you have use of:  $\$3,000 - \$100 \text{ fee} = \$2,900$ .  
Interest ( $I$ ) for APR purposes is total finance charges:

$$I = PRT = \$3,000 \times 7\% \times \frac{90}{360} = \quad \$ 52.50$$

|            |  |                |
|------------|--|----------------|
| Set-up fee |  | <u>+100.00</u> |
|------------|--|----------------|

|                       |                 |
|-----------------------|-----------------|
| Total finance charges | <u>\$152.50</u> |
|-----------------------|-----------------|

$$R = \frac{I}{PT} = \frac{\$152.50}{\$2,900 \times \frac{90}{365}} \approx \frac{\$152.50}{\$715.07} \approx .2133 \approx \mathbf{21.33\%}$$

↗ Even though interest is calculated using a 360-day year, an APR always uses a 365-day year

7.  $D = MRT = \$30,000 \times 13.5\% \times \frac{180}{360} = \$2,025$   
↖ Remember, the discount method uses a 360-day year to calculate interest

Proceeds =  $M - D = \$30,000 - \$2,025 = \$27,975$  (this is amount you have use of)

$$R = \frac{I}{PT} = \frac{\$2,025}{\$27,975 \times \frac{180}{365}} \approx \frac{\$2,025}{\$13,795.89} \approx .1468 \approx \mathbf{14.68\%}$$

8.

|           | Interest                        | Balance         |
|-----------|---------------------------------|-----------------|
| Beginning | —                               | \$500.00        |
| 6 months  | $\$500.00 \times 3\% = \$15.00$ | \$515.00        |
| 12 months | $\$515.00 \times 3\% = \$15.45$ | \$530.45        |
| 18 months | $\$530.45 \times 3\% = \$15.91$ | \$546.36        |
| 24 months | $\$546.36 \times 3\% = \$16.39$ | <b>\$562.75</b> |

9. Periodic rate =  $\frac{7.15}{2} = 3.575\%$   
 $\$100 + 3.575\% = \$103.58$   
 $+ 3.575\% = \$107.28 \rightarrow \mathbf{APY = 7.28\%}$

## Chapter 10 Future Value and Present Value: Using Formulas

### Unit 10.1 Time-value-of-money terminology

1. **12** (3 years  $\times$  4 periods per year)
2. **1.5%** ( $6\% \div 4 = 1.5\%$ )
3. **\$1,000** (this is the amount that happens at the beginning of the first period)
4. **\$50** (this is the amount that happens every period)
5. **\$1,847.68** (this is the amount that happens at the end of the last period)
6. **False.** PV is \$4,000 because that's the amount that happened at the beginning of the first period.
7. No one receives a check for \$1,600, so **\$1,600 is not a time-value-of-money variable.**
8. **\$6,000** (this is the amount that happens at the end of the last period)

### Unit 10.2 Future value

9. Formula 1A ( $n = 170$ ;  $i = 4\% = .04$ ):  $FV = PV(1 + i)^n = \$42(1.04)^{170} = \mathbf{\$33,030.64}$
10. Formula 1B ( $n = 30$ ;  $i = 8\% = .08$ ):  $FV = PMT \left[ \frac{(1 + i)^n - 1}{i} \right] = \$2,000 \left[ \frac{(1.08)^{30} - 1}{.08} \right] = \mathbf{\$226,566.42}$
11. Formula 1B ( $n = 40$ ;  $i = 2\% = .02$ ):  $FV = PMT \left[ \frac{(1 + i)^n - 1}{i} \right] = \$365 \left[ \frac{(1.02)^{40} - 1}{.02} \right] = \mathbf{\$22,046.72}$
12. Formula 1B ( $n = 51 \times 12 = 612$ ;  $i = 7.5\% \div 12 = .625\% = .00625$ ):  

$$FV = PMT \left[ \frac{(1 + i)^n - 1}{i} \right] = \$135 \left[ \frac{(1.00625)^{612} - 1}{.00625} \right] = \mathbf{\$956,673.97}$$
13. As noted for Formula 1B in Illustration 10-1, if payments are made at the *beginning* of each period, we multiply by  $(1 + i)$ :  

$$\$956,673.97 \times (1 + i) = \$956,673.97 \times 1.00625 = \mathbf{\$962,653.18}$$
14.

|                                              |                     |
|----------------------------------------------|---------------------|
| Ending balance                               | \$962,653.18        |
| Total amount deposited: $612 \times \$135 =$ | - 82,620.00         |
| Interest earned                              | <b>\$880,033.18</b> |

15.  $i = 7\% \div 12 \approx .5833333\% \approx .005833333$ :

$$35: FV = PMT \left[ \frac{(1+i)^n - 1}{i} \right] = \$100 \left[ \frac{(1.005833333)^{120} - 1}{.005833333} \right] = \mathbf{\$17,308.48}$$

$$45: FV = PMT \left[ \frac{(1+i)^n - 1}{i} \right] = \$100 \left[ \frac{(1.005833333)^{240} - 1}{.005833333} \right] = \mathbf{\$52,092.66}$$

$$55: FV = PMT \left[ \frac{(1+i)^n - 1}{i} \right] = \$100 \left[ \frac{(1.005833333)^{360} - 1}{.005833333} \right] = \mathbf{\$121,997.09}$$

$$65: FV = PMT \left[ \frac{(1+i)^n - 1}{i} \right] = \$100 \left[ \frac{(1.005833333)^{480} - 1}{.005833333} \right] = \mathbf{\$262,481.31}$$

16. Formula 1A ( $n = 100$ ;  $i = 12\% = .12$ ):  $FV = PV(1+i)^n = FV = \$500(1.12)^{100} = \mathbf{\$41,761,132.86}$

17. Formula 1A ( $n = 18$ ;  $i = 5\% = .05$ ):  $FV = PV(1+i)^n = FV = \$2,550(1.05)^{18} = \mathbf{\$6,136.88}$

18. Formula 1A ( $n = 40$ ;  $i = -5\% = -.05$ ):

$$FV = PV(1+i)^n = FV = 4,400 (1 + (-0.05))^{40} = 4,400 (0.95)^{40} = 565.45 = \mathbf{\text{about 565 elephants}}$$

### Unit 10.3 Present value

19. Formula 2A ( $n = 10$ ;  $i = 3\% = .03$ ):  $PV = \frac{FV}{(1+i)^n} = \frac{\$5,000}{(1.03)^{10}} = \mathbf{\$3,720.47}$

20. Formula 2B ( $n = 4 \times 4 = 16$ ;  $i = 6\% \div 4 = 1.5\% = .015$ ):

$$PV = PMT \left[ \frac{1 - \frac{1}{(1+i)^n}}{i} \right] = 600,000 \text{ euros} \left[ \frac{1 - \frac{1}{(1.015)^{16}}}{.015} \right] = \mathbf{8,478,758.43 \text{ euros}}$$

21.  $180 \times \$1,300 = \mathbf{\$234,000}$

22. **No**; you need to find the *present value* of the money saved.

23. Formula 2B ( $n = 15 \times 12 = 180$ ;  $i = 9\% \div 12 = .75\% = .0075$ ):

$$PV = PMT \left[ \frac{1 - \frac{1}{(1+i)^n}}{i} \right] = \$1,300 \left[ \frac{1 - \frac{1}{(1.0075)^{180}}}{.0075} \right] = \mathbf{\$128,171.43}$$

24. **No**; the value of the device (\$128,171.43) is less than its \$150,000 cost.

25.  $100 \times \$700 = \mathbf{\$70,000}$

26. Formula 2B ( $n = 100$ ;  $i = 6\% \div 12 = 0.5\% = .005$ ):

$$PV = PMT \left[ \frac{1 - \frac{1}{(1+i)^n}}{i} \right] = \$700 \left[ \frac{1 - \frac{1}{(1.005)^{100}}}{.005} \right] = \mathbf{\$54,979.85}$$

27. Let's look at this from the standpoint of an investor who might buy your bond. Let's find the PV of the interest checks (using Formula 2B), then the PV of the maturity value (using Formula 2A).  $n = 13 \times 2 = 26$ ;  $i = 8\% \div 2 = 4\% = .04$ :

$$\text{PV of interest checks: } PV = PMT \left[ \frac{1 - \frac{1}{(1+i)^n}}{i} \right] = \$30 \left[ \frac{1 - \frac{1}{(1.04)^{26}}}{.04} \right] = \$479.48$$

$$\text{PV of maturity value: } PV = \frac{FV}{(1+i)^n} = \frac{\$1,000}{(1.04)^{26}} = \underline{\underline{+360.69}}$$

$$\text{Total PV} \quad \quad \quad \mathbf{\$840.17}$$

28. The bond is worth less than \$1,000 **because the 6% rate is less than the 8% prevailing rate** that investors can earn.

29. Formula 2A ( $n = 20$ ,  $i = 8\% = .08$ ):  $PV = \frac{FV}{(1+i)^n} = \frac{\$1,000}{(1.08)^{20}} = \mathbf{\$214.55}$

30. Formula 2B ( $n = 6$ ;  $i = 9\% \div 12 = .75\% = .0075$ ):  $PV = PMT \left[ \frac{1 - \frac{1}{(1+i)^n}}{i} \right] = \$700 \left[ \frac{1 - \frac{1}{(1.0075)^6}}{.0075} \right] = \$4,091.92$

Adjust (payments at *beginning* of each month):  $\$4,091.92 \times 1.0075 = \mathbf{\$4,122.61}$

### Challenge problems

31. What \$5,800 will grow to. Formula 1A ( $n = 5 \times 2 = 10$ ;  $i = 8\% \div 2 = 4\% = .04$ ):

$$FV = PV(1+i)^n = \$5,800(1.04)^{10} = \$8,585.42$$

What \$100 each 6 months will grow to. Formula 1B:

$$FV = PMT \left[ \frac{(1+i)^n - 1}{i} \right] = \$100 \left[ \frac{(1.04)^{10} - 1}{.04} \right] = \mathbf{\$1,200.61}$$

Total FV  $\mathbf{\$9,786.03}$

32.  $\$45,000 \times 7.65\% = \mathbf{\$3,442.50}$

33.  $\$3,442.50$  (employee share) +  $\$3,442.50$  (employer share) =  $\mathbf{\$6,885}$

34.  $\$6,885 \div 4 = \mathbf{\$1,721.25}$

35. Formula 1B ( $n = 40 \times 4 = 160$ ;  $i = 7\% \div 4 = 1.75\% = .0175$ ):

$$FV = PMT \left[ \frac{(1+i)^n - 1}{i} \right] = \$1,721.25 \left[ \frac{(1.0175)^{160} - 1}{.0175} \right] = \mathbf{\$1,480,390.69}$$

36. Formula 2B ( $n = 28 \times 12 = 336$ ;  $i = 9\% \div 12 = .75\% = .0075$ ):

$$PV = PMT \left[ \frac{1 - \frac{1}{(1+i)^n}}{i} \right] = \$25,000 \left[ \frac{1 - \frac{1}{(1.0075)^{336}}}{.0075} \right] = \mathbf{\$3,062,600.87}$$

37. You will receive the net amount of \$5,500 at the beginning of each month. Let's find PV using Formula 2B, assuming payments are made at the *end* of each month. Then, as indicated in Illustration 10-1, we will multiply the result by  $(1+i)$ . ( $n = 20 \times 12 = 240$ ;  $i = 9\% \div 12 = .75\% = .0075$ ):

$$PV = PMT \left[ \frac{1 - \frac{1}{(1+i)^n}}{i} \right] = \$5,500 \left[ \frac{1 - \frac{1}{(1.0075)^{240}}}{.0075} \right] = \$611,297.25$$

Because payments are made at the *beginning* of each period:  $\$611,297.25 \times 1.0075 = \mathbf{\$615,881.98}$

Your leasehold interest is worth \$615,881.98; the paragraph in the lease that allows you to sublease the space is very valuable to you and is very costly to the landlord.

38. Formula 2B ( $n = 10$ ;  $i = 8\% = .08$ ):  $PV = PMT \left[ \frac{1 - \frac{1}{(1+i)^n}}{i} \right] = \$500,000 \left[ \frac{1 - \frac{1}{(1.08)^{10}}}{.08} \right] = \mathbf{\$3,355,040.70}$

39. Formula 1B ( $n = 10$ ;  $i = 8\% = .08$ ):  $FV = PMT \left[ \frac{(1+i)^n - 1}{i} \right] = \$500,000 \left[ \frac{(1.08)^{10} - 1}{.08} \right] = \mathbf{\$7,243,281.23}$

40. Find what \$750 per quarter will accumulate to. Formula 1B ( $n = 25 \times 4 = 100$ ;  $i = 6\% \div 4 = 1.5\% = .015$ ):

$$FV = PMT \left[ \frac{(1+i)^n - 1}{i} \right] = \$750 \left[ \frac{(1.015)^{100} - 1}{.015} \right] = \$171,602.28$$

Now find what \$171,602.28 will grow to over 10 years. Formula 1A ( $n = 10 \times 4 = 40$ ;  $i = 6\% \div 4 = 1.5\% = .015$ ):

$$FV = PV(1+i)^n = \$171,602.28(1.015)^{40} = \mathbf{\$311,289.69}$$

41.  $(40 \times \$6,000) + (20 \times \$9,000) = \mathbf{\$420,000}$

42. **No**; must compare the *present value* of Michael's offer with the \$240,000 cash offer.

43. **Step 1.** Find the PV of the \$6,000 quarterly payments. Formula 2B ( $n = 10 \times 4 = 40$ ;  $i = 8\% \div 4 = 2\% = .02$ ):

$$PV = PMT \left[ \frac{1 - \frac{1}{(1+i)^n}}{i} \right] = \$6,000 \left[ \frac{1 - \frac{1}{(1.02)^{40}}}{.02} \right] = \$164,132.88$$

**Step 2.** Find the PV of the \$9,000 quarterly payments. Formula 2B ( $n = 5 \times 4 = 20$ ;  $i = 8\% \div 4 = 2\% = .02$ ):

$$PV = PMT \left[ \frac{1 - \frac{1}{(1+i)^n}}{i} \right] = \$9,000 \left[ \frac{1 - \frac{1}{(1.02)^{20}}}{.02} \right] = \$147,162.90$$

**Step 3.** The amount found in Step 2 (\$147,162.90) is the PV *at the beginning of that stream of payments*—namely 10 years from now. Let's find the PV of \$147,162.90 to be received 10 years from now. We will use Formula 2A ( $n = 10 \times 4 = 40$ ;  $i = 8\% \div 4 = 2\% = .02$ ):

$$PV = \frac{FV}{(1+i)^n} = \frac{\$147,162.90}{(1.02)^{40}} = \$66,648.67$$

**Step 4.** The present value of the first stream of payments (\$6,000 per quarter for 10 years) is \$164,132.88. The present value (as of today) of the second stream of payments (\$9,000 per quarter for 5 years) is \$66,648.67. The present value of all of the cash flows is: \$164,132.88 + \$66,648.67 = **\$230,781.55**.

44. **Florence should accept Ishiro's offer**, because his \$240,000 cash offer is better than Michael's offer, which has a present value of \$230,781.55.

### Practice Test

1.  $n = 5 \text{ years} \times 4 \text{ periods per year} = 20$

2. **\$420** (this is the amount that happened at the beginning of the first period)

3.  $FV = PV(1+i)^n = \$500(1.12)^{50} = \mathbf{\$144,501.09}$

4. Formula 1B ( $n = 50 \times 12 = 600$ ;  $i = 6.75\% \div 12 = .5625\% = .005625$ ):

$$FV = PMT \left[ \frac{(1+i)^n - 1}{i} \right] = \$100 \left[ \frac{(1.005625)^{600} - 1}{.005625} \right] = \mathbf{\$496,875.02}$$

5. Formula 1A ( $n = 18$ ;  $i = 4\% = .04$ ):  $FV = PV(1+i)^n = \$3,800(1.04)^{18} = \mathbf{\$7,698.10}$

6. Formula 2A ( $n = 20$ ;  $i = 8\% = .08$ ):  $PV = \frac{FV}{(1+i)^n} = \frac{\$1,000}{(1.08)^{20}} = \mathbf{\$214.55}$

7.  $n = 12 \times 12 = 144$ ;  $i = 9.75\% \div 12 = .8125\% = .008125$ , so:

$$PV \text{ of annual savings (Formula 2B): } PV = PMT \left[ \frac{1 - \frac{1}{(1+i)^n}}{i} \right] = \$800 \left[ \frac{1 - \frac{1}{(1.008125)^{144}}}{.008125} \right] = \$67,757.52$$

$$PV \text{ of salvage value (Formula 2A): } PV = \frac{FV}{(1+i)^n} = \frac{\$8,000}{(1.008125)^{144}} = + 2,494.70$$

$$\text{Total PV} \quad \mathbf{\$70,252.22}$$

## Chapter 11 Sinking Funds, Annuities, and More: Using Formulas

### Unit 11.1 Sinking funds

- Formula 2A ( $n = 6.5 \times 4 = 26$ ;  $i = 8\% \div 4 = 2\% = .02$ ):  $PV = \frac{FV}{(1+i)^n} = \frac{\$50,000}{(1.02)^{26}} = \mathbf{\$29,878.96}$
- Formula 4A ( $n = 6.5 \times 4 = 26$ ;  $i = 8\% \div 4 = 2\% = .02$ ):  $PMT = \frac{FV(i)}{(1+i)^n - 1} = \frac{\$50,000(.02)}{(1.02)^{26} - 1} = \mathbf{\$1,484.96}$
- Formula 4A ( $n = 4.5 \times 4 = 18$ ;  $i = 3\% \div 4 = .75\% = .0075$ ):  $PMT = \frac{FV(i)}{(1+i)^n - 1} = \frac{\$40,000(.0075)}{(1.0075)^{18} - 1} = \mathbf{\$2,083.91}$
- $I = PRT = £86,500,000 \times 6\% \times 1 = \mathbf{£5,190,000}$
- Formula 4A ( $n = 20$ ;  $i = 8\% = .08$ ):  $PMT = \frac{FV(i)}{(1+i)^n - 1} = \frac{£86,500,000(.08)}{(1.08)^{20} - 1} = \mathbf{£1,890,216.06}$
- $£5,190,000$  (interest to bondholders) +  $£1,890,216.06$  (sinking fund deposit) =  $\mathbf{£7,080,216.06}$
- First, let's determine how many months it will take. Using Formula 5 ( $i = 8\% \div 12 \approx .66667\% \approx .0066667$ ):

$$n = \frac{-\ln \left[ \frac{PV + \left( \frac{PMT}{i} \right)}{\frac{PMT}{i} - FV} \right]}{\ln(1+i)} = \frac{-\ln \left[ \frac{\$0 + \left( \frac{-\$180}{.0066667} \right)}{\frac{-\$180}{.0066667} - \$1,000,000} \right]}{\ln(1.0066667)} = 547.60 \text{ months} = 45.63 \text{ years}$$

28 years (Kristi's age now) + 45.63 years = **73.63 years old**

### Unit 11.2 Annuities

- $I = PRT = \$500,000 \times 6.75\% \times \frac{1}{12} = \mathbf{\$2,812.50}$
- Formula 4B ( $n = 40 \times 12 = 480$ ;  $i = 6.75\% \div 12 = .5625\% = .005625$ ):  

$$PMT = \frac{PV(i)}{1 - \frac{1}{(1+i)^n}} = \frac{\$500,000(.005625)}{1 - \frac{1}{(1.005625)^{480}}} = \mathbf{\$3,016.78}$$
- Formula 4B ( $n = 30 \times 12 = 360$ ;  $i = 6.75\% \div 12 = .5625\% = .005625$ ):  

$$PMT = \frac{PV(i)}{1 - \frac{1}{(1+i)^n}} = \frac{\$500,000(.005625)}{1 - \frac{1}{(1.005625)^{360}}} = \mathbf{\$3,242.99}$$
- Using the right-hand column of III. 10-1:  $\$3,242.99 \div (1+i) = \$3,242.99 \div 1.005625 = \mathbf{\$3,224.85}$
- Formula 4B ( $n = 150$ ;  $i = 5.5\% = .055$ ):  $PMT = \frac{PV(i)}{1 - \frac{1}{(1+i)^n}} = \frac{\$4,000,000(.055)}{1 - \frac{1}{(1.055)^{150}}} = \mathbf{\$220,071.56}$   
 Adjust because distributions are at the *beginning* of each year:  $\$220,071.56 \div 1.055 = \mathbf{\$208,598.64}$

### Unit 11.3 Loan payments

- Formula 4B ( $n = 6 \times 12 = 72$ ;  $i = 6.5\% \div 12 \approx .541667\% \approx .00541667$ ):  

$$PMT = \frac{PV(i)}{1 - \frac{1}{(1+i)^n}} = \frac{\$27,500(.00541667)}{1 - \frac{1}{(1.00541667)^{72}}} = \mathbf{\$462.27}$$
- $72 \times \$462.27 = \$33,283.44$ ;  $\$33,283.44 - 27,500.00 = \mathbf{\$5,783.44}$
- Formula 4B ( $n = 24$ ;  $i = 1.75\% = .0175$ ):  $PMT = \frac{PV(i)}{1 - \frac{1}{(1+i)^n}} = \frac{\$900(.0175)}{1 - \frac{1}{(1.0175)^{24}}} = \mathbf{\$46.25}$

$$16. \text{ 15-year } (i = 7.25\% \div 12 \approx .604167\% \approx .0064167): \text{PMT} = \frac{\text{PV}(i)}{1 - \frac{1}{(1+i)^n}} = \frac{\$150,000(.0064167)}{1 - \frac{1}{(1.0064167)^{180}}} = \mathbf{\$1,369.29}$$

$$30\text{-year } (i = 7.5\% \div 12 = .625\% = .00625): \text{PMT} = \frac{\text{PV}(i)}{1 - \frac{1}{(1+i)^n}} = \frac{\$150,000(.00625)}{1 - \frac{1}{(1.00625)^{360}}} = \mathbf{\$1,048.82}$$

$$17. \$1,369.29 - \$1,048.82 = \mathbf{\$320.47}$$

$$18. \text{ 15-year loan: } 180 \times \$1,369.29 = \$246,472.20; \$246,472.20 - \$150,000 = \mathbf{\$96,472.20}$$

$$30\text{-year loan: } 360 \times \$1,048.82 = \$377,575.20; \$377,575.20 - \$150,000 = \mathbf{\$227,575.20}$$

$$19. \$227,575.20 - \$96,472.20 = \mathbf{\$131,103}$$

$$20. n = 20 \times 12 = 240; i = 4.875\% \div 12 \approx .40625\% \approx .0040625$$

$$\text{PMT} = \frac{\text{PV}(i)}{1 - \frac{1}{(1+i)^n}} = \frac{\$365,000(.0040625)}{1 - \frac{1}{(1.0040625)^{240}}} = \mathbf{\$2,383.71}$$

21. We will use Formula 5.  $\text{PV} = \$138,743.03; i = 8.75\% \div 12 \approx .729167\% \approx .00729167$ . Because the PMT is *paid*, it is a negative number.

$$n = \frac{-\ln \left[ \frac{\text{PV} + \left( \frac{\text{PMT}}{i} \right)}{\frac{\text{PMT}}{i} - \text{FV}} \right]}{\ln(1+i)} = \frac{-\ln \left[ \frac{\$138,743.03 + \left( \frac{-\$1,180.05}{.00729167} \right)}{\frac{-\$1,180.05}{.00729167} - \$0} \right]}{\ln(1.00729167)} = \mathbf{268.00 \text{ months (22 years and 4 months)}}$$

#### Unit 11.4 Solving for rate ( $i$ )

$$22. i = \left( \frac{\text{FV}}{\text{PV}} \right)^{\frac{1}{n}} - 1 = \left( \frac{\$520,000}{\$4,000} \right)^{\frac{1}{200}} - 1 = .0246 = \mathbf{2.46\%}$$

$$23. i = \left( \frac{\text{FV}}{\text{PV}} \right)^{\frac{1}{n}} - 1 = \left( \frac{\$165,000}{\$2,450} \right)^{\frac{1}{62}} - 1 = .0703 = \mathbf{7.03\%}$$

$$24. (a) i = \left( \frac{\text{FV}}{\text{PV}} \right)^{\frac{1}{n}} - 1 = \left( \frac{30.6}{9.9} \right)^{\frac{1}{50}} - 1 = .0228 = \mathbf{2.28\%} \quad (b) i = \left( \frac{\text{FV}}{\text{PV}} \right)^{\frac{1}{n}} - 1 = \left( \frac{100}{30.6} \right)^{\frac{1}{20}} - 1 = .0610 = \mathbf{6.10\%}$$

$$(c) i = \left( \frac{\text{FV}}{\text{PV}} \right)^{\frac{1}{n}} - 1 = \left( \frac{238.7}{100} \right)^{\frac{1}{32}} - 1 = .0276 = \mathbf{2.76\%} \quad (d) i = \left( \frac{\text{FV}}{\text{PV}} \right)^{\frac{1}{n}} - 1 = \left( \frac{238.7}{9.9} \right)^{\frac{1}{102}} - 1 = .0317 = \mathbf{3.17\%}$$

$$25. i = \left( \frac{\text{FV}}{\text{PV}} \right)^{\frac{1}{n}} - 1 = \left( \frac{\$532,500}{\$750} \right)^{\frac{1}{14}} - 1 = .5983 = \mathbf{59.83\%}$$

$$26. i = \left( \frac{\text{FV}}{\text{PV}} \right)^{\frac{1}{n}} - 1 = \left( \frac{\$23,000}{\$15,600} \right)^{\frac{1}{12}} - 1 = .0329 = \mathbf{3.29\%}$$

**No;** your salary has increased 3.29% per year, which is less than the average annual inflation rate.



27. Formulas are not designed to solve for  $i$  when periodic payments are involved. Let's use the Guess and Check Method. One approach would be to find the present value of the cash flows using different rates, until a rate results in a present value of \$1,200 (the price paid for the stock). Let's try 14%:

$$\text{PV of dividends: } PV = PMT \left[ \frac{1 - \frac{1}{(1+i)^n}}{i} \right] = \$50 \left[ \frac{1 - \frac{1}{(1.14)^{12}}}{.14} \right] = \$ 283.01$$

$$\text{PV of sales proceeds: } PV = \frac{FV}{(1+i)^n} = \frac{\$4,200}{(1.14)^{12}} = + 871.75$$

$$\text{Total PV} \quad \$1,154.76$$

The PV of \$1,154.76 is fairly close to our \$1,200 target figure, but is a bit too low. When calculating present value, reducing the rate increases the present value, so we need try a lower rate. Let's try 13.5%:

$$\text{PV of dividends: } PV = PV = PMT \left[ \frac{1 - \frac{1}{(1+i)^n}}{i} \right] = \$50 \left[ \frac{1 - \frac{1}{(1.135)^{12}}}{.135} \right] = \$ 289.33$$

$$\text{PV of sales proceeds: } PV = \frac{FV}{(1+i)^n} = \frac{\$4,200}{(1.135)^{12}} = + 918.97$$

$$\text{Total PV} \quad \$1,208.30$$

We are getting very close. The rate needs to be just a bit higher. Let's try 13.58%:

$$\text{PV of dividends: } PV = PV = PMT \left[ \frac{1 - \frac{1}{(1+i)^n}}{i} \right] = \$50 \left[ \frac{1 - \frac{1}{(1.1358)^{12}}}{.1358} \right] = \$ 288.31$$

$$\text{PV of sales proceeds: } PV = \frac{FV}{(1+i)^n} = \frac{\$4,200}{(1.1358)^{12}} = + 911.23$$

$$\text{Total PV} \quad \$1,199.54$$

A rate of 13.58% results in a present value of \$1,199.54, which is very close to our target figure of \$1,200. **You earned approximately 13.58%, compounded annually.**

### Challenge problems

28.  $I = PRT = \$650,000 \times 6\% \times \frac{1}{12} = \$3,250$

29. **The savings plan balance will increase** because the interest you earn is greater than the amount you withdraw.

30. What \$650,000 will grow to: Formula 1A ( $n = 40 \times 12 = 480$ ;  $i = 6\% \div 12 = .5\% = .005$ ):

$$FV = PV(1+i)^n = \$650,000(1.005)^{480} = \$ 7,122,344.89$$

Decrease in FV because of the \$3,000 monthly withdrawal:

$$\text{Formula 1B } (n = 480; i = .005): FV = PMT \left[ \frac{(1+i)^n - 1}{i} \right] = \$3,000 \left[ \frac{(1.005)^{480} - 1}{.005} \right] = - 5,974,472.20$$

$$\text{Balance in 40 years} \quad \$1,147,872.69$$

(In spite of making hefty withdrawals, the balance has increased from \$650,000 to \$1,147,872.69.)

31. Formula 5 ( $i = 6\% \div 12 = .5\% = .005$ ;  $PV = \text{negative } \$650,000$ ;  $PMT = \$3,500$ ;  $FV = 0$ ):

$$n = \frac{-\ln \left[ \frac{PV + \left( \frac{PMT}{i} \right)}{\frac{PMT}{i} - FV} \right]}{\ln(1+i)} = \frac{-\ln \left[ \frac{-\$650,000 + \left( \frac{\$3,500}{.005} \right)}{\frac{\$3,500}{.005} - \$0} \right]}{\ln(1.005)} = 529.13 \text{ months (44.09 years)}$$

32. Formula 2A ( $n = 2.5 \times 12 = 30$ ;  $i = 6\% \div 12 = 0.5\% = .005$ ):  $PV = \frac{FV}{(1+i)^n} = \frac{\$8,000}{(1.005)^{30}} = \$6,888.24$

33. Formula 4A ( $n = 2.5 \times 12 = 30$ ;  $i = 6\% \div 12 = 0.5\% = .005$ ): 
$$\text{PMT} = \frac{\text{FV}(i)}{(1+i)^n - 1} = \frac{\$8,000(.005)}{(1.005)^{30} - 1} = \mathbf{\$247.83}$$

34. What \$2,400 will grow to (Formula 1A):  $\text{FV} = \text{PV}(1+i)^n = \$2,400(1.005)^{30} = \$2,787.36$

Additional FV required:  $\$8,000 - \$2,787.36 = \$5,212.64$

PMT needed to accumulate \$5,212.64 (Formula 4A): 
$$\text{PMT} = \frac{\text{FV}(i)}{(1+i)^n - 1} = \frac{\$5,212.64(.005)}{(1.005)^{30} - 1} = \mathbf{\$161.48}$$

35. *Note:* 35.9 cents, written in terms of dollars, is \$0.359, so: 
$$i = \left( \frac{\text{FV}}{\text{PV}} \right)^{\frac{1}{n}} - 1 = \left( \frac{\$4,399}{\$0.359} \right)^{\frac{1}{35}} - 1 = .0742 = \mathbf{7.42\%}$$

36. Formula 2B ( $n = 30 \times 12 = 360$ ;  $i = 6.75\% \div 12 = .5625\% = .005625$ ):

$$\text{PV} = \text{PMT} \left[ \frac{1 - \frac{1}{(1+i)^n}}{i} \right] = \$1,100 \left[ \frac{1 - \frac{1}{(1.005625)^{360}}}{.005625} \right] = \mathbf{\$169,596.55}$$

37. First, let's find the amount needed at the start of the 30-year withdrawal stage. We need to know PV and we know PMT, so we use Formula 2B ( $n = 30 \times 12 = 360$ ;  $i = 6\% \div 12 = .5\% = .005$ ):

$$\text{PV} = \text{PMT} \left[ \frac{1 - \frac{1}{(1+i)^n}}{i} \right] = \$2,000 \left[ \frac{1 - \frac{1}{(1.005)^{360}}}{.005} \right] = \$333,583.23$$

Now, let's find the amount Jacob needs to deposit at the end of each month over the next 35 years to accumulate the \$333,583.23. We need to know PMT and we know FV, so we use Formula 4A ( $n = 35 \times 12 = 420$ ):

$$\text{PMT} = \frac{\text{FV}(i)}{(1+i)^n - 1} = \frac{\$333,583.23(.005)}{(1.005)^{420} - 1} = \mathbf{\$234.14}$$

|     |                                                       |                     |
|-----|-------------------------------------------------------|---------------------|
| 38. | Total amount to be received: $360 \times \$2,000 =$   | \$720,000.00        |
|     | Total amount to be deposited: $420 \times \$234.14 =$ | <u>- 98,338.80</u>  |
|     | Interest earned                                       | <b>\$621,661.20</b> |

39. Projected tuition, 8 years from now:  $\text{FV} = \text{PV}(1+i)^n = \$6,000(1.04)^8 = \$8,211.41$

Amount needed in fund 8 years from now (assuming withdrawals are at the *end* of each year):

$$\text{PV} = \text{PMT} \left[ \frac{1 - \frac{1}{(1+i)^n}}{i} \right] = \$8,211.41 \left[ \frac{1 - \frac{1}{(1.06)^4}}{.06} \right] = \$28,453.40$$

Adjust, because withdrawals are at *beginning* of each year:  $\$28,453.40$  (rounded)  $\times 1.06 = \$30,160.60$

Amount to be deposited at the end of each year to accumulate \$30,160.60 in 8 years:

$$\text{PMT} = \frac{\text{FV}(i)}{(1+i)^n - 1} = \frac{\$30,160.60(.06)}{(1.06)^8 - 1} = \mathbf{\$3,047.30}$$

## Practice Test

1. First, figure the required deposit assuming deposits are made at the *end* of each month.

$$\text{Formula 4A } (n = 18 \times 12 = 216; i = 6\% \div 12 = .5\% = .005): \text{PMT} = \frac{\text{FV}(i)}{(1+i)^n - 1} = \frac{\$35,000(.005)}{(1.005)^{216} - 1} = \$90.36$$

We need to adjust the answer because deposits are made at the *beginning* of each period. You can deposit less because the plan starts earning interest sooner. So, we *divide* the answer by  $(1+i)$ :

$$\$90.36 \div (1+i) = \$90.36 \div 1.005 = \mathbf{\$89.91}$$

2. Formula 5 ( $i = 6\% \div 12 = .5\% = .005$ ;  $PV = \text{negative } \$5,500$ ;  $PMT = \text{negative } \$400$ ;  $FV = \$22,000$ ):

$$n = \frac{-\ln \left[ \frac{PV + \left( \frac{PMT}{i} \right)}{\frac{PMT}{i} - FV} \right]}{\ln(1 + i)} = \frac{-\ln \left[ \frac{-\$5,500 + \left( \frac{-\$400}{.005} \right)}{\frac{-\$400}{.005} - \$22,000} \right]}{\ln(1.005)} = \mathbf{35.38 \text{ months}}$$

3. Formula 4B ( $n = 30 \times 12 = 360$ ;  $i = 6.5\% \div 12 \approx .5416667\% \approx .005416667$ ):

$$PMT = \frac{PV(i)}{1 - \frac{1}{(1+i)^n}} = \frac{\$250,000(.005416667)}{1 - \frac{1}{(1.005416667)^{360}}} = \mathbf{\$1,580.17}$$

4. Formula 4B ( $n = 4 \times 12 = 48$ ;  $i = 6.5\% \div 12 \approx .5416667\% \approx .005416667$ ):

$$PMT = \frac{PV(i)}{1 - \frac{1}{(1+i)^n}} = \frac{\$13,500(.005416667)}{1 - \frac{1}{(1.005416667)^{48}}} = \mathbf{\$320.15}$$

5. Formula 4B ( $n = 30 \times 12 = 360$ ;  $i = 6.75\% \div 12 = .5625\% = .005625$ ):

$$PMT = \frac{PV(i)}{1 - \frac{1}{(1+i)^n}} = \frac{\$240,000(.005625)}{1 - \frac{1}{(1.005625)^{360}}} = \$1,556.64$$

Total interest:  $(360 \times \$1,556.64) - \$240,000 = \$560,390.40 - 240,000.00 = \mathbf{\$320,390.40}$

6. Formula 3 ( $n = 10$ ;  $FV = \$165,000$ ;  $PV = \$108,000$ ):  $i = \left( \frac{FV}{PV} \right)^{\frac{1}{n}} - 1 = \left( \frac{\$165,000}{\$108,000} \right)^{\frac{1}{10}} - 1 = .0433 = \mathbf{4.33\%}$

## Chapter 12 Future Value and Present Value: Using Financial Calculators

### Unit 12.1 Time-value-of-money terminology

1. **12** ( $3 \text{ years} \times 4 \text{ periods per year}$ )
2. **1.5%** ( $6\% \div 4 = 1.5\%$ )
3. **\$1,000** (this is the amount that happens at the beginning of the first period)
4. **\$50** (this is the amount that happens every period)
5. **\$1,847.68** (this is the amount that happens at the end of the last period)
6. **False.** PV is \$4,000 because that's the amount that happened at the beginning of the first period.
7. No one receives a check for \$1,600, so **\$1,600 is not a time-value-of-money variable.**
8. **\$6,000** (this is the amount that happens at the end of the last period)

### Unit 12.2 Financial Calculators

9. We should clear the TVM registers if the upcoming problem is an entirely new problem. If the upcoming problem is merely a variation of the preceding problem, it is easier to not clear the registers and instead change the values that are different.
10. By using this approach, we don't have to change the "periods per year" setting from problem to problem; we must, however, enter the *periodic rate* in the *i-register*.
11. **False.** We can review the values by pressing [RCL] [N], [RCL] [PV], etc.
12. **False.** Values can be entered in any order.
13. **3**
14. **True**
15. **False.** You do not make a payment of \$600, so you should *not* enter \$600 in the PMT register. Instead, you should enter \$100 (actually, negative \$100) in the PMT register.

## Unit 12.3 Future value

16.

| N   | i | PV  | PMT | FV               |
|-----|---|-----|-----|------------------|
| 170 | 4 | -42 |     | <b>33,030.64</b> |

17.

| N  | i | PV | PMT    | FV                |
|----|---|----|--------|-------------------|
| 30 | 8 |    | -2,000 | <b>226,566.42</b> |

18.

| N  | i | PV | PMT  | FV               |
|----|---|----|------|------------------|
| 40 | 2 |    | -365 | <b>22,046.72</b> |

19.

| N                    | i                     | PV | PMT  | FV                |
|----------------------|-----------------------|----|------|-------------------|
| $51 \times 12 = 612$ | $7.5 \div 12 = 0.625$ |    | -135 | <b>956,673.97</b> |

20. Change to “begin” mode. Then solve for FV (it is not necessary to re-enter amounts). Answer is **\$962,653.18**.

*Suggestion:* After getting the answer, don’t forget to put calculator back in “end” mode.

21.

|                                              |                     |
|----------------------------------------------|---------------------|
| Ending balance                               | \$962,653.18        |
| Total amount deposited: $612 \times \$135 =$ | <u>- 82,620.00</u>  |
| Interest earned                              | <b>\$880,033.18</b> |

22.

| N                    | i                         | PV | PMT  | FV                |
|----------------------|---------------------------|----|------|-------------------|
| $10 \times 12 = 120$ | $7 \div 12 = 0.58\bar{3}$ |    | -100 | <b>17,308.48</b>  |
| $20 \times 12 = 240$ | ↑                         |    | ↑    | <b>52,092.67</b>  |
| $30 \times 12 = 360$ | ↑                         |    | ↑    | <b>121,997.10</b> |
| $40 \times 12 = 480$ | ↑                         |    | ↑    | <b>262,481.34</b> |

23.

| N   | i  | PV   | PMT | FV                   |
|-----|----|------|-----|----------------------|
| 100 | 12 | -500 |     | <b>41,761,132.86</b> |

24.

| N  | i | PV     | PMT | FV              |
|----|---|--------|-----|-----------------|
| 18 | 5 | -2,550 |     | <b>6,136.88</b> |

25.

| N  | i  | PV     | PMT | FV            |
|----|----|--------|-----|---------------|
| 40 | -5 | -4,400 |     | <b>565.45</b> |

There will be about **565 elephants**.

## Unit 12.4 Present value

26.

| N  | i | PV               | PMT | FV    |
|----|---|------------------|-----|-------|
| 10 | 3 | <b>-3,720.47</b> |     | 5,000 |

27.

| N                 | i                | PV                         | PMT     | FV |
|-------------------|------------------|----------------------------|---------|----|
| $4 \times 4 = 16$ | $6 \div 4 = 1.5$ | <b>-8,478,758.43 euros</b> | 600,000 |    |

28.  $180 \times \$1,300 =$  **\$234,000**

29. **No**; you need to find the *present value* of the money saved.

30.

| N                    | i                  | PV                 | PMT   | FV |
|----------------------|--------------------|--------------------|-------|----|
| $15 \times 12 = 180$ | $9 \div 12 = 0.75$ | <b>-128,171.43</b> | 1,300 |    |

31. **No**; the value of the device (\$128,171.43) is less than its \$150,000 cost.32.  $100 \times \$700 = \mathbf{\$70,000}$ 

33.

| N   | i                  | PV                | PMT | FV |
|-----|--------------------|-------------------|-----|----|
| 100 | $6 \div 12 = 0.50$ | <b>-54,979.85</b> | 700 |    |

34. Let's look at this from the standpoint of an investor who wants to earn 8% compounded semiannually. The investor would receive interest checks of \$30 each 6 months for 13 years, plus the \$1,000 maturity value in 13 years.

| N                  | i              | PV             | PMT | FV    |
|--------------------|----------------|----------------|-----|-------|
| $13 \times 2 = 26$ | $8 \div 2 = 4$ | <b>-840.17</b> | 30  | 1,000 |

35. The bond is worth less than \$1,000 **because the 6% rate is less than the 8% prevailing rate** that investors can earn.

36.

| N  | i | PV             | PMT | FV    |
|----|---|----------------|-----|-------|
| 20 | 8 | <b>-214.55</b> |     | 1,000 |

37.

| N | i                  | PV              | PMT         | FV |
|---|--------------------|-----------------|-------------|----|
| 6 | $9 \div 12 = 0.75$ | <b>4,122.61</b> | -700 Begin* |    |

\*Note: Don't forget to put back in "end" mode.

### Challenge problems

38.

| N                 | i              | PV     | PMT  | FV              |
|-------------------|----------------|--------|------|-----------------|
| $5 \times 2 = 10$ | $8 \div 2 = 4$ | -5,800 | -100 | <b>9,786.03</b> |

39.  $\$45,000 \times 7.65\% = \mathbf{\$3,442.50}$ 40.  $\$3,442.50$  (employee share) +  $\$3,442.50$  (employer share) = **\$6,885**41.  $\$6,885 \div 4 = \mathbf{\$1,721.25}$ 

42.

| N                   | i                 | PV | PMT       | FV                  |
|---------------------|-------------------|----|-----------|---------------------|
| $40 \times 4 = 160$ | $7 \div 4 = 1.75$ |    | -1,721.25 | <b>1,480,390.69</b> |

43.

| N                    | i                  | PV                  | PMT     | FV |
|----------------------|--------------------|---------------------|---------|----|
| $28 \times 12 = 336$ | $9 \div 12 = 0.75$ | <b>3,062,600.87</b> | -25,000 |    |

44.

| N                    | i                  | PV                 | PMT          | FV |
|----------------------|--------------------|--------------------|--------------|----|
| $20 \times 12 = 240$ | $9 \div 12 = 0.75$ | <b>-615,881.98</b> | 5,500 Begin* |    |

\*Note: You collect \$27,500 per month and pay \$22,000, keeping the difference of \$5,500 at the beginning of each month. Don't forget to put your calculator back in "end" mode.

Your leasehold interest is worth \$615,881.98; the paragraph in the lease that allows you to sublease the space is very valuable to you and is very costly to the landlord.

45.

| N  | i | PV                   | PMT     | FV |
|----|---|----------------------|---------|----|
| 10 | 8 | <b>-3,355,040.70</b> | 500,000 |    |

46.

| N | i | PV | PMT      | FV                  |
|---|---|----|----------|---------------------|
| ↑ | ↑ | 0  | -500,000 | <b>7,243,281.23</b> |

47. First, let's find what \$750 per quarter will accumulate to.

| N                   | i                | PV | PMT  | FV                |
|---------------------|------------------|----|------|-------------------|
| $25 \times 4 = 100$ | $6 \div 4 = 1.5$ |    | -750 | <b>171,602.28</b> |

Now, let's find what the \$171,602.28 will grow to over the final 10 years.

| N                  | i | PV           | PMT | FV                |
|--------------------|---|--------------|-----|-------------------|
| $10 \times 4 = 40$ | ↑ | -171,602.28* | 0   | <b>311,289.69</b> |

\*Note: Answer assumes we round the FV amount, from Step 1, to the nearest penny before entering in the PV register.

### Practice Test

1.  $n = 5 \text{ years} \times 4 \text{ periods per year} = 20$

2. **\$420** (this is the amount that happened at the beginning of the first period)

3.

| N  | i  | PV   | PMT | FV                |
|----|----|------|-----|-------------------|
| 50 | 12 | -500 |     | <b>144,501.09</b> |

4.

| N                    | i                       | PV | PMT  | FV                |
|----------------------|-------------------------|----|------|-------------------|
| $50 \times 12 = 600$ | $6.75 \div 12 = 0.5625$ |    | -100 | <b>496,875.02</b> |

5.

| N  | i | PV     | PMT | FV              |
|----|---|--------|-----|-----------------|
| 18 | 4 | -3,800 |     | <b>7,698.10</b> |

6.

| N  | i | PV             | PMT | FV    |
|----|---|----------------|-----|-------|
| 20 | 8 | <b>-214.55</b> |     | 1,000 |

7.

| N                    | i                       | PV                | PMT | FV    |
|----------------------|-------------------------|-------------------|-----|-------|
| $12 \times 12 = 144$ | $9.75 \div 12 = 0.8125$ | <b>-70,252.22</b> | 800 | 8,000 |

## Chapter 13 Sinking Funds, Annuities, and More: Using Financial Calculators

### Unit 13.1 Sinking funds

1.

| N                   | i              | PV                | PMT | FV     |
|---------------------|----------------|-------------------|-----|--------|
| $6.5 \times 4 = 26$ | $8 \div 4 = 2$ | <b>-29,878.96</b> |     | 50,000 |

2.

| N | i | PV | PMT              | FV |
|---|---|----|------------------|----|
| ↑ | ↑ | 0  | <b>-1,484.96</b> | ↑  |

3.

| N | i | PV     | PMT              | FV     |
|---|---|--------|------------------|--------|
| ↑ | ↑ | -4,700 | <b>-1,251.38</b> | 50,000 |

4.

| N                   | i                 | PV | PMT              | FV     |
|---------------------|-------------------|----|------------------|--------|
| $4.5 \times 4 = 18$ | $3 \div 4 = 0.75$ |    | <b>-2,083.91</b> | 40,000 |

5.  $I = PRT = £86,500,000 \times 6\% \times 1 = \text{£}5,190,000$

6.

| N  | i | PV | PMT                  | FV         |
|----|---|----|----------------------|------------|
| 20 | 8 |    | <b>-1,890,216.06</b> | 86,500,000 |

7.  $£5,190,000$  (interest to bondholders) +  $£1,890,216.06$  (sinking fund deposit) = **£7,080,216.06**

8. First, let's determine how many months it will take. Then, we will figure her age.

| N             | i                  | PV | PMT  | FV        |
|---------------|--------------------|----|------|-----------|
| <b>547.60</b> | $8 \div 12 = 0.66$ |    | -180 | 1,000,000 |

$547.60 \text{ months} \div 12 = 45.63 \text{ years}$ . 28 years (Kristi's age now) + 45.63 years = 73.63 (**73 years old**)

## Unit 13.2 Annuities

9.  $I = PRT = \$500,000 \times 6.75\% \times \frac{1}{12} = \text{\$}2,812.50$

10.

| N                    | i                       | PV       | PMT             | FV |
|----------------------|-------------------------|----------|-----------------|----|
| $40 \times 12 = 480$ | $6.75 \div 12 = 0.5625$ | -500,000 | <b>3,016.78</b> | 0  |

11.

| N                    | i | PV | PMT             | FV |
|----------------------|---|----|-----------------|----|
| $30 \times 12 = 360$ | ↑ | ↑  | <b>3,242.99</b> | 0  |

12.

| N                    | i | PV | PMT   | FV |
|----------------------|---|----|-------|----|
| <b>290.14 months</b> | ↑ | ↑  | 3,500 | 0  |

$290.14 \text{ months} \div 12 = \text{24.18 years}$

13. **It will increase** because the withdrawals are less than the interest you earn.

14.

| N                    | i | PV | PMT   | FV                |
|----------------------|---|----|-------|-------------------|
| $25 \times 12 = 300$ | ↑ | ↑  | 2,700 | <b>587,608.96</b> |

15.

| N   | i   | PV         | PMT                      | FV |
|-----|-----|------------|--------------------------|----|
| 150 | 5.5 | -4,000,000 | <b>208,598.64</b> Begin* |    |

\*Note: Don't forget to put back in "end" mode.

## Unit 13.3 Loan payments

16.

| N                  | i                      | PV     | PMT            | FV |
|--------------------|------------------------|--------|----------------|----|
| $6 \times 12 = 72$ | $6.5 \div 12 = 0.5416$ | 27,500 | <b>-462.27</b> |    |

17.  $72 \times \$462.27 = \$33,283.44$ ;  $\$33,283.44 - 27,500.00 = \text{\$}5,783.44$

18.

| N  | i     | PV  | PMT           | FV |
|----|-------|-----|---------------|----|
| 24 | 1.75* | 900 | <b>-46.25</b> |    |

\*Note: The periodic rate is 1.75(%), not  $1.75 \div 12$ .

19.

| N                    | i                              | PV      | PMT              | FV |
|----------------------|--------------------------------|---------|------------------|----|
| $15 \times 12 = 180$ | $7.25 \div 12 = 0.6041\bar{6}$ | 150,000 | <b>-1,369.29</b> |    |
| $30 \times 12 = 360$ | $7.5 \div 12 = 0.625$          | ↑       | <b>-1,048.82</b> |    |

20.  $\$1,369.29 - \$1,048.82 = \$320.47$

21. 15-year loan:  $180 \times \$1,369.29 = \$246,472.20$ ;  $\$246,472.20 - \$150,000 = \$96,472.20$   
 30-year loan:  $360 \times \$1,048.82 = \$377,575.20$ ;  $\$377,575.20 - \$150,000 = \$227,575.20$

22.  $\$227,575.20 - \$96,472.20 = \$131,103$

23.

| N                    | i                           | PV      | PMT              | FV |
|----------------------|-----------------------------|---------|------------------|----|
| $20 \times 12 = 240$ | $4.875 \div 12 = 0.40625^*$ | 365,000 | <b>-2,383.71</b> |    |

\*Note: We can find the decimal equivalent of  $\frac{7}{8}$  by dividing 7 by 8, getting 0.875. So,  $4\frac{7}{8} = 4.875$ .

24.

| N                    | i                              | PV         | PMT       | FV |
|----------------------|--------------------------------|------------|-----------|----|
| <b>268.00 months</b> | $8.75 \div 12 = 0.7291\bar{6}$ | 138,743.03 | -1,180.05 |    |

25.

| N                    | i | PV | PMT       | FV |
|----------------------|---|----|-----------|----|
| <b>261.22 months</b> | ↑ | ↑  | -1,190.05 |    |
| <b>215.03 months</b> | ↑ | ↑  | -1,280.05 |    |

### Challenge problems

26.

| N | i | PV       | PMT | FV                |
|---|---|----------|-----|-------------------|
| 5 | 4 | -400,000 |     | <b>486,661.16</b> |

27.

| N                 | i                | PV | PMT                      | FV |
|-------------------|------------------|----|--------------------------|----|
| $5 \times 4 = 20$ | $6 \div 4 = 1.5$ | 0  | <b>-20,735.00 Begin*</b> | ↑  |

\*Note: Don't forget to put back in "end" mode.

28.

| N                    | i                        | PV  | PMT | FV |
|----------------------|--------------------------|-----|-----|----|
| <b>165.34 months</b> | $8 \div 12 = 0.6\bar{6}$ | 500 | -5  |    |

29.

| N                   | i | PV | PMT | FV |
|---------------------|---|----|-----|----|
| <b>61.02 months</b> | ↑ | ↑  | -10 |    |

30. **No.** The extra \$5 a month applies entirely to principal, reducing the balance more quickly.

31.

| N                | i                          | PV        | PMT     | FV |
|------------------|----------------------------|-----------|---------|----|
| <b>54 months</b> | $11 \div 12 = 0.91\bar{6}$ | 13,841.90 | -326.14 |    |



|     |              |   |            |     |    |
|-----|--------------|---|------------|-----|----|
| 32. | N            | i | PV         | PMT | FV |
|     | 49.87 months | ↑ | 13,007.90* | ↑   |    |

\*Note: \$13,841.90 - \$834 extra principal = \$13,007.90

**The loan term will be reduced by 4.13 months** (54 months before making the extra payment - 49.87 months = 4.13 months).

|           |                    |                              |         |                |    |
|-----------|--------------------|------------------------------|---------|----------------|----|
| 33.       | N                  | i                            | PV      | PMT            | FV |
| a. Rebate | $5 \times 12 = 60$ | $8.5 \div 12 = 0.708\bar{3}$ | 22,000* | <b>-451.36</b> |    |
| b. 2.9%   | ↑                  | $2.9 \div 12 = 0.241\bar{6}$ | 25,500  | <b>-457.07</b> |    |

\*Note: \$25,500 - \$3,500 rebate = \$22,000

|     |                      |                                |                   |      |    |
|-----|----------------------|--------------------------------|-------------------|------|----|
| 34. | N                    | i                              | PV                | PMT  | FV |
|     | $30 \times 12 = 360$ | $4.75 \div 12 = 0.3958\bar{3}$ | <b>172,530.35</b> | -900 |    |

35. First, let's find the amount needed at the start of the 30-year withdrawal stage.

|                      |                    |                    |       |    |
|----------------------|--------------------|--------------------|-------|----|
| N                    | i                  | PV                 | PMT   | FV |
| $30 \times 12 = 360$ | $6 \div 12 = 0.50$ | <b>-333,583.23</b> | 2,000 |    |

Now, let's find the amount Jacob needs to deposit at the end of each month over the next 35 years to accumulate the \$333,583.23.

|                      |   |    |                |            |
|----------------------|---|----|----------------|------------|
| N                    | i | PV | PMT            | FV         |
| $35 \times 12 = 420$ | ↑ | 0  | <b>-234.14</b> | 333,583.23 |

By depositing \$234.14 at the end of each month over the next 35 years, Jacob will be able to withdraw \$2,000 at the end of each month for the following 30 years.

|     |                                                       |                     |
|-----|-------------------------------------------------------|---------------------|
| 36. | Total amount to be received: $360 \times \$2,000 =$   | \$720,000.00        |
|     | Total amount to be deposited: $420 \times \$234.14 =$ | <u>- 98,338.80</u>  |
|     | Interest earned                                       | <b>\$621,661.20</b> |

37. Projected tuition, 8 years from now:

|   |   |        |     |                 |
|---|---|--------|-----|-----------------|
| N | i | PV     | PMT | FV              |
| 8 | 4 | -6,000 |     | <b>8,211.41</b> |

Amount needed in fund 8 years from now:

|   |   |                   |                 |    |
|---|---|-------------------|-----------------|----|
| N | i | PV                | PMT             | FV |
| 4 | 6 | <b>-30,160.61</b> | 8,211.41 Begin* |    |

\*Note: Don't forget to put your calculator back in "end" mode.

Amount to be deposited at the end of each year to accumulate \$30,160.61 in 8 years:

|   |   |    |                  |           |
|---|---|----|------------------|-----------|
| N | i | PV | PMT              | FV        |
| 8 | 6 |    | <b>-3,047.31</b> | 30,160.61 |

## Practice Test

|    |                      |                    |    |                      |        |
|----|----------------------|--------------------|----|----------------------|--------|
| 1. | N                    | i                  | PV | PMT                  | FV     |
|    | $18 \times 12 = 216$ | $6 \div 12 = 0.50$ |    | <b>-89.91</b> Begin* | 35,000 |

\*Note: Don't forget to put your calculator back in "end" mode.

|    |              |                    |        |      |        |
|----|--------------|--------------------|--------|------|--------|
| 2. | N            | i                  | PV     | PMT  | FV     |
|    | 35.38 months | $6 \div 12 = 0.50$ | -5,500 | -400 | 22,000 |

|    |                      |                              |          |          |    |
|----|----------------------|------------------------------|----------|----------|----|
| 3. | N                    | i                            | PV       | PMT      | FV |
|    | $30 \times 12 = 360$ | $6.5 \div 12 = 0.541\bar{6}$ | -250,000 | 1,580.17 |    |

|    |                    |                              |        |         |    |
|----|--------------------|------------------------------|--------|---------|----|
| 4. | N                  | i                            | PV     | PMT     | FV |
|    | $4 \times 12 = 48$ | $6.5 \div 12 = 0.541\bar{6}$ | 13,500 | -320.15 |    |

|    |                      |                                  |         |           |    |
|----|----------------------|----------------------------------|---------|-----------|----|
| 5. | N                    | i                                | PV      | PMT       | FV |
|    | $20 \times 12 = 240$ | $7.625 \div 12 = 0.63541\bar{6}$ | 140,000 | -1,138.56 |    |

|    |                      |                                |         |           |    |
|----|----------------------|--------------------------------|---------|-----------|----|
| 6. | N                    | i                              | PV      | PMT       | FV |
|    | $40 \times 12 = 480$ | $7.25 \div 12 = 0.6041\bar{6}$ | 180,000 | -1,151.41 |    |

Total interest:  $(480 \times \$1,151.41) - \$180,000 = \$552,676.80 - \$180,000 = \$372,676.80$

## Chapter 14 Installment Loans and Open-End Credit

### Unit 14.1 Cost of installment buying

- (c) **greater than \$177.08**. If Maria's credit union charged no interest, her monthly payment would be \$177.08 ( $\$8,500 \div 48 = \$177.08$ ); with interest, her payment will be more than \$177.08.
- (b) **greater than 6.5%**, because the \$50 fee is just like interest, paid in advance, which has the effect of increasing the interest rate.

|    |                      |                 |
|----|----------------------|-----------------|
| 3. | Price of car         | \$28,500        |
|    | Tax and license fees | 1,700           |
|    | Origination fee      | + 300           |
|    | Total amount needed  | \$30,500        |
|    | Less down payment    | - 3,000         |
|    | Required loan        | <b>\$27,500</b> |

|    |               |                                             |                    |
|----|---------------|---------------------------------------------|--------------------|
| 4. | <b>Step 1</b> | Total of all payments: $48 \times \$664.92$ | \$31,916.16        |
|    | <b>Step 2</b> | Less loan amount                            | -27,500.00         |
|    |               | Interest portion of payments                | \$ 4,416.16        |
|    | <b>Step 3</b> | Plus prepaid loan costs                     | + 300.00           |
|    |               | Total finance charges                       | <b>\$ 4,716.16</b> |

|    |               |                                                            |                    |
|----|---------------|------------------------------------------------------------|--------------------|
| 5. | <b>Step 1</b> | Cost of the purchase: $\$28,500 + \$1,700$ tax and license | \$30,200.00        |
|    | <b>Step 2</b> | Add finance charges (from Problem 2)                       | + 4,716.16         |
|    |               | Total cost, including finance charges                      | <b>\$34,916.16</b> |

|    |                                                            |                   |
|----|------------------------------------------------------------|-------------------|
| 6. | Cost of the purchase: $\$6,200 + \$500.00$ tax and license | \$6,700.00        |
|    | Finance charge                                             |                   |
|    | Total of all payments: $24 \times \$235.18$                | \$5,644.32        |
|    | Less loan amount                                           | -5,200.00         |
|    | Interest portion of payments                               | 444.32            |
|    | Total cost, including finance charges                      | <b>\$7,144.32</b> |

If you paid cash (without needing a loan), your total cost would be \$6,700. But since you get a loan, you must pay \$444.32 of interest, pushing your total cost to \$7,144.32.

## Unit 14.2 Paying off an installment loan

7. **False.** Because interest is figured on the unpaid balance, interest decreases as the loan balance goes down.
8. **False.** A 365-day year is used.
9. **(d)**

10. Days in June:  $30 - 12 = 18$  June has 30 days; not charged interest on first 12 days  
 Days in July  $+16$   
**34 days**

11.

| Due date | Date received | Total payment   | Interest      | Principal       | Balance         |
|----------|---------------|-----------------|---------------|-----------------|-----------------|
| July 1   | (Start)       | —               | —             | —               | \$1,000.00      |
| Aug. 1   | July 28       | \$254.71        | <b>\$6.66</b> | <b>\$248.05</b> | <b>\$751.95</b> |
| Sep. 1   | Aug. 29       | \$254.71        | <b>\$5.93</b> | <b>\$248.78</b> | <b>\$503.17</b> |
| Oct. 1   | Sep. 27       | \$254.71        | <b>\$3.60</b> | <b>\$251.11</b> | <b>\$252.06</b> |
| Nov. 1   | Nov. 1        | <b>\$254.24</b> | <b>\$2.18</b> | <b>\$252.06</b> | \$0.00          |

### Procedure for August 1 payment

Number of days:  $28 - 1 = 27$

Interest:  $I = PRT = \$1,000 \times 9\% \times \frac{27}{365} = \$6.66$

Principal:  $\$254.71 - \$6.66 = \$248.05$

New balance:  $\$1,000 - \$248.05 = \$751.95$

### Procedure for November 1 payment

Number of days: 3 days in Sep. + 31 days in Oct. + 1 day in Nov. = 35

Interest:  $I = PRT = \$252.06 \times 9\% \times \frac{35}{365} = \$2.18$

Principal: \$252.06 (previous balance)

Total payment:  $\$2.18 + \$252.06 = \$254.24$

12.

| Due date | Date received | Total payment     | Interest | Principal  | Balance    |
|----------|---------------|-------------------|----------|------------|------------|
| Oct. 1   | Oct. 1        | —                 | —        | —          | \$2,182.64 |
| —        | Oct. 27       | <b>\$2,203.63</b> | \$20.99  | \$2,182.64 | \$0.00     |

### Procedure for October 27 payment

Number of days:  $27 - 1 = 26$

Interest:  $I = PRT = \$2,182.64 \times 13.5\% \times \frac{26}{365} = \$20.99$

Principal: \$2,182.64 (previous balance)

Total payment:  $\$20.99 + \$2,182.64 = \$2,203.63$

## Unit 14.3 Open-end credit

13. a.  $\frac{13}{12} \approx 1.083333(\%)$  b.  $\frac{13}{365} \approx 0.035616(\%)$
14. Let's convert the 1.75% periodic rate to an annual rate:  $1.75 \times 12 = 21.00$  So, **the 15.9% rate is lower.**

15.

| Charge card statement: July 10 |                                  |              |             |
|--------------------------------|----------------------------------|--------------|-------------|
| Date                           | Item                             | Amount       | New balance |
| 6/11                           | Previous balance brought forward |              | \$420       |
| 6/18                           | Charge                           | \$50         | \$470       |
| 6/24                           | Payment                          | \$150 Credit | \$320       |
| 6/30                           | Charge                           | \$80         | \$400       |
| 7/5                            | Charge                           | \$40         | \$440       |

| Number of days                      |   | Balance    |   | Subtotal       |
|-------------------------------------|---|------------|---|----------------|
| 7 (June 11, 12, 13, 14, 15, 16, 17) | × | \$420      | = | \$ 2,940       |
| 6 (June 18, 19, 20, 21, 22, 23)     | × | 470        | = | 2,820          |
| 6 (June 24, 25, 26, 27, 28, 29)     | × | 320        | = | 1,920          |
| 5 (June 30, July 1, 2, 3, 4)        | × | 400        | = | 2,000          |
| <u>+ 6 (July 5, 6, 7, 8, 9, 10)</u> | × | <u>440</u> | = | <u>+ 2,640</u> |
| 30                                  |   |            |   | \$12,320       |

$$\text{Average daily balance} = \frac{\$12,320}{30} = \$410.67$$

16.  $\$410.67$  (average daily balance)  $\times 1.25\% = \$5.13$ 17. Daily periodic rate:  $\frac{8.75}{365} \approx 0.02397260(\%)$  Interest =  $\$48,700 \times 0.02397260\% \times 31 = \$361.91$ 

### Challenge problems

18.  $\$8,300$  (price of car) +  $\$550$  (tax & license fees) +  $\$50$  (processing fee) -  $\$700$  (cash) =  **$\$8,200$** 

19. Total of all payments:  $36 \times \$247.61 = \$8,913.96$   
 Less loan amount  $- 8,200.00$   
 Interest portion of payments  $\$713.96$   
 Plus prepaid loan costs  $+ 50.00$   
 Total finance charges  **$\$763.96$**

20. Cost of the purchase:  $\$8,300 + \$550 = \$8,850.00$   
 Add finance charge (from Problem 19)  $+ 763.96$   
 Total cost, including finance charges  **$\$9,613.96$**

21.

| Due Date | Date Received | Total Payment | Interest       | Principal       | Balance           |
|----------|---------------|---------------|----------------|-----------------|-------------------|
| Sep. 8   | (Start)       | —             | —              | —               | \$8,200.00        |
| Oct. 8   | Oct. 6        | \$247.61      | <b>\$34.60</b> | <b>\$213.01</b> | <b>\$7,986.99</b> |
| Nov. 8   | Nov. 10       | \$300.00      | <b>\$42.12</b> | <b>\$257.88</b> | <b>\$7,729.11</b> |

#### Procedure for October 8 payment

Number of days: 22 days in Sep. ( $30 - 8 = 22$ ) + 6 days in Oct. = 28Interest:  $I = PRT = \$8,200 \times 5.5\% \times \frac{28}{365} = \$34.60$ Principal:  $\$247.61 - \$34.60 = \$213.01$ Balance:  $\$8,200 - \$213.01 = \$7,986.99$ 

#### Procedure for November 8 payment

Number of days: 25 days in Oct. ( $31 - 6 = 25$ ) + 10 days in Nov. = 35Interest:  $I = PRT = \$7,986.99 \times 5.5\% \times \frac{35}{365} = \$42.12$ Principal:  $\$300 - \$42.12 = \$257.88$ Balance:  $\$7,986.99 - \$257.88 = \$7,729.11$

22.

| Due date | Date received | Total payment   | Interest | Principal | Balance  |
|----------|---------------|-----------------|----------|-----------|----------|
| Apr. 8   | Apr. 8        | —               | —        | —         | \$418.22 |
| —        | May 3         | <b>\$419.80</b> | \$1.58   | \$418.22  | \$0.00   |

**Procedure for May 3 payment**

Number of days: 22 days in Apr. (30 - 8 = 22) + 3 days in May = 25

Interest:  $I = PRT = \$418.22 \times 5.5\% \times \frac{25}{365} = \$1.58$ 

Principal: \$418.22 (previous balance)

Total payment: \$1.58 + \$418.22 = \$419.80

**Practice Test****1. Finance charge****Step 1** Total of all payments:  $60 \times \$386.66$  \$23,199.60**Step 2** Less loan amount - 20,000.00

Interest portion of payments \$ 3,199.60

**Total cost****Step 1** Cost of the purchase: \$22,200 + \$1,500 tax and license \$23,700.00**Step 2** Add finance charge (above) + 3,199.60Total cost **\$26,899.60****2. Interest is calculated through the date payment is received by the lender—August 7.**Using the days-in-month method: 26 days in July (31 - 5) + 7 days in August = **33 days**.

3.

| Due date | Date received | Total payment | Interest | Principal | Balance           |
|----------|---------------|---------------|----------|-----------|-------------------|
| Nov. 18  | (Start)       | —             | —        | —         | \$2,400.00        |
| Dec. 18  | Dec. 16       | \$100.00      | \$18.41  | \$81.59   | <b>\$2,318.41</b> |

**Procedure**

Number of days: 12 days in Nov. (30 - 18 = 12) + 16 days in Dec. = 28

Interest:  $I = PRT = \$2,400 \times 10\% \times \frac{28}{365} = \$18.41$ 

Principal: \$100 - \$18.41 = \$81.59

New balance: \$2,400 - \$81.59 = \$2,318.41

4.

| Due date | Date received | Total payment     | Interest | Principal  | Balance    |
|----------|---------------|-------------------|----------|------------|------------|
| —        | May 24        | —                 | —        | —          | \$1,489.23 |
| —        | June 2        | <b>\$1,492.13</b> | \$2.90   | \$1,489.23 | \$0.00     |

**Procedure**

Number of days: 7 days in May (31 - 24 = 7) + 2 days in Jun. = 9

Interest:  $I = PRT = \$1,489.23 \times 7.9\% \times \frac{9}{365} = \$2.90$ 

Principal: \$1,489.23 (previous balance)

Total payment: \$2.90 + \$1,489.23 = \$1,492.13

**5. Daily periodic rate:  $\frac{8.5}{365} \approx 0.02328767(\%)$  Interest =  $\$92,817 \times 0.02328767\% \times 30 = \$648.45$**

## Chapter 15 Home Ownership and Mortgage Loans

### Unit 15.1 Home ownership and mortgage payments

- False;** your home is real estate, not personal property.
- True**
- The first lender gets \$123,200; the second lender gets \$16,800.
- The first lender gets \$123,200; the second lender gets \$24,400; Nash gets the remaining \$7,400.
- False**
- Step 1** Monthly gross income:  $\$3,600 + \$1,300 = \$4,900.00$

**Step 2** Use the front-end ratio (29%):

|                                                                               |                   |
|-------------------------------------------------------------------------------|-------------------|
| a. Amount available for housing costs: $\$4,900 \times 29\%$                  | \$1,421.00        |
| b. Subtract monthly property taxes and insurance: $(\$1,700 + \$575) \div 12$ | - 189.58          |
| c. Amount available for monthly payment                                       | <u>\$1,231.42</u> |

**Step 3** Use the back-end ratio (41%):

|                                                                                |                   |
|--------------------------------------------------------------------------------|-------------------|
| a. Amount available for housing costs and consumer debt: $\$4,900 \times 41\%$ | \$2,009.00        |
| b. Subtract monthly property taxes and insurance (see above)                   | - 189.58          |
| c. Subtract consumer debt: $\$295 + \$20 + \$20$                               | - 335.00          |
| d. Amount available for monthly payment                                        | <u>\$1,484.42</u> |

**Step 4** Using the front-end ratio, their maximum monthly payment is \$1,231.42. Using the back-end ratio, the maximum monthly payment is \$1,484.42. Their maximum monthly payment is the lesser of the two: **\$1,231.42.**

- |                                                    |                     |
|----------------------------------------------------|---------------------|
| Total amount to be repaid: $360 \times \$1,074.62$ | \$386,863.20        |
| Subtract principal portion (loan amount)           | - 150,000.00        |
| Interest portion of payments                       | <u>\$236,863.20</u> |
- $(\$1,725 + \$575) \div 12 = \$2,300 \div 12 = \mathbf{\$191.67}$
- $\$1,074.62 \text{ (PI)} + \$191.67 \text{ (TI)} = \mathbf{\$1,266.29 \text{ (PITI)}}$
- Yes.** If taxes or insurance change, the TI portion of the payment changes, resulting in a change in the total (PITI) payment.

### Unit 15.2 Paying off a mortgage loan and increasing equity

- Refer to Problems 6-9. Calculate interest, principal, and remaining balance for the first two monthly payments.

The TI portion of the payment does not apply to the debt.

| Payment number | Payment (PI) | Interest        | Principal       | Balance             |
|----------------|--------------|-----------------|-----------------|---------------------|
| New loan       | —            | —               | —               | \$150,000.00        |
| 1              | \$1,074.62   | <b>\$968.75</b> | <b>\$105.87</b> | <b>\$149,894.13</b> |
| 2              | \$1,074.62   | <b>\$968.07</b> | <b>\$106.55</b> | <b>\$149,787.58</b> |

**Payment 1** Interest:  $I = PRT = \$150,000 \times 7.75\% \times \frac{1}{12} = \mathbf{\$968.75}$   
 Principal =  $\$1,074.62 - \$968.75 = \mathbf{\$105.87}$   
 Balance =  $\$150,000 - \$105.87 = \mathbf{\$149,894.13}$

**Payment 2** Interest:  $I = PRT = \$149,894.13 \times 7.75\% \times \frac{1}{12} = \mathbf{\$968.07}$   
 Principal =  $\$1,074.62 - \$968.07 = \mathbf{\$106.55}$   
 Balance =  $\$149,894.13 - \$106.55 = \mathbf{\$149,787.58}$

- True**
- False.** If an amortization schedule were printed for a car loan, it would soon be worthless, because interest is figured to the date payment is received, and payments are often made a few days early or a few days late.
- $\$315,000 - \$147,300 = \mathbf{\$167,700}$

## Unit 15.3 Repayment variations and loan charges

15. Be sure to set decimal at 2 places when amortizing. And give your calculator ample time between keystrokes (look at your display after pressing each key).

| HP 10BII+                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | TI BAII PLUS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>(a) calculate monthly payment</p> <p> <b>C ALL</b> 0.00</p> <p>120,000 <b>PV</b> 120,000.00</p> <p>30 <b>×</b> 12 <b>=</b> <b>N</b> 360.00</p> <p>6 <b>÷</b> 12 <b>=</b> <b>I/YR</b> 0.50</p> <p><b>PMT</b> -719.46</p> <p>(b) first payment</p> <p> <b>AMORT</b> 1 - 1</p> <p><b>=</b> -119.46 PRIN</p> <p><b>=</b> -600.00 INT</p> <p><b>=</b> 119,880.54 BAL</p> <p>(c) interest, first 8 payments</p> <p>1 <b>INPUT</b> 8  <b>AMORT</b> 1 - 8</p> <p><b>=</b> -4,783.10 INT</p> <p>(d) balance after payment 102</p> <p>1 <b>INPUT</b> 102  <b>AMORT</b> 1 - 102</p> <p><b>=</b> <b>=</b> 104,155.45 BAL</p> <p>(e) interest, all 360 payments</p> <p>1 <b>INPUT</b> 360  <b>AMORT</b> 1 - 360</p> <p><b>=</b> <b>=</b> -139,006.67 INT</p> <p>(f) final monthly payment</p> <p><b>=</b> 1.07 BAL*</p> <p><b>+</b> 719.46 <b>=</b> 720.53</p> | <p>(a) calculate monthly payment</p> <p><b>2ND</b> <b>CLR TVM</b> 7.??</p> <p>120,000 <b>PV</b> PV=120,000.00</p> <p>30 <b>×</b> 12 <b>=</b> <b>N</b> N=360.00</p> <p>6 <b>÷</b> 12 <b>=</b> <b>I/Y</b> I/Y=0.50</p> <p><b>CPT</b> <b>PMT</b> PMT= -719.46</p> <p>(b) first payment</p> <p><b>2ND</b> <b>AMORT</b> <b>2ND</b> <b>CLR WORK</b> P1=1.00</p> <p><b>↓</b> P2=1.00</p> <p><b>↓</b> BAL=119,880.54</p> <p><b>↓</b> PRN= -119.46</p> <p><b>↓</b> INT= -600.00</p> <p>(c) interest, first 8 payments</p> <p><b>↓</b> <b>↓</b> 8 <b>ENTER</b> P2= 8.00</p> <p><b>↓</b> <b>↓</b> <b>↓</b> INT= -4,783.10</p> <p>(d) balance after payment 102</p> <p><b>↓</b> <b>↓</b> 102 <b>ENTER</b> P2=102.00</p> <p><b>↓</b> BAL=104,155.45</p> <p>(e) interest, all 360 payments</p> <p><b>↑</b> 360 <b>ENTER</b> P2=360.00</p> <p><b>↓</b> <b>↓</b> <b>↓</b> INT= -139,006.67</p> <p>(f) final monthly payment</p> <p><b>↑</b> <b>↑</b> BAL=1.07*</p> <p><b>+</b> 719.46 <b>=</b> 720.53</p> <p><b>2ND</b> <b>QUIT</b> 0.00</p> |

Note: The balance is \$1.07, indicating that the final payment must be \$1.07 greater to end up with an ending balance of \$0.00.

16.

| HP 10BII+                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | TI BAII PLUS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>calculate monthly payment</p> <p> <b>C ALL</b> 0.00</p> <p>350,000 <b>PV</b> 350,000.00</p> <p>25 <b>×</b> 12 <b>=</b> <b>N</b> 300.00</p> <p>10.25 <b>÷</b> 12 <b>=</b> <b>I/YR</b> 0.85</p> <p><b>PMT</b> -3,242.34</p> <p>first calendar-year</p> <p>1 <b>INPUT</b> 5  <b>AMORT</b> 1 - 5</p> <p><b>=</b> -1,285.56 PRIN</p> <p><b>=</b> -14,926.14 INT</p> <p><b>=</b> 348,714.44 BAL</p> <p>second calendar-year</p> <p>6 <b>INPUT</b> 17  <b>AMORT</b> 6 - 17</p> <p><b>=</b> -3,317.85 PRIN</p> <p><b>=</b> -35,590.23 INT</p> <p><b>=</b> 345,396.59 BAL</p> | <p>calculate monthly payment</p> <p><b>2ND</b> <b>CLR TVM</b> 7.??</p> <p>350,000 <b>PV</b> PV=350,000.00</p> <p>25 <b>×</b> 12 <b>=</b> <b>N</b> N=300.00</p> <p>10.25 <b>÷</b> 12 <b>=</b> <b>I/Y</b> I/Y=0.85</p> <p><b>CPT</b> <b>PMT</b> PMT= -3,242.34</p> <p>first calendar-year</p> <p><b>2ND</b> <b>AMORT</b> <b>2ND</b> <b>CLR WORK</b> P1=1.00</p> <p><b>↓</b> 5 <b>ENTER</b> P2=5.00</p> <p><b>↓</b> BAL=348,714.44</p> <p><b>↓</b> PRN= -1,285.56</p> <p><b>↓</b> INT= -14,926.14</p> <p>second calendar-year</p> <p><b>↓</b> 6 <b>ENTER</b> <b>↓</b> 17 <b>ENTER</b> P2=17.00</p> <p><b>↓</b> BAL=345,396.59</p> <p><b>↓</b> PRN= -3,317.85</p> <p><b>↓</b> INT= -35,590.23</p> |

(continued on next page)

| HP 10BII+                                                                                                                       | TI BAII PLUS                                                                                                                                                              |
|---------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>third calendar-year</i><br><b>AMORT</b> * 18 - 29<br><b>-3,674.38</b> PRIN<br><b>-35,233.70</b> INT<br><b>341,722.21</b> BAL | <i>third calendar-year</i><br><b>CPT</b> * P1=18.00<br>P2=29.00<br><b>BAL=341,722.21</b><br>PRN= <b>-3,674.38</b><br>INT= <b>-35,233.70</b><br><b>0.00</b><br><b>QUIT</b> |

Note: For the second calendar-year, there were 12 payments. Because the next series of payments (the third calendar-year) also includes 12 payments, we don't have to tell the calculator the beginning and ending payment numbers.

| 17.                                                                                                                                                                  | <table> <tr> <th>HP 10BII+</th><th>TI BAII PLUS</th></tr> <tr> <td> <b>C ALL</b> 0.00<br/> 100,000 <b>PV</b> 100,000.00<br/> 30 <b>x</b> 12 <b>=</b> <b>N</b> 360.00<br/> 9 <b>÷</b> 12 <b>=</b> <b>I/YR</b> 0.75<br/> <b>PMT</b> <b>-804.62</b> </td><td> <b>CLR TVM</b> ??<br/> 100,000 <b>PV</b> PV=100,000.00<br/> 30 <b>x</b> 12 <b>=</b> <b>N</b> N=360.00<br/> 9 <b>÷</b> 12 <b>=</b> <b>I/Y</b> I/Y=0.75<br/> <b>CPT</b> <b>PMT</b> PMT= <b>-804.62</b> </td></tr> </table> | HP 10BII+ | TI BAII PLUS | <b>C ALL</b> 0.00<br>100,000 <b>PV</b> 100,000.00<br>30 <b>x</b> 12 <b>=</b> <b>N</b> 360.00<br>9 <b>÷</b> 12 <b>=</b> <b>I/YR</b> 0.75<br><b>PMT</b> <b>-804.62</b> | <b>CLR TVM</b> ??<br>100,000 <b>PV</b> PV=100,000.00<br>30 <b>x</b> 12 <b>=</b> <b>N</b> N=360.00<br>9 <b>÷</b> 12 <b>=</b> <b>I/Y</b> I/Y=0.75<br><b>CPT</b> <b>PMT</b> PMT= <b>-804.62</b> |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| HP 10BII+                                                                                                                                                            | TI BAII PLUS                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |           |              |                                                                                                                                                                      |                                                                                                                                                                                              |
| <b>C ALL</b> 0.00<br>100,000 <b>PV</b> 100,000.00<br>30 <b>x</b> 12 <b>=</b> <b>N</b> 360.00<br>9 <b>÷</b> 12 <b>=</b> <b>I/YR</b> 0.75<br><b>PMT</b> <b>-804.62</b> | <b>CLR TVM</b> ??<br>100,000 <b>PV</b> PV=100,000.00<br>30 <b>x</b> 12 <b>=</b> <b>N</b> N=360.00<br>9 <b>÷</b> 12 <b>=</b> <b>I/Y</b> I/Y=0.75<br><b>CPT</b> <b>PMT</b> PMT= <b>-804.62</b>                                                                                                                                                                                                                                                                                        |           |              |                                                                                                                                                                      |                                                                                                                                                                                              |

Note: Don't clear registers; Problems 19-23 are a continuation.

|                                      |                                                                                                                                                                                                                             |                |              |                                      |                     |                  |                     |
|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|--------------|--------------------------------------|---------------------|------------------|---------------------|
| 18.                                  | <table> <tr> <td>360 × \$804.62</td><td>\$289,663.20</td></tr> <tr> <td>Less principal portion (loan amount)</td><td><u>- 100,000.00</u></td></tr> <tr> <td>Interest portion</td><td><b>\$189,663.20</b></td></tr> </table> | 360 × \$804.62 | \$289,663.20 | Less principal portion (loan amount) | <u>- 100,000.00</u> | Interest portion | <b>\$189,663.20</b> |
| 360 × \$804.62                       | \$289,663.20                                                                                                                                                                                                                |                |              |                                      |                     |                  |                     |
| Less principal portion (loan amount) | <u>- 100,000.00</u>                                                                                                                                                                                                         |                |              |                                      |                     |                  |                     |
| Interest portion                     | <b>\$189,663.20</b>                                                                                                                                                                                                         |                |              |                                      |                     |                  |                     |

| 19.                                                                                                                                 | <table> <tr> <th>HP 10BII+</th><th>TI BAII PLUS</th></tr> <tr> <td> <i>(keystrokes continued from Problem 17)</i><br/> 1 <b>INPUT</b> 360  <b>AMORT</b> 1-360<br/> <b>-189,667.92</b> INT<br/> <b>4.72</b> BAL </td><td> <i>(keystrokes continued from Problem 17)</i><br/> <b>AMORT</b> <b>CLR WORK</b> P1=1.00<br/>  360 <b>ENTER</b> P2=360.00<br/> <b>BAL=4.72</b><br/> <b>INT= -189,667.92</b> </td></tr> </table> | HP 10BII+ | TI BAII PLUS | <i>(keystrokes continued from Problem 17)</i><br>1 <b>INPUT</b> 360 <b>AMORT</b> 1-360<br><b>-189,667.92</b> INT<br><b>4.72</b> BAL | <i>(keystrokes continued from Problem 17)</i><br><b>AMORT</b> <b>CLR WORK</b> P1=1.00<br>360 <b>ENTER</b> P2=360.00<br><b>BAL=4.72</b><br><b>INT= -189,667.92</b> |
|-------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|--------------|-------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| HP 10BII+                                                                                                                           | TI BAII PLUS                                                                                                                                                                                                                                                                                                                                                                                                            |           |              |                                                                                                                                     |                                                                                                                                                                   |
| <i>(keystrokes continued from Problem 17)</i><br>1 <b>INPUT</b> 360 <b>AMORT</b> 1-360<br><b>-189,667.92</b> INT<br><b>4.72</b> BAL | <i>(keystrokes continued from Problem 17)</i><br><b>AMORT</b> <b>CLR WORK</b> P1=1.00<br>360 <b>ENTER</b> P2=360.00<br><b>BAL=4.72</b><br><b>INT= -189,667.92</b>                                                                                                                                                                                                                                                       |           |              |                                                                                                                                     |                                                                                                                                                                   |

Note: Don't clear registers; Problems 21-23 are a continuation.

20. **There is a difference of \$4.72. The answer to Problem 19 (\$189,667.92) is the correct answer.** The answer to Problem 18 (\$189,663.20) is based on making 360 payments of \$804.62. As shown in Problem 19, the unpaid balance after making 360 payments of \$804.62 is \$4.72, so the final payment must be increased \$4.72 (to \$809.34) to end up with a zero balance.

|                                                  |                     |
|--------------------------------------------------|---------------------|
| Total paid: (359 × \$804.62) + (1 × \$809.34)    | \$289,667.92        |
| Less principal portion of payments (loan amount) | <u>- 100,000.00</u> |
| Interest (matches answer of Problem 19)          | <b>\$189,667.92</b> |

| 21.                                                                                                            | <table> <tr> <th>HP 10BII+</th><th>TI BAII PLUS</th></tr> <tr> <td> <i>(keystrokes continued from Problem 19)</i><br/> 1 <b>INPUT</b> 180  <b>AMORT</b> 1-180<br/> <b>79,331.49</b> BAL </td><td> <i>(keystrokes continued from Problem 19)</i><br/> <b>AMORT</b> <b>CLR WORK</b> P1=1.00<br/>  180 <b>ENTER</b> P2=180.00<br/> <b>BAL=79,331.49</b> </td></tr> </table> | HP 10BII+ | TI BAII PLUS | <i>(keystrokes continued from Problem 19)</i><br>1 <b>INPUT</b> 180 <b>AMORT</b> 1-180<br><b>79,331.49</b> BAL | <i>(keystrokes continued from Problem 19)</i><br><b>AMORT</b> <b>CLR WORK</b> P1=1.00<br>180 <b>ENTER</b> P2=180.00<br><b>BAL=79,331.49</b> |
|----------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|--------------|----------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| HP 10BII+                                                                                                      | TI BAII PLUS                                                                                                                                                                                                                                                                                                                                                             |           |              |                                                                                                                |                                                                                                                                             |
| <i>(keystrokes continued from Problem 19)</i><br>1 <b>INPUT</b> 180 <b>AMORT</b> 1-180<br><b>79,331.49</b> BAL | <i>(keystrokes continued from Problem 19)</i><br><b>AMORT</b> <b>CLR WORK</b> P1=1.00<br>180 <b>ENTER</b> P2=180.00<br><b>BAL=79,331.49</b>                                                                                                                                                                                                                              |           |              |                                                                                                                |                                                                                                                                             |

Note: Don't clear registers; Problem 23 is a continuation.

22. **Interest is figured on the unpaid balance. Because the balance is greater during the first half of the loan, interest is higher. So principal is lower during the first half, resulting in slow reduction during the first half.**



23. How many months will be left on the loan when the balance is half repaid?

| HP 10BII+                              | TI BAII PLUS                           |
|----------------------------------------|----------------------------------------|
| (keystrokes continued from Problem 21) | (keystrokes continued from Problem 21) |
| 50,000 <b>PV</b>                       | 0.00                                   |
| <b>N</b>                               | PV=50,000.00                           |
| 50,000.00                              | N=83.98                                |
| <b>83.98</b>                           |                                        |

24. 360 months - 83.98 months left (see Problem 23)  $\approx$  276 months elapsed; 276 months  $\div$  12 = 23 years. **It will take about 23 years for the loan to be half repaid.**

#### Unit 15.4 Repayment variations and loan charges

25.  $6.10\% + 0.50\% = 6.60\%$ . However, because of the 1% annual cap, the rate will be  $5.50\% + 1\% = 6.50\%$ .

26. **It increases** with the increase in the interest rate.

27.  $I = PRT = \$340,000 \times 9.75\% \times \frac{1}{12} = \$2,762.50$ .

28. **\$340,000**; the balance remains unchanged because payments cover interest, but no principal.

29. Interest:  $I = PRT = \$225,000 \times 7\% \times \frac{1}{12} = \$1,312.50$

Principal: \$1,100 total paid - \$1,312.50 = negative \$212.50

(Notice, the \$1,100 monthly payment is not enough to cover interest, so the balance will *increase*.)

Balance:  $\$225,000 + \$212.50 = \$225,212.50$  (This is a negative amortization loan.)

30. Maximum total balances allowed:  $\$265,000 \times 75\% = \$198,750$   
 Less current loan balances  $-172,200$   
 Available line of credit **\$ 26,550**

31. **True.**

32.  $\$700,000 \times 1\frac{1}{4}\% = \$700,000 \times 1.25\% = \$8,750$

33.  $(\$320,000 \times 0.5\%) + (\$320,000 \times 0.75\%) + \$750 + \$70 + \$700 + \$970 + \$400 + \$200 + \$95 = \$7,185$

34. **True.**

#### Challenge problems

35. Monthly income:  $\$1,250 + \$1,100 + \$760 + \$10$  monthly interest = \$3,120  
 Amount available for housing costs:  $\$3,120 \times 30\%$  \$936.00  
 Subtract monthly property taxes and insurance:  $(\$975 + \$490) \div 12$   $-122.08$   
 Amount available for mortgage payment **\$813.92**

36. Amount available for housing costs and consumer debt:  $\$3,120 \times 41\%$  \$1,279.20  
 Subtract monthly property taxes and insurance (see above)  $-122.08$   
 Subtract consumer debt:  $\$110 + \$30 + \$10 + \$45$   $-195.00$   
 Amount available for mortgage payment **\$ 962.12**

37. Using the front-end ratio, their maximum payment is \$813.92. Using the back-end ratio, the maximum payment is \$965.12. Their maximum payment is the lesser of the two: **\$813.92.**

38. PI \$ 714.65  
 TI:  $(\$948 + \$520) \div 12 =$   $+122.33$   
 PITI **\$836.98**

39. Initial deposit into escrow account \$270.00  
 Add monthly deposits:  $7 \times \$122.33 =$   $+856.31$   
 Less property taxes paid  $-948.00$   
 Ending escrow balance **\$178.31**

40.  $I = PRT = \$115,000 \times 7\% \times \frac{1}{12} = \$670.83$   
 Principal = \$714.65 (PI portion of payment) - \$670.83 = \$43.82  
 Balance =  $\$115,000 - \$43.82 = \$114,956.18$

41.  $\$142,000$  (value) -  $\$112,581$  (first mortgage) -  $\$18,300$  (second mortgage) =  **$\$11,119$**
42. The **first lender gets the first \$116,100; the second lender gets the remaining \$18,400.** Mort and Carla get nothing.
- 43.
- |                                    |                  |
|------------------------------------|------------------|
| Selling price                      | \$180,000        |
| Balance, first mortgage            | - 108,434        |
| Balance, second mortgage           | - 4,500          |
| Commission: $\$180,000 \times 6\%$ | - 10,800         |
| Other selling expenses             | - 2,200          |
| Net proceeds                       | <b>\$ 54,066</b> |

## Practice Test

1. Monthly gross income:  $\$4,550 + \$5,200 = \$9,750$
- Amount available for housing costs and consumer debt:  $\$9,750 \times 41\%$   $\$3,997.50$   
 Subtract monthly property taxes and insurance:  $(\$2,780 + \$750) \div 12$  - 294.17  
 Subtract consumer debt:  $\$391 + \$275 + \$318 + \$1,350 + \$25 + \$25$  -2,384.00  
 Amount available for monthly payment  **$\$1,319.33$**
2.  $I = PRT = \$105,000 \times 6.5\% \times \frac{1}{12} = \$568.75$   
 Principal:  $\$663.67 - \$568.75 = \$94.92$   
 Balance:  $\$105,000 + \$94.92 = \mathbf{\$104,905.08}$
- 3.
- |                                 |                                 |
|---------------------------------|---------------------------------|
| PI                              | \$ 872.55                       |
| TI: $(\$1,325 + \$710) \div 12$ | <u>+ 169.58</u>                 |
| PITI                            | <b><math>\\$1,042.13</math></b> |
4. The first calendar year, you make 9 monthly payments. For calendar-year 2, you make payments 10-21.

| HP 10BII+                                                                                                                                                                                                                                                                                                    | TI BAI PLUS                                                                                                                                                                                                                                                                                                                                                                                                         |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><i>calculate monthly payment</i></p> <p> C ALL 0.00</p> <p>270,000 PV 270,000.00</p> <p>20 <math>\times</math> 12 = N 240.00</p> <p>4.75 <math>\div</math> 12 = I/YR 0.40</p> <p>PMT -1,774.80</p> <p><i>interest, second calendar year</i></p> <p>10 INPUT 21  AMORT 10-21</p> <p>= = -12,345.93 INT</p> | <p><i>calculate monthly payment</i></p> <p>2ND CLR TVM ???</p> <p>270,000 PV PV=270,000.00</p> <p>20 <math>\times</math> 12 = N N=240.00</p> <p>4.75 <math>\div</math> 12 = I/Y I/Y=0.40</p> <p>CPT PMT PMT= -1,774.80</p> <p><i>interest, second calendar year</i></p> <p>2ND AMORT 2ND CLR WORK P1=1.00</p> <p>10 ENTER P1=10.00</p> <p>↓ 21 ENTER P2=21.00</p> <p>↓ ↓ ↓ INT= -12,345.93</p> <p>2ND QUIT 0.00</p> |

5. For Year 2, your rate will be the 5% T-bill rate +  $\frac{1}{2}\%$ , or 5.5%. For Year 3, the rate could be the 6.25% T-bill rate +  $\frac{1}{2}\%$ , or 6.75%; however, because of the annual cap, your rate is limited to **6.5%** (5.5% rate for year 2 + 1% annual cap).
6.  $\$174,500 \times 80\% = \$139,600$ ;  $\$139,600 - \$103,200 = \mathbf{\$36,400}$
7.  $(\$170,000 \times 0.5\%) + (\$170,000 \times 0.875\%) + \$70 + \$475 + \$630 + \$400 + \$125 + \$70 =$   
 $\$850 + \$1,487.50 + \$70 + \$475 + \$630 + \$400 + \$125 + \$70 = \mathbf{\$4,107.50}$

# Chapter 16 Stocks, Bonds, and Mutual Funds

## Unit 16.1 Stocks

- False**
- False.** Preferred stockholders are paid before common stockholders but after creditors.
- Total dividends \$1,575,000

Dividends for preferred stock: \$400,000 last year + \$600,000 this year -1,000,000

Dividends available to common stockholders \$ 575,000

Dividends per share of common stock:  $\$575,000 \div 1,150,000 \text{ shares} = \$0.50$

Your dividend:  $75 \text{ shares} \times \$0.50 \text{ per share} = \mathbf{\$37.50}$
- False.** Commissions vary, depending on the services the stockbroker provides.
- False.** Dow Jones is *not* a stock exchange. The largest stock exchange in the United States is the New York Stock Exchange.

6. **True**

7.

| 52 weeks |       | Div  | Yld% | PE Ratio | Vol 100s | Close | Net Chg |
|----------|-------|------|------|----------|----------|-------|---------|
| Hi       | Lo    |      |      |          |          |       |         |
| 92.13    | 78.25 | 1.40 | 1.6  | 27       | 352      | 86.56 | -0.63   |

- \$92.13** per share
  - \$78.25** per share
  - \$86.56** per share
  - Decreased \$0.63** per share
  - 35,200 shares** ( $352 \times 100 = 35,200$ )
  - $1.40 \text{ (amount in "Div" column)} \div 86.56 \text{ (amount in "Close" column)} \approx .016 \approx \mathbf{1.6\%}$
  - $PE = \frac{P}{E} = \frac{\$86.56}{\$3.21} \approx 26.97 \approx \mathbf{27}$
- $(100 \text{ shares} \times \$38.50) + \$80 = \$3,850 + \$80 = \mathbf{\$3,930}$
  - $(100 \text{ shares} \times \$46) - \$120 = \$4,600 - \$120 = \mathbf{\$4,480}$

10.

| Company | Price per share | Earnings per share | PE ratio     |
|---------|-----------------|--------------------|--------------|
| A       | \$65.00         | \$8.13             | <b>8.00</b>  |
| B       | \$65.00         | \$5.91             | <b>11.00</b> |
| C       | \$65.00         | \$2.22             | <b>29.28</b> |

- If we owned stock in Company A, our share of earnings would be \$8.13 for each share of stock we owned. Someone willing to pay \$65 for a share of stock **would be paying about \$8.00 for each \$1 of annual earnings** (assuming that annual earnings remain constant).
- Company A.** The price-earnings ratio for Company A is 8.00, indicating the investor pays \$8.00 to get \$1 (of earnings) back. For Company B, an investor pays \$11.00 to get \$1 back. For Company C, an investor pays \$29.28 to get \$1 back. An investment in Company A requires the smallest outlay to get \$1 back.
- Investors apparently feel Company C has a much better future than is indicated by current earnings.**

## Unit 16.2 Bonds

- True**
- True**
- False**
- True**
- (c) Premium.** Investors would prefer to have your 7% bond rather than a new 6% bond, so they will pay a premium for your bond.
- (b) Discount.** Investors would prefer to have a new 8% bond rather than your 7% bond, so they will buy your bond only if you sell at a discount.

20.  $8\frac{5}{8}\% = 8.625\%$     21. **2026**    22. **30 bonds**    23.  $\$1,000 \times 126.765\% = \$1,267.65$
24. **The prevailing rate for new bonds is less than the coupon rate for this bond; therefore, investors are willing to pay a premium for this bond.**
25.  $\$1,000 \times 0.583\% = \$5.83$ ; price **decreased \$5.83**
26.  $\text{Cur Yld} = \frac{\text{Coupon rate}}{\text{Close column value}} = \frac{8.625}{126.765} \approx .0680 \approx \mathbf{6.80\%}$
27.    Price per bond:  $\$5,000 \times 133\frac{13}{32}\% = \$5,000 \times 133.40625\% = \$6,670.3125$   
       Number of bonds  $\times \underline{\hspace{1cm} 3 \hspace{1cm}}$   
       Total price **\$ 20,010.94**

## Unit 16.3 Mutual funds

28. **True**

29.

| Total of closing prices | Liabilities   | Shares outstanding | NAV                                                                                                    |
|-------------------------|---------------|--------------------|--------------------------------------------------------------------------------------------------------|
| \$23,478,000            | \$4,122,000   | 800,000            | $\frac{\$23,478,000 - \$4,122,000}{800,000} = \frac{\$19,356,000}{800,000} = \mathbf{\$24.20}$         |
| \$8,155,000             | \$1,050,000   | 450,000            | $\frac{\$8,155,000 - \$1,050,000}{450,000} = \frac{\$7,105,000}{450,000} = \mathbf{\$15.79}$           |
| \$745,000,000           | \$192,000,000 | 5,820,000          | $\frac{\$745,000,000 - \$192,000,000}{5,820,000} = \frac{\$553,000,000}{5,820,000} = \mathbf{\$95.02}$ |

30. **True**    31. **True**

## Challenge problems

32. **Stock**    33. **Stock**    34. **Bond**    35. **Both**    36. **Bond**

37.    a. Before-tax return 6.75  
       Portion to taxman:  $6.75 \times 28\% = \underline{-1.89}$   
       After-tax return 4.86
- b. After-tax return 5.25    **(The municipal bond has the greater after-tax return)**

38. Let's determine which rate is better by finding what an arbitrary \$100 grows to over 1 year at each rate:

|                                                                       |          |
|-----------------------------------------------------------------------|----------|
| 7.6% compounded annually: $\$100 + 7.6\% =$                           | \$107.60 |
| 7.5% compounded semiannually: Periodic rate = $7.5\% \div 2 = 3.75\%$ |          |
| Balance in 6 months: $\$100 + 3.75\% =$                               | \$103.75 |
| Balance in 12 months: $+ 3.75\% =$                                    | \$107.64 |

Because its ending balance is greater, **the bond paying 7.5% compounded semiannually provides the greater return.** In fact, that bond earns the same as one paying 7.64% compounded annually, because  $\$100 + 7.64\%$  also results in an ending balance of \$107.64. Using the terminology of Unit 9.3, a rate of 7.5% compounded semiannually has an *annual percentage yield (APY)* of 7.64%.

## Practice Test

1. Total dividends \$1,275,000
- |                                                                          |                         |
|--------------------------------------------------------------------------|-------------------------|
| Dividends for preferred stock: \$200,000 last year + \$400,000 this year | $\underline{- 600,000}$ |
| Dividends available to common stockholders                               | <b>\$ 675,000</b>       |
- Dividends per share of common stock:  $\$675,000 \div 562,500 \text{ shares} = \$1.20$   
 Your dividend:  $150 \text{ shares} \times \$1.20 \text{ per share} = \mathbf{\$180}$

2.

| 52 weeks |       | Div | Yld% | PE Ratio | Vol 100s | Close | Net Chg |
|----------|-------|-----|------|----------|----------|-------|---------|
| Hi       | Lo    |     |      |          |          |       |         |
| 51.38    | 38.25 | .60 | 1.3  | 25       | 1613     | 44.94 | -0.88   |

a. **\$51.38** per share    b. **161,300 shares** ( $1,613 \times 100 = 161,300$ )    c. **60¢ per share**

3.  $(125 \times \$44.94) + \$120 = \$5,617.50 + \$120 = \mathbf{\$5,737.50}$

4.  $PE = \frac{P}{E} = \frac{\$86.75}{\$2.28} \approx 38.05 \approx \mathbf{38}$

5.

| Bond                                 | Cur Yld | Vol | Close   | Net Chg |
|--------------------------------------|---------|-----|---------|---------|
| IBM 8 <sup>3</sup> / <sub>8</sub> 18 | 6.3     | 30  | 132.758 | + 1.27  |

$(\$1,000 \times 132.758\%) - \$75 = \$1,327.58 - \$75 = \mathbf{\$1,252.58}$

6.  $\$1,000 \times 8\frac{3}{8}\% = \$1,000 \times 8.375\% = \mathbf{\$83.75}$

7. (a) **less than the coupon rate**, as evidenced by the bonds being priced at a premium; buyers are willing to pay a premium for this bond because it has an excellent interest rate.

8. Price per bond:  $\$5,000 \times 112\frac{17}{32}\% = \$5,000 \times 112.53125\% = \$5,626.5625$   
 Number of bonds  $\times \underline{\quad 4 \quad}$   
 Total price  $\mathbf{\$ 22,506.25}$

9.  $NAV = \frac{\$12,742,000 - \$3,450,000}{900,000} = \frac{\$9,292,000}{900,000} = \mathbf{\$10.32}$

## Chapter 17 Additional Applications Using Financial Calculators

### Unit 17.1 Solving for interest rate paid

1.

| N                  | i                             | PV     | PMT            | FV |
|--------------------|-------------------------------|--------|----------------|----|
| $4 \times 12 = 48$ | $7.2 \div 12 = 0.60$          | 27,500 | <b>-661.08</b> |    |
| ↑                  | $0.65 \times 12 \approx 7.77$ | 27,200 | ↑              |    |

2.

| N  | i                              | PV    | PMT    | FV |
|----|--------------------------------|-------|--------|----|
| 36 | $1.49 \times 12 \approx 17.92$ | 2,150 | -77.64 |    |

3.

| N  | i                              | PV    | PMT  | FV |
|----|--------------------------------|-------|------|----|
| 36 | $1.09 \times 12 \approx 13.12$ | 4,000 | -135 |    |

**You should borrow from your credit union at 11.75% because your friend is charging you 13.12% interest.**

4. **Step 1 (dollar amount of interest):**  $I = PRT = \$800 \times 10\% \times 1 = \$80.00$   
**Step 2 (add to loan amount):**  $\$800 + \$80 = \$880$   
**Step 3 (divide by total number of payments):**  $\$880 \div 12 = \mathbf{\$73.33}$

| N  | i                              | PV  | PMT     | FV |
|----|--------------------------------|-----|---------|----|
| 12 | $1.50 \times 12 \approx 17.96$ | 800 | -73.33* |    |

\*Note: Entered as a rounded amount (not the unrounded result of Step 3, above).

|    |   |                            |     |                |    |
|----|---|----------------------------|-----|----------------|----|
| 5. | N | i                          | PV  | PMT            | FV |
|    | 6 | $2.63 \times 12 = 31.54^*$ | 470 | -83.50 Begin** |    |

\*Note: Even though you pay only 6 monthly payments, we multiply the periodic rate (2.63%) by 12, not 6, because there are 12 months in a year.

\*\*Note: Don't forget to put back in "end" mode when finished.

|    |                      |                               |         |         |    |
|----|----------------------|-------------------------------|---------|---------|----|
| 6. | N                    | i                             | PV      | PMT     | FV |
|    | $25 \times 12 = 300$ | $6.5 \div 12 = 0.541\bar{6}$  | 90,000  | -607.69 |    |
|    | ↑                    | $0.59 \times 12 \approx 7.07$ | 85,475* | ↑       |    |

\*Note: The reportable APR reflects origination fee, points, and mortgage insurance:  $\$90,000 - \$4,525 = \$85,475$ .

|    |   |                               |         |     |    |
|----|---|-------------------------------|---------|-----|----|
| 7. | N | i                             | PV      | PMT | FV |
|    | ↑ | $0.60 \times 12 \approx 7.21$ | 84,347* | ↑   |    |

\*Note: A real APR reflects all loan costs. You receive net proceeds of \$84,347 after loan costs are deducted:  $\$90,000 - \$4,525 - \$1,128 = \$84,347$ . Notice, \$400 hazard insurance and \$425 into escrow account are *not* loan costs.

8. **More.** By prepaying the loan, loan costs must be spread over a shorter period of time; this has the effect of increasing the APR.

|    |                      |                               |        |         |             |
|----|----------------------|-------------------------------|--------|---------|-------------|
| 9. | N                    | i                             | PV     | PMT     | FV          |
|    | $25 \times 12 = 300$ | $6.5 \div 12 = 0.541\bar{6}$  | 90,000 | -607.69 |             |
|    | $6 \times 12 = 72$   | $0.66 \times 12 \approx 7.89$ | 84,347 | ↑       | -79,450.80* |

\*Note: FV amount (79,450.80) is the balance after payment 72, found by amortizing 72 payments. Remember to enter in the FV register as a negative value.

|     |                      |                                  |        |         |             |
|-----|----------------------|----------------------------------|--------|---------|-------------|
| 10. | N                    | i                                | PV     | PMT     | FV          |
|     | $25 \times 12 = 300$ | $6.875 \div 12 = 0.57291\bar{6}$ | 90,000 | -628.94 |             |
|     | $6 \times 12 = 72$   | $0.65 \times 12 \approx 7.82$    | 86,147 | ↑       | -79,936.39* |

\*Note: FV amount (\$79,936.39) is the balance after payment 72, found by amortizing 72 payments.

11. **The 6.875% loan has a lower APR (7.82%) than the 6.5% loan (7.89%).**

|     |                      |                                |          |         |             |
|-----|----------------------|--------------------------------|----------|---------|-------------|
| 12. | N                    | i                              | PV       | PMT     | FV          |
|     | $30 \times 12 = 360$ | $9.5 \div 12 = 0.791\bar{6}$   | 80,000   | -672.68 |             |
|     | $8 \times 12 = 96$   | $0.90 \times 12 \approx 10.77$ | 74,700** | ↑       | -74,374.40* |

\*Note: FV amount (\$74,374.40) is the balance after payment 96, found by amortizing 96 payments.

\*\*Note:  $\$80,000 - \$2,300$  loan costs -  $\$3,000$  prepayment penalty for paying off old loan early =  $\$74,700$ .

13. **Yes, unless you expect rates to drop.** The 10.77% APR of the new loan is less than the 11.5% note rate of your existing loan.

## Unit 17.2 Growth rates

|     |    |      |        |     |         |
|-----|----|------|--------|-----|---------|
| 14. | N  | i    | PV     | PMT | FV      |
|     | 62 | 7.03 | -2,450 |     | 165,000 |

|     |     |      |       |     |       |
|-----|-----|------|-------|-----|-------|
| 15. | N   | i    | PV    | PMT | FV    |
|     | 50  | 2.28 | -9.9  |     | 30.6  |
|     | 20  | 6.10 | -30.6 |     | 100   |
|     | 32  | 2.76 | -100  |     | 238.7 |
|     | 102 | 3.17 | -9.9  |     | ↑     |

|     |    |             |         |     |        |
|-----|----|-------------|---------|-----|--------|
| 16. | N  | i           | PV      | PMT | FV     |
|     | 12 | <b>3.29</b> | -15,600 |     | 23,000 |

**No;** your salary has increased 3.29% per year, which is less than the average annual inflation rate.

|     |    |             |       |     |      |
|-----|----|-------------|-------|-----|------|
| 17. | N  | i           | PV    | PMT | FV   |
|     | 72 | <b>2.64</b> | -0.62 |     | 4.05 |

|     |    |             |        |     |       |
|-----|----|-------------|--------|-----|-------|
| 18. | N  | i           | PV     | PMT | FV    |
|     | 35 | <b>7.42</b> | -0.359 |     | 4.399 |

### Unit 17.3 Solving for interest rate earned

|     |   |             |         |     |        |
|-----|---|-------------|---------|-----|--------|
| 19. | N | i           | PV      | PMT | FV     |
|     | 4 | <b>8.84</b> | -28,500 |     | 40,000 |

|     |   |             |      |     |       |
|-----|---|-------------|------|-----|-------|
| 20. | N | i           | PV   | PMT | FV    |
|     | 8 | <b>8.05</b> | -940 | 70* | 1,000 |

\*Note: \$1,000 face value × 7% coupon rate = \$70

21. **The prevailing rate for similar bonds was apparently greater than the 7% coupon rate,** so the seller had to discount the price of the bond to attract investors.

22. **Because you were able to buy the note at a discount.**

|     |   |              |      |     |       |
|-----|---|--------------|------|-----|-------|
| 23. | N | i            | PV   | PMT | FV    |
|     | 5 | <b>10.71</b> | -940 | 70  | 1,130 |

24. **Because you were able to sell the bond at a premium.**

25. **True**

26. **False**

|     |   |              |         |     |        |
|-----|---|--------------|---------|-----|--------|
| 27. | N | i            | PV      | PMT | FV     |
|     | 5 | <b>23.51</b> | -305.75 |     | 878.95 |

|     |                    |                           |    |            |       |
|-----|--------------------|---------------------------|----|------------|-------|
| 28. | N                  | i                         | PV | PMT        | FV    |
|     | $6 \times 12 = 72$ | $-0.37 \times 12 = -4.45$ |    | -40 Begin* | 2,522 |

\*Note: Don't forget to put back in "end" mode.

|     |    |              |      |     |         |
|-----|----|--------------|------|-----|---------|
| 29. | N  | i            | PV   | PMT | FV      |
|     | 14 | <b>59.83</b> | -750 |     | 532,500 |

### Unit 17.5 Cash flow problems

30.  $(66 \times \$500) + (120 \times \$750) = \mathbf{\$123,000}$

| 31. | HP 10BII+                 | TI BAII PLUS                       |
|-----|---------------------------|------------------------------------|
|     | C ALL 0.00                | CF 2ND CLR WORK CFo=0.00           |
|     | 60,000 +/- CFj -60,000.00 | 60,000 +/- ENTER CFo= -60,000.00   |
|     | 500 CFj 66  Nj 66.00      | ↓ 500 ENTER ↓ 66 ENTER F01=66.00   |
|     | 750 CFj 120  Nj 120.00    | ↓ 750 ENTER ↓ 120 ENTER F02=120.00 |
|     | IRR/YR 0.79               | IRR CPT IRR=0.79                   |
|     | × 12 = 9.52               | × 12 = 9.52                        |
|     |                           | 2ND QUIT 0.00                      |

You will earn **9.52% compounded monthly**.

| 32. | HP 10BII+                         | TI BAII PLUS                          |
|-----|-----------------------------------|---------------------------------------|
|     | C ALL 0.00                        | CF 2ND CLR WORK CFo=0.00              |
|     | 50,000 +/- CFj -50,000.00         | 50,000 +/- ENTER CFo= -50,000.00      |
|     | 5,200 +/- CFj -5,200.00           | ↓ 5,200 +/- ENTER C01= -5,200.00      |
|     | 1,400 +/- CFj -1,400.00           | ↓ ↓ 1,400 +/- ENTER C02= -1,400.00    |
|     | 3,500 CFj 3,500.00                | ↓ ↓ 3,500 ENTER C03=3,500.00          |
|     | 7,700 CFj 7,700.00                | ↓ ↓ 7,700 ENTER C04=7,700.00          |
|     | 10,000 + 84,000 = CFj * 94,000.00 | ↓ ↓ 10,000 + 84,000 = * C05=94,000.00 |
|     | IRR/YR 14.04                      | ENTER IRR CPT IRR=14.04               |
|     |                                   | 2ND QUIT 0.00                         |

\*Note: Because the \$10,000 Year 5 cash flow and the \$84,000 sales proceeds both occur at the end of year 5, we combine before entering.

33.  $(42 \times \$700) + (180 \times \$800) = \mathbf{\$173,400}$

| 34. | HP 10BII+              | TI BAII PLUS                       |
|-----|------------------------|------------------------------------|
|     | C ALL 0.00             | CF 2ND CLR WORK CFo=0.00           |
|     | 0 CFj * 0.00           | 0 ENTER * CFo=0.00                 |
|     | 700 CFj 42  Nj 42.00   | ↓ 700 ENTER ↓ 42 ENTER F01=42.00   |
|     | 800 CFj 180  Nj 180.00 | ↓ 800 ENTER ↓ 180 ENTER F02=180.00 |
|     | 8.75 ÷ 12 = I/YR 0.73  | NPV 8.75 ÷ 12 = ENTER I=0.73       |
|     | NPV 84,240.19          | ↓ CPT NPV=84,240.19                |
|     |                        | 2ND QUIT 0.00                      |

\*Note: Because we do not know the amount, we enter a zero cash flow at the beginning of the first period.

## Challenge problems

35. **b and d**; we can find a YTM on a bond and a yield on a note (based on a certain price).

| 36. | N | i    | PV     | PMT | FV    |
|-----|---|------|--------|-----|-------|
|     | 4 | 3.33 | -3,930 |     | 4,480 |

| 37. | N | i    | PV | PMT | FV |
|-----|---|------|----|-----|----|
|     | ↑ | 5.15 | ↑  | 75  | ↑  |



38.

| HP 10BII+                                                                         |         |           | TI BAII PLUS                                                                      |           |              |                |
|-----------------------------------------------------------------------------------|---------|-----------|-----------------------------------------------------------------------------------|-----------|--------------|----------------|
|  | C ALL   | 0.00      |  | CF        | 2ND CLR WORK | CFo=0.00       |
| 3,930                                                                             | +/- CFj | -3,930.00 | 3,930                                                                             | +/- ENTER |              | CFo= -3,930.00 |
| 75                                                                                | CFj     | 75.00     | ↓ 75                                                                              | ENTER     |              | C01=75.00      |
| 100                                                                               | CFj     | 100.00    | ↓ ↓ 100                                                                           | ENTER     |              | C02=100.00     |
| 0                                                                                 | CFj     | 0.00      | ↓ ↓ 0                                                                             | ENTER     |              | C03=0.00       |
| 150 + 4,480 =                                                                     | CFj *   | 4,630.00  | ↓ ↓ 150 + 4,480 = *                                                               |           |              | 4,630.00       |
|  | IRR/YR  | 5.28      | ENTER                                                                             |           |              | C04=4,630.00   |
|                                                                                   |         |           | IRR                                                                               | CPT       |              | IRR=5.28       |
|                                                                                   |         |           | 2ND                                                                               | QUIT      |              | 0.00           |

39.

| N   | i    | PV     | PMT | FV      |
|-----|------|--------|-----|---------|
| 200 | 2.46 | -4,000 |     | 520,000 |

40.

- a. Before-tax return 6.75  
 Portion to taxman:  $6.75 \times 28\% =$  -1.89  
 After-tax return 4.86
- b. After-tax return 5.25 (The municipal bond has the greater after-tax return)

41.  $157 \times \$550 = \$86,350$ 

42.

| N   | i                       | PV      | PMT | FV |
|-----|-------------------------|---------|-----|----|
| 157 | $0.62 \times 12 = 7.47$ | -55,000 | 550 |    |

Your yield will be 7.47% compounded monthly.

43. To earn a rate greater than 7.47% you must pay **less than \$55,000**.

44.

| N | i                            | PV         | PMT | FV |
|---|------------------------------|------------|-----|----|
| ↑ | $8.5 \div 12 = 0.708\bar{3}$ | -52,010.73 | ↑   |    |

45.

Let's find the annual percentage yield (APY) for the 7.5% bond. Using an arbitrary \$100 deposit:

Balance in 6 months:  $\$100 + 3.75\% = \$103.75$ Balance in 12 months:  $+ 3.75\% = \$107.64 \rightarrow$  The APY is 7.64%7.5% compounded semiannually is equivalent to 7.64% compounded annually, so **the bond paying 7.5% semiannually provides a greater return.**

## Practice Test

1.

| N | i                              | PV  | PMT           | FV |
|---|--------------------------------|-----|---------------|----|
| 6 | $3.46 \times 12 \approx 41.54$ | 345 | -62.50 Begin* |    |

\*Note: Don't forget to put back in "end" mode.

2.

| N                    | i                             | PV        | PMT       | FV           |
|----------------------|-------------------------------|-----------|-----------|--------------|
| $20 \times 12 = 240$ | $6.75 \div 12 = 0.5625$       | 220,000   | -1,672.80 |              |
| $6 \times 12 = 72$   | $0.62 \times 12 \approx 7.48$ | 212,800** | ↑         | -181,492.23* |

\*Note: FV amount (181,492.23) is the balance after payment 72, found by amortizing 72 payments. Enter in the FV register as a *negative* value.\*\*Note:  $\$220,000 - \$7,200$  loan costs =  $\$212,800$ . The \$400 and \$350 amounts are not loan costs.

|    |    |      |          |     |         |
|----|----|------|----------|-----|---------|
| 3. | N  | i    | PV       | PMT | FV      |
|    | 10 | 4.38 | -155,000 |     | 238,000 |

|    |                    |                              |      |       |       |
|----|--------------------|------------------------------|------|-------|-------|
| 4. | N                  | i                            | PV   | PMT   | FV    |
|    | $17 \times 2 = 34$ | $3.94 \times 2 \approx 7.88$ | -965 | 37.50 | 1,000 |

Your YTM is **7.88%** compounded semiannually.

| 5. | HP 10BII+                    | TI BAII PLUS                         |
|----|------------------------------|--------------------------------------|
|    | C ALL 0.00                   | CF  2ND CLR WORK CF0=0.00            |
|    | 12,000 +/- CFj -12,000.00    | 12,000 +/- ENTER CF0= -12,000.00     |
|    | 200 CFj 20  Nj 20.00         | ↓ 200 ENTER ↓ 20 ENTER F01=20.00     |
|    | 0 CFj 4  Nj 4.00             | ↓ 0 ENTER ↓ 4 ENTER F02=4.00         |
|    | 250 CFj 7  Nj 7.00*          | ↓ 250 ENTER ↓ 7 ENTER F03=7.00*      |
|    | 250 + 17,300 = CFj 17,550.00 | ↓ 250 + 17,300 = ENTER C04=17,550.00 |
|    | IRR/YR 2.49                  | IRR CPT IRR=2.49                     |
|    | × 4 = 9.95                   | × 4 = 9.95                           |
|    |                              | 2ND QUIT 0.00                        |

\*Note: The last \$250 dividend happened at the same time as the sale, so the two cash flows are combined.

| 6. | HP 10BII+              | TI BAII PLUS                       |
|----|------------------------|------------------------------------|
|    | C ALL 0.00             | CF  2ND CLR WORK CF0=0.00          |
|    | 0 CFj* 0.00            | 0 ENTER* CF0=0.00                  |
|    | 650 CFj 34  Nj 34.00   | ↓ 650 ENTER ↓ 34 ENTER F01=34.00   |
|    | 850 CFj 180  Nj 180.00 | ↓ 850 ENTER ↓ 180 ENTER F02=180.00 |
|    | 9 ÷ 12 = I/YR 0.75     | NPV 9 ÷ 12 = ENTER I=0.75          |
|    | NPV 84,446.54          | ↓ CPT NPV=84,446.54                |
|    |                        | 2ND QUIT 0.00                      |

\*Note: Because we do not know the amount, we enter a zero cash flow at the beginning of the first period.

## Chapter 18 Financial Statements: How to Read and Interpret

### Unit 18.1 Income statements

- (a) net income
- (b) over a given period of time
- False

|                      |                  |                  |                  |
|----------------------|------------------|------------------|------------------|
|                      | 4.               | 5.               | 6.               |
| Revenues             | \$108,000        | \$120,000        | <b>\$ 69,000</b> |
| Total expenses       | \$ 28,000        | <b>\$130,000</b> | \$42,000         |
| Net income (or loss) | <b>\$ 80,000</b> | (\$10,000)       | \$27,000         |

- Net sales = Gross sales - Sales returns - Sales discounts = \$805,000 - \$5,400 - \$15,700 = **\$783,900**
- Cost of goods sold = Beginning inventory + Cost of goods purchased - Ending inventory  
= \$82,400 + \$264,000 - \$94,800 = **\$251,600**
- Gross profit = Net sales - Cost of goods sold = \$783,900 - \$251,600 = **\$532,300**
- Net income = Gross profit - Operating expenses = \$532,300 - \$371,300 = **\$161,000**

## Unit 18.2 Balance sheets

11. **A**    12. **E**    13. **B**    14. **G**    15. **A**    16. **C**    17. **D**    18. **E&F\***    19. **B**    20. **G**

*\*Note:* For Problem 18, part of the mortgage will be paid within 1 year (or operating cycle); this amount (principal portion only, without interest) is a current liability. The remainder of the mortgage balance is a long-term liability.

21. Owner's equity = Assets - Liabilities = \$135,700 - \$24,800 = **\$110,900**

22. **False**

|                   | 23.              | 24               | 25.              |
|-------------------|------------------|------------------|------------------|
| Total assets      | \$128,000        | \$820,000        | <b>\$219,000</b> |
| Total liabilities | \$ 65,000        | <b>\$148,000</b> | \$192,000        |
| Equity            | <b>\$ 63,000</b> | \$672,000        | \$27,000         |

26. **False.** The equity section is called stockholders' equity.

27. **True**

28. **False.** The difference is called net worth.

## Unit 18.3 Trend and ratio analysis

29. **True**

30.

**BBB OFFICE SUPPLY, INC.**  
Comparative Income Statement (2015 vs 2014)

|                                  | Annual Amounts |           | Percent of Net Sales |              | Increase (or Decrease) |               |
|----------------------------------|----------------|-----------|----------------------|--------------|------------------------|---------------|
|                                  | 2015           | 2014      | 2015                 | 2014         | Amount                 | Percent       |
| Gross sales                      | \$346,200      | \$364,900 | <b>101.1</b>         | <b>100.5</b> | <b>(\$18,700)</b>      | <b>(5.1)</b>  |
| Sales returns                    | 3,800          | 1,700     | <b>1.1</b>           | <b>0.5</b>   | <b>2,100</b>           | <b>123.5</b>  |
| Net sales                        | \$342,400      | \$363,200 | <b>100.0</b>         | <b>100.0</b> | <b>(\$20,800)</b>      | <b>(5.7)</b>  |
| Cost of goods sold               | 153,100        | 148,700   | <b>44.7</b>          | <b>40.9</b>  | <b>4,400</b>           | <b>3.0</b>    |
| Gross profit                     | \$189,300      | \$214,500 | <b>55.3</b>          | <b>59.1</b>  | <b>(\$25,200)</b>      | <b>(11.7)</b> |
| Total operating expenses         | 177,700        | 153,400   | <b>51.9</b>          | <b>42.2</b>  | <b>24,300</b>          | <b>15.8</b>   |
| Net income (before income taxes) | \$11,600       | \$61,100  | <b>3.4</b>           | <b>16.8</b>  | <b>(\$49,500)</b>      | <b>(81.0)</b> |
| Less income taxes                | 4,000          | 22,000    | <b>1.2</b>           | <b>6.1</b>   | <b>(18,000)</b>        | <b>(81.8)</b> |
| Net income (after income taxes)  | \$7,600        | \$39,100  | <b>2.2</b>           | <b>10.8</b>  | <b>(\$31,500)</b>      | <b>(80.6)</b> |

(continued on next page)

**BBB OFFICE SUPPLY, INC.**  
**Comparative Balance Sheet (Dec. 31, 2015 vs Dec. 31, 2014)**

|                                 | Year-end Amounts |           | Percent of Total |       | Increase (or Decrease) |         |
|---------------------------------|------------------|-----------|------------------|-------|------------------------|---------|
|                                 | 2015             | 2014      | 2015             | 2014  | Amount                 | Percent |
| <b>Assets</b>                   |                  |           |                  |       |                        |         |
| Current assets                  |                  |           |                  |       |                        |         |
| Cash                            | \$23,100         | \$36,100  | 17.7             | 22.1  | (\$13,000)             | (36.0)  |
| Accounts receivable             | 42,000           | 45,100    | 32.2             | 27.6  | (3,100)                | (6.9)   |
| Merchandise inventory           | 58,100           | 73,800    | 44.5             | 45.2  | (15,700)               | (21.3)  |
| Prepaid expenses                | 300              | 300       | 0.2              | 0.2   | 0                      | 0       |
| Total current assets            | \$123,500        | \$155,300 | 94.6             | 95.2  | (\$31,800)             | (20.5)  |
| Plant and equipment, net        | 7,100            | 7,900     | 5.4              | 4.8   | (800)                  | (10.1)  |
| Total assets                    | \$130,600        | \$163,200 | 100.0            | 100.0 | (\$32,600)             | (20.0)  |
| <b>Liabilities</b>              |                  |           |                  |       |                        |         |
| Accounts payable                | \$18,000         | \$19,000  | 13.8             | 11.6  | (\$1,000)              | (5.3)   |
| Total liabilities               | \$18,000         | \$19,000  | 13.8             | 11.6  | (\$1,000)              | (5.3)   |
| <b>Stockholders' Equity</b>     |                  |           |                  |       |                        |         |
| Common stock                    | \$100,000        | \$100,000 | 76.6             | 61.3  | \$0                    | 0       |
| Retained earnings               | 12,600           | 44,200    | 9.6              | 27.1  | (31,600)               | (71.5)  |
| Total stockholders' equity      | \$112,600        | \$144,200 | 86.2             | 88.4  | (\$31,600)             | (21.9)  |
| Total liabilities and SH equity | \$130,600        | \$163,200 | 100.0            | 100.0 | (\$32,600)             | (20.0)  |

31. The answer is a bit subjective, but here are a few ideas.

- Sales decreased 5.1%.
- Cost of goods sold increased 3.0%, even though sales decreased.
- Expenses increased 15.8%, even though sales decreased.
- Total stockholders' equity decreased \$31,600.

32. Current ratio =  $\frac{\text{Current assets}}{\text{Current liabilities}} = \frac{\$123,500}{\$18,000} \approx 6.9$

**For each dollar of current liabilities, BBB has about \$6.90 of current assets.**

33. Acid-test ratio =  $\frac{\text{Cash} + \text{Accounts receivable}}{\text{Current liabilities}} = \frac{\$23,100 + \$42,000}{\$18,000} = \frac{\$65,100}{\$18,000} \approx 3.6$

**For each dollar of current liabilities, BBB has about \$3.60 of highly liquid assets.**

34. Debt ratio =  $\frac{\text{Total liabilities}}{\text{Total assets}} = \frac{\$18,000}{\$130,600} \approx .138 \approx 13.8\%$

**For each dollar of assets, BBB owes 13.8¢.**

35. Inventory turnover =  $\frac{\text{Cost of goods sold}}{\text{Average inventory}} = \frac{\$153,100}{(\$73,800 + \$58,100) \div 2} = \frac{\$153,100}{\$65,950} \approx 2.3$

**Inventory was sold 2.3 times during the year.**

36. Cost of goods sold as % of net sales =  $\frac{\text{Cost of goods sold}}{\text{Net sales}} = \frac{\$153,100}{\$342,400} \approx .447 \approx 44.7\%$

**BBB's goods cost 44.7% of what they sold for.**

37. Profit margin, before tax =  $\frac{\text{Net income, before tax}}{\text{Net sales}} = \frac{\$11,600}{\$342,400} \approx 0.034 \approx 3.4\%$

**BBB's profit is 3.4% of net sales.**

38. Return on equity =  $\frac{\text{Net income, after tax}}{\text{Equity}} = \frac{\$7,600}{\$112,600} \approx .067 \approx 6.7\%$

**BBB's profit, after tax, is 6.7% of stockholders' equity.**

39. (b) **Worse**

40. a. **Increase profits.** By increasing profits, LMN will have more cash or accounts receivable, thereby increasing current assets.  
 b. **Increase long-term financing.** By doing this, LMN will increase long-term liabilities and increase cash. Because long-term liabilities do not affect the current ratio, the ratio will be improved.  
 c. **Reduce dividends.** By reducing dividends, cash will not decrease as much.  
 d. **Sell additional stock.** By doing this, cash will be increased without affecting current liabilities.
41. (a) **High.** Businesses prefer selling their inventory quickly.
42. a. **Do more advertising.** By doing more advertising, sales should increase, thereby contributing to a quicker inventory turnover.  
 b. **Improve sales staff.** Maybe the sales staff is not assisting customers adequately. By giving better assistance, sales should increase.  
 c. **Reduce inventory.** If inventory is excessive, reducing inventory may be a good strategy. However, if the inventory is not excessive, decreasing inventory may lead to a decrease in sales.

Challenge problems

43. **Sole proprietorship and partnership**

44. **Partnership and corporation**

45. **Corporation**

46. **Corporation**

47. **Sole proprietorship and corporation**

48. (c)

|     |                                                           |                          |
|-----|-----------------------------------------------------------|--------------------------|
| 49. | Income tax paid by corporation: $\$1,200,000 \times 34\%$ | \$408,000                |
|     | Income tax paid by stockholders:                          |                          |
|     | Profit                                                    | \$1,200,000              |
|     | Less income tax paid by corporation                       | <u>- 408,000</u>         |
|     | Available for dividends                                   | \$ 792,000 $\times 35\%$ |
|     |                                                           | <u>+277,200</u>          |
|     | Total                                                     | \$685,200                |

$$\text{Percent of profit paid as income tax} = \frac{\$685,200}{\$1,200,000} = .571 = \mathbf{57.1\%}$$

50.

| FISHER'S CLOTHING STORE, INC.                         |               |                |                  |
|-------------------------------------------------------|---------------|----------------|------------------|
| Income Statement for the Quarter Ended March 31, 2016 |               |                |                  |
| Revenue from sales                                    |               |                |                  |
| Gross sales                                           |               |                | \$1,653,800      |
| Less: Sales returns                                   |               |                | <u>143,700</u>   |
| Net sales                                             |               |                | \$1,510,100      |
| Cost of goods sold                                    |               |                |                  |
| Merchandise inventory, January 1, 2016                |               | \$436,000      |                  |
| Purchases                                             | \$922,800     |                |                  |
| Less: Purchase returns                                | \$5,300       |                |                  |
| Purchase discounts                                    | <u>13,800</u> |                |                  |
| Subtotal                                              | <u>19,100</u> |                |                  |
| Net purchases                                         | \$903,700     |                |                  |
| Add transportation in                                 | <u>3,400</u>  |                |                  |
| Cost of goods purchased                               |               | <u>907,100</u> |                  |
| Goods available for sale                              |               | \$1,343,100    |                  |
| Merchandise inventory, March 31, 2016                 |               | <u>461,900</u> |                  |
| Cost of goods sold                                    |               |                | <u>881,200</u>   |
| Gross profit from sales                               |               |                | \$628,900        |
| Less operating expenses                               |               |                | <u>296,600</u>   |
| Net income (before income taxes)                      |               |                | \$332,300        |
| Less income tax expense                               |               |                | <u>110,000</u>   |
| Net income (after income taxes)                       |               |                | <u>\$222,300</u> |

51.

| WAYNE'S CORNER MARKET, INC.                |  |               |                 |  |
|--------------------------------------------|--|---------------|-----------------|--|
| Balance Sheet: June 30, 2016               |  |               |                 |  |
| Assets                                     |  |               |                 |  |
| Current assets                             |  |               |                 |  |
| Cash                                       |  | \$22,800      |                 |  |
| Merchandise inventory                      |  | 42,200        |                 |  |
| Prepaid expenses                           |  | <u>800</u>    |                 |  |
| Total current assets                       |  |               | \$65,800        |  |
| Plant and equipment                        |  |               |                 |  |
| Store equipment                            |  | \$42,000      |                 |  |
| Less accumulated depreciation              |  | <u>10,500</u> |                 |  |
|                                            |  |               | <u>31,500</u>   |  |
| Total assets                               |  |               | <u>\$97,300</u> |  |
| Liabilities                                |  |               |                 |  |
| Current liabilities                        |  |               |                 |  |
| Accounts payable                           |  | \$38,100      |                 |  |
| Long-term liabilities                      |  |               |                 |  |
| Notes payable                              |  | <u>5,000</u>  |                 |  |
| Total liabilities                          |  |               | \$43,100        |  |
| Stockholders' Equity                       |  |               |                 |  |
| Common stock: 1,000 shares @ \$20          |  | \$20,000      |                 |  |
| Retained earnings                          |  | <u>34,200</u> |                 |  |
| Total stockholders' equity                 |  |               | <u>54,200</u>   |  |
| Total liabilities and stockholders' equity |  |               | <u>\$97,300</u> |  |

### Practice Test

1. **An income statement is for a period of time, not a certain date.** The last line should read something like "For June 2016," "For quarter ending June 30, 2016," or "For six months ending June 30, 2016."
2.
  - a. Net sales = Gross sales - Sales returns - Sales discounts = \$220,000 - \$1,500 - \$2,000 = **\$216,500**
  - b. Cost of goods sold = Beginning inventory + Cost of goods purchased - Ending inventory = \$92,000 + \$145,000 - \$95,000 = **\$142,000**
  - c. Gross profit = Net sales - Cost of goods sold = \$216,500 - \$142,000 = **\$74,500**
  - d. Net income = Gross profit - Operating expenses = \$74,500 - \$30,000 = **\$44,500**
3. 
 

|                                                               |                  |
|---------------------------------------------------------------|------------------|
| Assets: \$28,000 + \$52,000 + \$60,000 + \$2,000 + \$50,000 = | \$192,000        |
| Liabilities                                                   | - 24,000         |
| Equity                                                        | <b>\$168,000</b> |

4.  $\$42,100 \div \$152,800 \approx .276 \approx \mathbf{27.6\%}$

5.

| Item                | 2016     | 2015     | Increase (or Decrease) |               |
|---------------------|----------|----------|------------------------|---------------|
|                     |          |          | Amount                 | Percent       |
| Cash                | \$27,000 | \$23,000 | <b>\$4,000</b>         | <b>17.4</b>   |
| Accounts receivable | \$52,000 | \$58,000 | <b>(\$6,000)</b>       | <b>(10.3)</b> |

6. a.  $\text{Current ratio} = \frac{\text{Current assets}}{\text{Current liabilities}} = \frac{\$120,000}{\$72,000} \approx \mathbf{1.7}$

**For each dollar of current liabilities, the company has about \$1.70 of current assets.**

b.  $\text{Debt ratio} = \frac{\text{Total liabilities}}{\text{Total assets}} = \frac{\$150,000}{\$280,000} \approx .536 \approx \mathbf{53.6\%}$

**For each dollar of assets, the company owes about 53.6¢.**

c.  $\text{Inventory turnover} = \frac{\text{Cost of goods sold}}{\text{Average inventory}} = \frac{\$140,000}{(\$60,000 + \$68,000) \div 2} = \frac{\$140,000}{\$64,000} \approx \mathbf{2.2}$

**Inventory was sold 2.2 times during the year.**

## Chapter 19 Inventory and Overhead

### Unit 19.1 Inventory methods: Assigning a cost to ending inventory

- True**
- |                      |                     |                 |
|----------------------|---------------------|-----------------|
| Beginning inventory: | 8 × \$11.35         | \$ 90.80        |
| March 23:            | 12 × \$11.62        | 139.44          |
| May 5:               | 17 × \$11.55        | 196.35          |
| July 23:             | 25 × \$12.25        | 306.25          |
| September 18:        | <u>15 × \$12.47</u> | <u>+187.05</u>  |
| Totals               | <b>77</b>           | <b>\$919.89</b> |
- |                           |                    |                |
|---------------------------|--------------------|----------------|
| From beginning inventory: | 1 × \$11.35        | \$11.35        |
| From March 23:            | 1 × \$11.62        | 11.62          |
| From July 23:             | 2 × \$12.25        | 24.50          |
| From September 18:        | <u>3 × \$12.47</u> | <u>+37.41</u>  |
| Totals                    | <b>7</b>           | <b>\$84.88</b> |

From Problem 2
- Average unit cost =  $\frac{\text{Total cost available for sale}}{\text{Number of units available for sale}} = \frac{\$919.89}{77} = \$11.95$

Ending inventory = 7 × \$11.95 = **\$83.65**
- Because the FIFO method assumes that the oldest goods were sold first, the 7 hammers in ending inventory are the most *recently* purchased.

7 hammers × \$12.47 (from the September 18 purchase) = **\$87.29**
- LIFO method assumes that the ending inventory consists of the oldest goods.

7 hammers × \$11.35 (from beginning inventory) = **\$79.45**
- |                          |                                                                                                   |
|--------------------------|---------------------------------------------------------------------------------------------------|
| Specific identification: | COGS = Cost of goods available for sale - ending inventory = \$919.89 - \$84.88 = <b>\$835.01</b> |
| Weighted average:        | COGS = Cost of goods available for sale - ending inventory = \$919.89 - \$83.65 = <b>\$836.24</b> |
| FIFO:                    | COGS = Cost of goods available for sale - ending inventory = \$919.89 - \$87.29 = <b>\$832.60</b> |
| LIFO:                    | COGS = Cost of goods available for sale - ending inventory = \$919.89 - \$79.45 = <b>\$840.44</b> |
- By thinking of COGS as an expense, we find that the **FIFO** method (with the lowest COGS) will result in the greatest profit.
- The method with the greatest ending inventory (**FIFO**) will produce the greatest total assets, and therefore the greatest equity.

### Unit 19.2 Overhead: Spreading expenses to departments

- False.** In some cases, using floor space is appropriate. In other cases, it is more appropriate to use something else, such as building value, number of employees, or sales.
- |                  |                                                                     |                 |
|------------------|---------------------------------------------------------------------|-----------------|
| A:               | $\frac{365,000}{1,850,000} \times \$65,000 = \$12,824.32 \approx$   | <b>\$12,800</b> |
| B:               | $\frac{420,000}{1,850,000} \times \$65,000 = \$14,756.76 \approx$   | <b>\$14,800</b> |
| C:               | $\frac{1,065,000}{1,850,000} \times \$65,000 = \$37,418.92 \approx$ | <b>\$37,400</b> |
| Total allocation |                                                                     | \$65,000        |
- |                  |                                                                   |                 |
|------------------|-------------------------------------------------------------------|-----------------|
| A:               | $\frac{422,000}{1,612,000} \times \$40,000 = \$10,471.46 \approx$ | <b>\$10,471</b> |
| B:               | $\frac{377,000}{1,612,000} \times \$40,000 = \$9,354.84 \approx$  | <b>\$ 9,355</b> |
| C:               | $\frac{813,000}{1,612,000} \times \$40,000 = \$20,173.70 \approx$ | <b>\$20,174</b> |
| Total allocation |                                                                   | \$40,000        |

13. A:  $\frac{12,000}{84,400} \times \$7,100 = \$1,009.48 \approx \mathbf{\$1,010}$   
 B:  $\frac{18,500}{84,400} \times \$7,100 = \$1,556.28 \approx \mathbf{\$1,560}$   
 C:  $\frac{53,900}{84,400} \times \$7,100 = \$4,534.24 \approx \mathbf{\$4,530}$   
 Total allocation \$7,100

### Challenge problems

14. A:  $\frac{16}{64} \times \$18,210 = \$4,552.50 \approx \$4,553$  **\$ 4,552** ← (The rounded total [\$18,211] is \$1 too high, so one of the rounded amounts must be decreased \$1. Dept. A requires the least adjustment.)  
 B:  $\frac{15}{64} \times \$18,210 = \$4,267.97 \approx \$4,268$  **\$ 4,268**  
 C:  $\frac{33}{64} \times \$18,210 = \$9,389.53 \approx \$9,390$  **\$ 9,390**  
 Total allocation \$18,211    \$18,210

15. 

| Available for sale                                  | Weighted average                          | FIFO                                   | LIFO                                   |
|-----------------------------------------------------|-------------------------------------------|----------------------------------------|----------------------------------------|
| $4 \times \$480$ \$ 1,920                           | $\frac{\$23,160}{46} = \$503.48$          | $3 \times \$520 = \mathbf{\$1,560.00}$ | $3 \times \$480 = \mathbf{\$1,440.00}$ |
| $10 \times \$490$ 4,900                             |                                           |                                        |                                        |
| $12 \times \$495$ 5,940                             | $3 \times \$503.48 = \mathbf{\$1,510.44}$ |                                        |                                        |
| <u><math>20 \times \\$520</math></u> <u>+10,400</u> |                                           |                                        |                                        |
| 46                \$23,160                          |                                           |                                        |                                        |

### Practice Test

1. 

| Available for sale                                  | Weighted average                          | FIFO                                   | LIFO                                   |
|-----------------------------------------------------|-------------------------------------------|----------------------------------------|----------------------------------------|
| $12 \times \$180$ \$ 2,160                          | $\frac{\$11,400}{59} = \$193.22$          | $8 \times \$200 = \mathbf{\$1,600.00}$ | $8 \times \$180 = \mathbf{\$1,440.00}$ |
| $10 \times \$190$ 1,900                             |                                           |                                        |                                        |
| $12 \times \$195$ 2,340                             | $8 \times \$193.22 = \mathbf{\$1,545.76}$ |                                        |                                        |
| <u><math>25 \times \\$200</math></u> <u>+ 5,000</u> |                                           |                                        |                                        |
| 59                \$11,400                          |                                           |                                        |                                        |
2. 

| Available for sale                                   | Specific identification                             | COGS                                      |
|------------------------------------------------------|-----------------------------------------------------|-------------------------------------------|
| $35 \times \$340$ \$11,900                           | $12 \times \$340$ \$ 4,080                          | $\$76,150 - \$11,510 = \mathbf{\$64,640}$ |
| $40 \times \$350$ 14,000                             | $4 \times \$350$ 1,400                              |                                           |
| <u><math>150 \times \\$335</math></u> <u>+50,250</u> | <u><math>18 \times \\$335</math></u> <u>+ 6,030</u> |                                           |
| 225                \$76,150                          | 34 <b>\$11,510</b>                                  |                                           |
3. **c**
4. Total sq ft:  $22,000 + 37,000 + 25,000 + 18,000 = 102,000$  sq ft  
 Department 1 share:  $\frac{22,000}{102,000} \times \$15,788 = \mathbf{\$3,405.25}$

## Chapter 20 Depreciation

### Unit 20.1 Depreciation for financial accounting

1. **False**    2. **\$1,300**    3. **5 years**    4. **\$150**
5. **\$1,150** ( $\$1,300 - \$150$ ). This is the amount that can be depreciated.
6.  $\$230 \times 3 \text{ years} = \mathbf{\$690}$
7.  $\$1,300 - \$690 = \mathbf{\$610}$
8. **False.** To take depreciation, a business must *own* the asset.
9. **False.** Part of the purchase price is for land, and because land does not wear out, only the building portion can be depreciated.



10. Annual depreciation =  $\frac{\text{Depreciable basis}}{\text{Useful life}} = \frac{\$2,000}{5} = \$400$

11.

| Year  | Depreciation expense | Accumulated depreciation | Book value     |
|-------|----------------------|--------------------------|----------------|
| Begin | —                    | —                        | <b>\$2,400</b> |
| 1     | <b>\$400</b>         | <b>\$ 400</b>            | <b>\$2,000</b> |
| 2     | <b>\$400</b>         | <b>\$ 800</b>            | <b>\$1,600</b> |
| 3     | <b>\$400</b>         | <b>\$1,200</b>           | <b>\$1,200</b> |
| 4     | <b>\$400</b>         | <b>\$1,600</b>           | <b>\$800</b>   |
| 5     | <b>\$400</b>         | <b>\$2,000</b>           | <b>\$400</b>   |

12. Depreciation per unit =  $\frac{\text{Depreciable basis}}{\text{Total estimated units of production}} = \frac{\$2,000}{160,000} = \$0.0125$  (1.25¢ per copy)

| Year  | Annual depreciation                                               | Book value |
|-------|-------------------------------------------------------------------|------------|
| Begin | —                                                                 | \$2,400    |
| 1     | 34,200 copies $\times$ \$0.0125 $\approx$ <b>\$428</b>            | \$1,972    |
| 2     | 35,800 copies $\times$ \$0.0125 $\approx$ <b>\$448</b>            | \$1,524    |
| 3     | 30,100 copies $\times$ \$0.0125 $\approx$ <b>\$376</b>            | \$1,148    |
| 4     | 38,400 copies $\times$ \$0.0125 = <b>\$480</b>                    | \$668      |
| 5     | 35,200 copies $\times$ \$0.0125 = \$440; limited to <b>\$268*</b> | \$400      |
| Total | \$2,000                                                           | NA         |

\*Note: Because book value cannot go below the \$400 salvage value, year 5 depreciation is limited to \$268.

13. Rate =  $\frac{200\%}{5} = 40\%$  (For each year, multiply the previous year-end book value by 40%.)

| Year  | Annual depreciation                                         | Book value |
|-------|-------------------------------------------------------------|------------|
| Begin | —                                                           | \$2,400    |
| 1     | $\$2,400 \times 40\% =$ <b>\$960</b>                        | \$1,440    |
| 2     | $\$1,440 \times 40\% =$ <b>\$576</b>                        | \$864      |
| 3     | $\$864 \times 40\% \approx$ <b>\$346</b>                    | \$518      |
| 4     | $\$518 \times 40\% \approx$ \$207; limited to <b>\$118*</b> | \$400      |
| 5     | <b>\$0</b>                                                  | \$400      |
| Total | \$2,000                                                     | NA         |

\*Note: Because book value cannot go below the \$400 salvage value, depreciation for year 4 is limited to \$118, and no depreciation is taken in year 5.

14. The determining factor is when the asset is placed in service (June 17). Because the desk was not placed in service during the first 15 days of June, you get no depreciation for June. You get depreciation for **6 months** (July through December).

15. Year 1:  $\frac{\$1,400}{7} \times \frac{6}{12} =$  **\$100**      Year 2:  $\frac{\$1,400}{7} =$  **\$200**

## Unit 20.2 Depreciation for federal income taxes (MACRS)

16. **True**

17. **False.** 27.5-year property is presumed to have been purchased in the middle of the *month* it was purchased.

18. **5 years** (See Illustration 20-3)

19. **5 years**

20. **39 years**

21. **7 years**

22. Use the rates of Illustration 22-4:  $\$2,500 \times 20\% = \$500$

23.  $\$8,000 \times 7.41\% \approx \$593$

24.  $\$800 \times 32\% = \$256$

25. Illustration 22-5:  $\$220,000 \times 1.364\% \approx \$3,001$

26. Illustration 22-6:  $\$970,000 \times 2.564\% \approx \$24,871$

27. Illustration 22-7:  $\$970,000 \times 2.5\% = \$24,250$

28. For MACRS, we don't decide on a useful life; the IRS dictates the life. In Illustration 22-3, we find the recovery period for a copy machine is 5 years not 3 years. Also, for MACRS we ignore salvage value. Use Illustration 22-4.

|                                  |                |
|----------------------------------|----------------|
| Year 1: $\$1,500 \times 20\%$    | <b>\$300</b>   |
| Year 2: $\$1,500 \times 32\%$    | <b>480</b>     |
| Year 3: $\$1,500 \times 19.20\%$ | <b>288</b>     |
| Year 4: $\$1,500 \times 11.52\%$ | <b>173</b>     |
| Year 5: $\$1,500 \times 11.52\%$ | <b>173</b>     |
| Year 6: $\$1,500 \times 5.76\%$  | <b>+ 86</b>    |
| Total                            | <b>\$1,500</b> |

29. **You get only half a year's depreciation in year 1; this carries some depreciation into year 6.**

30. Building value =  $\$250,000 \times 80\% = \$200,000$ . Use Illustration 22-5, September column.

|                                    |                |
|------------------------------------|----------------|
| Year 1: $\$200,000 \times 1.061\%$ | <b>\$2,122</b> |
| Year 2: $\$200,000 \times 3.636\%$ | <b>\$7,272</b> |
| Year 3: $\$200,000 \times 3.636\%$ | <b>\$7,272</b> |

31. **Taxpayers are allowed only 11.5 months depreciation for year 1.**

32.     a. Section 179 expense deduction (maximum for 2015) **\$500,000**  
       b. MACRS depreciation  
          Depreciable basis:  $\$572,000 - \$500,000 = \$72,000$   
          Depreciation (7-year property):  $\$72,000 \times 14.29\%$  **\$10,289 (rounded)**

### Challenge problems

33.     Calendar-year 1:  $\frac{\$27,000}{5} \times \frac{7}{12} = \$3,150$

Calendar-year 2:  $\frac{\$27,000}{5} = \$5,400$

Calendar-year 3:  $\frac{\$27,000}{5} = \$5,400$

34.     Rate =  $\frac{200\%}{5} = 40\%$  (For each 12 months, multiply the previous year-end book value by 40%.)

| Months | Depreciation                                          | Book value |
|--------|-------------------------------------------------------|------------|
| Begin  | —                                                     | \$35,000   |
| 1–12   | $\$35,000 \times 40\% = \$14,000$                     | \$21,000   |
| 13–24  | $\$21,000 \times 40\% = \$8,400$                      | \$12,600   |
| 25–36  | $\$12,600 \times 40\% = \$5,040$ ; limited to \$4,600 | \$8,000    |

Calendar-year 1:  $\$14,000 \times \frac{7}{12} \approx \$8,167$

Calendar-year 2:  $(\$14,000 \times \frac{5}{12}) + (\$8,400 \times \frac{7}{12}) = \$5,833.33 + \$4,900 \approx \$10,733$

Calendar-year 3:  $(\$8,400 \times \frac{5}{12}) + (\$5,040 \times \frac{7}{12}) = \$3,500 + \$2,940 \approx \$6,400$

35.     Calendar-year 1:  $\$35,000 \times 20\% = \$7,000$

Calendar-year 2:  $\$35,000 \times 32\% = \$11,200$

Calendar-year 3:  $\$35,000 \times 19.20\% = \$6,720$

36. Straight-line:  $\$3,150 + \$5,400 + \$5,400 = \$13,950$   
 200% declining-balance:  $\$8,167 + \$10,733 + \$6,440 = \mathbf{\$25,340}$   $\leftarrow$  (200% declining balance has the greatest)  
 MACRS:  $\$7,000 + \$11,200 + \$6,720 = \$24,920$

### Practice Test

1. a. **\$30,000**   b. **5 years**   c. **\$5,000**   d. **\$25,000**   e. **\$10,000**   f. **\$20,000**
2.  $\frac{\$5,000}{250,000} = \$0.02$  (2¢ per copy)   Year 1:  $78,200 \text{ copies} \times \$0.02 = \mathbf{\$1,564}$    Year 2:  $65,300 \times \$0.02 = \mathbf{\$1,306}$
3.  $\frac{125\%}{8} = 15.625\%$  (For each year, multiply the previous year-end book value by 15.625%.)

| Year  | Annual depreciation                              | Book value |
|-------|--------------------------------------------------|------------|
| Begin | —                                                | \$2,000    |
| 1     | $\$2,000 \times 15.625\% \approx \mathbf{\$313}$ | \$1,687    |
| 2     | $\$1,687 \times 15.625\% \approx \mathbf{\$264}$ | \$1,423    |

4. Get no depreciation for the first 9 months.  
 Year 1:  $\$313 \times \frac{3}{12} \approx \mathbf{\$78}$    Year 2:  $(\$313 \times \frac{9}{12}) + (\$264 \times \frac{3}{12})$   
 $= \$234.75 + \$66 \approx \mathbf{\$301}$
5. Desks have 7-yr recovery period; salvage value is ignored.  
 Year 1:  $\$2,000 \times 14.29\% \approx \mathbf{\$286}$    Year 2:  $\$2,000 \times 24.49\% \approx \mathbf{\$490}$
6. Building value =  $\$850,000 \times 80\% = \$680,000$   
 Use Illustration 22-5, July column: Year 1:  $\$680,000 \times 1.667\% \approx \mathbf{\$11,336}$    Year 2:  $\$680,000 \times 3.636\% \approx \mathbf{\$24,725}$
7. a. Section 179 expense deduction (maximum for 2015)   **\$500,000**  
 b. MACRS depreciation  
 Depreciable basis:  $\$508,000 - \$500,000 = \$8,000$   
 Depreciation:  $\$8,000 \times 14.29\%$    **\$1,143**

## Chapter 21 Taxes: Income, Sales, and Property

### Unit 21.1 Federal income tax

1. **False**
2. (a) **Tax tables**
3. III. 23-1, “\$16,450–\$16,500” range, single column: **\$2,018**
4. **Step 1 (locate the schedule):** III. 21-2, Schedule Y-1  
**Step 2 (find the range):** “over \$73,800 but not over \$148,850”  
**Step 3 (find difference):**  $\$133,400 - \$73,800 = \$59,600$   
**Step 4 (multiply by rate):**  $\$59,600 \times 25\% = \$14,900$   
**Step 5 (find the tax):**  $\$14,900 + \$10,162.50 \approx \mathbf{\$25,063}$
5. **Step 1 (locate the schedule):** III. 21-2, Schedule Y-1  
**Step 2 (find the range):** “over \$148,850 but not over \$226,850”  
**Step 3 (find difference):**  $\$162,400 - \$148,850 = \$13,550$   
**Step 4 (multiply by rate):**  $\$13,550 \times 28\% = \$3,794$   
**Step 5 (find the tax):**  $\$3,794 + \$28,925 = \mathbf{\$32,719}$

6. **Tom (\$42,000)**  
 Ill. 21-1, “\$42,000–\$42,050” range, married filing separately column: **\$6,363**  
**Shauna (\$120,400)**  
**Step 1 (locate the schedule):** Ill. 21-2, Schedule Y-2  
**Step 2 (find the range):** “over \$113,425 but not over \$202,550”  
**Step 3 (find difference):** \$120,400 - \$113,425 = \$6,975  
**Step 4 (multiply by rate):** \$6,975 × 33% = \$2,301.75  
**Step 5 (find the tax):** \$2,301.75 + \$25,382.50 ≈ **\$27,684**
7. **Tom (\$42,000)**  
 Ill. 21-1, “\$42,000–\$42,050” range, single column: **\$6,363**  
**Shauna (\$120,400)**  
**Step 1 (locate the schedule):** Ill. 21-2, Schedule X  
**Step 2 (find the range):** “over \$89,350 but not over \$186,350”  
**Step 3 (find difference):** \$120,400 - \$89,350 = \$31,050  
**Step 4 (multiply by rate):** \$31,050 × 28% = \$8,694  
**Step 5 (find the tax):** \$8,694 + \$18,193.75 ≈ **\$26,888**
8. Married filing jointly: **\$32,719** *This is the least tax*  
 Married filing separately: \$6,363 (Tom) + \$27,684 (Shauna) **\$34,047** *This is the greatest tax*  
 Single: \$6,363 (Tom) + \$26,888 (Shauna) **\$33,251**
9. **Step 1 (find the range):** Ill. 21-3, “over \$10,000,000 but not over \$15,000,000”  
**Step 2 (find difference):** \$12,525,000 - \$10,000,000 = \$2,525,000  
**Step 3 (multiply by rate):** \$2,525,000 × 35% = \$883,750  
**Step 4 (find the tax):** \$883,750 + \$3,400,000 = **\$4,283,750**

## Unit 21.2 Sales tax

10. **False.** Sales tax is charged only on sales to consumers. Sales tax is not charged on goods purchased for resale.

11. Cost of merchandise \$20.49  
 Sales tax (from chart) + 1.23  
 Total amount due **\$21.72**
12. Cost of merchandise \$20.49  
 Sales tax: \$20.49 × 6% + 1.23  
 Total amount due **\$21.72**
13. Price of new car \$22,400  
 Less trade-in - 6,500  
 Net price \$15,900 × 6.5% = **\$1,033.50**
14. 

| Your city                  |                    | Different part of state     |                    |
|----------------------------|--------------------|-----------------------------|--------------------|
| Price                      | \$18,700.00        | Price                       | \$18,300.00        |
| Sales tax: \$18,700 × 6.5% | <u>1,215.50</u>    | Sales tax: \$18,300 × 7.25% | <u>1,326.75</u>    |
| Total amount due           | <b>\$19,915.50</b> | Total amount due            | <b>\$19,626.75</b> |

## Unit 21.3 Property tax

15. **(b)** State and local governments
16.  $\$350,000 \times 50\% = \mathbf{\$175,000}$
17. Tax rate =  $\frac{\text{Total budget of the taxing entity}}{\text{Total assessed value within the taxing entity}} = \frac{\$25,194,500}{\$3,825,876,200} \approx .0065853 \approx \mathbf{.006586}$  (rounded up)
18. **Tax rates are rounded up to ensure adequate revenues.** A tax rate of .006585 would not produce enough money:  $\$3,825,876,200 \times .006585 = \$25,193,394.78$  (a bit short of the \$25,194,500 needed).
19.  $\$175,000 \text{ Assessed value} \times .024593 \text{ Tax rate} = \mathbf{\$4,303.78}$

20. Property tax =  $\frac{\text{Assessed value}}{\$100} \times \text{Tax rate} = \frac{\$175,000}{\$100} \times \$2.452 = \mathbf{\$4,291.00}$
21. Property tax = Assessed value  $\times$  Tax rate =  $\$248,000 \times 1.8565\% = \mathbf{\$4,604.12}$
22. Property tax =  $\frac{\text{Assessed value}}{1,000} \times \text{Mill levy} = \frac{\$720,000}{1,000} \times 21.344 = \mathbf{\$15,367.68}$

### Challenge problems

23. Ill. 21-1, “\$70,800–\$70,850” range, married filing jointly column: **\$9,716**
24. **Step 1 (locate the schedule):** Ill. 21-2, Schedule Y-1  
**Step 2 (find the range):** “over \$18,150 but not over \$73,800”  
**Step 3 (find difference):**  $\$70,824 - \$18,150 = \$52,674$   
**Step 4 (multiply by rate):**  $\$52,674 \times 15\% = \$7,910.10$   
**Step 5 (find the tax):**  $\$7,910.10 + \$1,815 \approx \mathbf{\$9,716}$
25. **Same**
26. A likely guess: **Tax tables are, for most people, easier to use than tax rate schedules.**
27. **15%** (found in Step 4 of Problem 24)
28. **The 15% means that for each additional dollar of taxable income, Cary and Judy must pay 15% to the IRS.** For example, if Cary and Judy had \$100 of additional taxable income, they would pay an extra \$15 to the IRS.
29.  $\frac{\$9,716 \text{ (tax, Problem 23)}}{\$70,824 \text{ (taxable income)}} \approx .1372 \approx \mathbf{13.72\%}$
30. Assessed value =  $\$200,000 \times 25\% = \$50,000$   
Property tax =  $\frac{\text{Assessed value}}{1,000} \times \text{Mill levy} = \frac{\$50,000}{1,000} \times 51.044 = \mathbf{\$2,552.20}$

### Practice Test

1. Ill. 21-1, “\$43,800–\$43,850” range, single column: **\$6,813**
2. **Step 1 (locate the schedule):** Ill. 21-2, Schedule Y-1  
**Step 2 (find the range):** “over \$148,850 but not over \$226,850”  
**Step 3 (find difference):**  $\$182,488 - \$148,850 = \$33,638$   
**Step 4 (multiply by rate):**  $\$33,638 \times 28\% = \$9,418.64$   
**Step 5 (find the tax):**  $\$9,418.64 + \$28,925 \approx \mathbf{\$38,344}$
3. Illustration 21-3:  $\$35,911,080 \times 35\% = \mathbf{\$12,568,878}$
4. 

|                                    |                |
|------------------------------------|----------------|
| Cost of TV                         | \$6,800        |
| Sales tax: $\$6,800 \times 6.75\%$ | <u>+ 459</u>   |
| Total amount due                   | <b>\$7,259</b> |
5. 

|                      |                                          |
|----------------------|------------------------------------------|
| Price of new vehicle | \$47,500                                 |
| Less trade-in        | <u>- 8,000</u>                           |
| Net price            | $\$39,500 \times 7\% = \mathbf{\$2,765}$ |
6. Tax rate =  $\frac{\text{Total budget of the taxing entity}}{\text{Total assessed value within the taxing entity}} = \frac{\$8,255,500}{\$952,844,200} \approx .0086641 \approx \mathbf{.008665 \text{ (round up)}}$
7. Property tax =  $\frac{\text{Assessed value}}{\$100} \times \text{Tax rate} = \frac{\$450,000}{\$100} \times \$2.628 = \mathbf{\$11,826}$

## Chapter 22 Insurance

### Unit 22.1 Property insurance

1. **False.** Each policy explains what hazards are covered. If the loss results from a hazard covered in the policy, the insured gets reimbursed; if the loss results from a hazard not covered in the policy, the insured is not reimbursed.
2. **\$750** (You will receive the cost to replace the camera.)
3. **\$600** (This was the value of the camera immediately prior to the loss).
4.  $\$750$  (replacement cost) -  $\$500$  (deductible) = **\$250**
5.
 

|                                                |                 |
|------------------------------------------------|-----------------|
| Total annual premium                           | \$280.00        |
| Earned portion: $\$280 \times \frac{218}{365}$ | <u>- 167.23</u> |
| Refund                                         | <b>\$112.77</b> |
6. **False.** There are several different types of homeowner's policies, each covering different hazards.
7.
 

|                                                       |                                 |
|-------------------------------------------------------|---------------------------------|
| Basic premium (look across \$170,000 row to column 4) | \$753.00                        |
| Security system discount: $\$753 \times 5\%$          | <u>- 37.65</u>                  |
| Subtotal                                              | \$715.35                        |
| Premium for additional liability coverage             | <u>+ 60.00</u>                  |
| Total annual premium                                  | <b>\$775.35 (\$775 rounded)</b> |
8. **False.** Most homeowner's policies automatically cover personal belongings for a percent of the policy's face value.
9.
 

|                                                                              |                                     |
|------------------------------------------------------------------------------|-------------------------------------|
| Basic premium: $\frac{\$1,550,000}{\$1,000} \times \$2.70$                   | \$4,185.00                          |
| Discount for having \$1,000 deductible: $\$4,185 \times 4\%$                 | <u>- 167.40</u>                     |
| Subtotal                                                                     | \$4,017.60                          |
| Additional liabilities coverage: $\frac{\$1,550,000}{\$1,000} \times \$0.20$ | <u>+ 310.00</u>                     |
| Total annual premium                                                         | <b>\$4,327.60 (\$4,328 rounded)</b> |
10. **False.** Collision coverage pays for damage to the insured's car only.
11. **False.** With no-fault coverage, reimbursement for bodily injury (up to a certain dollar limit) is made *without regard to who was at fault*.

### Unit 22.2 Life insurance

12. **False.** Rates vary greatly, depending on age, sex, and medical condition.
13. **Decreasing term**
14. **Whole-life**
15. **Universal life**
16. **Term insurance**
17.  $\frac{\$200,000}{\$1,000} \times \$2.66 = \mathbf{\$532}$
18. **\$532** (The premium stays the same for the 15-year period.)
19.  $\frac{\$200,000}{\$1,000} \times \$6.58 = \mathbf{\$1,316}$
20.  $\frac{\$200,000}{\$1,000} \times \$9.63 = \mathbf{\$1,926}$
21. **\$1,926** (The premium stays the same for life.)
22. Remember, the rates of Ill. 22-3 are for males. Rates for females are those of a male 4 years younger, so
 

|                                                                    |                   |
|--------------------------------------------------------------------|-------------------|
| $\frac{\$120,000}{\$1,000} \times \$7.06$ (rate for a 23 year old) | <b>= \$847.20</b> |
|--------------------------------------------------------------------|-------------------|
23. **True**
24. Using Ill. 22-5, 10 years, Option 1:  $\frac{\$100,000}{\$1,000} \times \$96 = \mathbf{\$9,600}$
25. Using Ill. 22-5, 10 years, Option 2:  $\frac{\$100,000}{\$1,000} \times \$258 = \mathbf{\$25,800 \text{ of coverage}}$

26. Using Ill. 22-5, 10 years, Option 3: **18 years, 74 days**

27. **False.** The beneficiary can elect to receive the money over time; several annuity plans are available.

### Challenge problems

28.

| N | i                              | PV  | PMT        | FV |
|---|--------------------------------|-----|------------|----|
| 6 | $5.30 \times 12 \approx 63.57$ | 450 | -85 Begin* |    |

\*Note:  $\$450 \div 6 = \$75$ ;  $\$75 + \$10$  carrying charge =  $\$85$ .

29.

| N  | i           | PV | PMT         | FV     |
|----|-------------|----|-------------|--------|
| 15 | <b>6.15</b> |    | -715 Begin* | 17,870 |

\*Note:  $\$892$  (total premium) -  $\$177$  (insurance portion) =  $\$715$  to cash value (savings) portion. Don't forget to put back in "end" mode.

30.

| N                    | i                               | PV       | PMT | FV |
|----------------------|---------------------------------|----------|-----|----|
| $20 \times 12 = 240$ | $0.40 \times 12 \approx 4.82^*$ | -150,000 | 975 |    |

\*Note: If, by chance, you forgot to change back to "End" mode, you would have gotten a wrong answer.

### Practice Test

1.  $\$650$  (cost to replace) -  $\$500$  (deductible) =  **$\$150$**

2.

|                                                |                 |
|------------------------------------------------|-----------------|
| Annual premium                                 | \$620.00        |
| Earned portion: $\$620 \times \frac{145}{365}$ | - 246.30        |
| Refund                                         | <b>\$373.70</b> |

3.

|                                                       |                                 |
|-------------------------------------------------------|---------------------------------|
| Basic premium (look across \$180,000 row to column 3) | \$641.00                        |
| Burglar alarm discount: $\$641 \times 5\%$            | - 32.05                         |
| Subtotal                                              | \$608.95                        |
| Smoke alarm discount: $\$608.95 \times 3\%$           | - 18.27                         |
| Subtotal                                              | \$590.68                        |
| New home discount: $\$590.68 \times 10\%$             | - 59.07                         |
| Annual premium                                        | <b>\$531.61 (\$532 rounded)</b> |

4.

|                                                                          |                                     |
|--------------------------------------------------------------------------|-------------------------------------|
| Basic premium: $\frac{\$700,000}{\$1,000} \times \$3.90$                 | \$2,730.00                          |
| Discount for having \$2,500 deductible: $\$2,730 \times 6\%$             | - 163.80                            |
| Subtotal                                                                 | \$2,566.20                          |
| Additional liability coverage: $\frac{\$700,000}{\$1,000} \times \$0.20$ | + 140.00                            |
| Total annual premium                                                     | <b>\$2,706.20 (\$2,706 rounded)</b> |

5. **None are true.** Collision covers damage to *your* car caused by collision. With no-fault insurance, reimbursement for bodily injury (up to a certain dollar limit) is made *without regard* to who was at fault. If another driver damages your car and has no insurance, your company pays only if you have uninsured motor vehicle coverage.

6. **True**

7. **With term insurance, we pay for insurance only. With whole life, we pay for insurance plus savings.**

8. Rates of Ill. 22-3 are for males; for females, deduct 4 years, so:  $\frac{\$70,000}{\$1,000} \times \$7.39 = \mathbf{\$517.30}$  (same for her entire life)

9. Ill. 22-5, 20 years, Option 2:  $\frac{\$200,000}{\$1,000} \times \$548 = \mathbf{\$109,600}$

## Chapter 23 Measurements: Real-World Applications

### Unit 23.1 Length, area, and volume: Applications

- 90°**
- True**
- $10\text{ ft} + 12\text{ ft} + 13\text{ ft} + 20\text{ ft} + 20\text{ ft} = \mathbf{75\text{ ft}}$
- $23.32\text{ in.} + 12\text{ in.} + 20\text{ in.} = \mathbf{55.32\text{ in.}}$
- $10\text{ ft} + 20\text{ ft} + 5\text{ ft} + 10\text{ ft} + 15\text{ ft} + 10\text{ ft} + 5\text{ ft} + 20\text{ ft} + 5\text{ ft} + 5\text{ ft} + 10\text{ ft} + 5\text{ ft} = \mathbf{120\text{ ft}}$
- $P = 2(L + W) = 2(660\text{ ft} + 330\text{ ft}) = 2(990\text{ ft}) = \mathbf{1,980\text{ ft}}$
- $r, d, c$ . Diameter is twice the radius; circumference is about 3.14 times the diameter.
- $C = \pi d \approx 3.14(48) \approx \mathbf{150.72\text{ in.}}$
- $d = \frac{c}{\pi} \approx \frac{44\text{ ft}}{3.14} \approx \mathbf{14.01\text{ ft}}$
- |                                                                          |                              |
|--------------------------------------------------------------------------|------------------------------|
| Rectangle: $A = LW = (38\text{ in.})(30\text{ in.})$                     | 1,140 in. <sup>2</sup>       |
| Triangle: $A = \frac{1}{2}bh = \frac{1}{2}(7\text{ in.})(30\text{ in.})$ | <u>+ 105 in.<sup>2</sup></u> |
| Total area                                                               | <b>1,245 sq in.</b>          |
- |                                                                         |                                |
|-------------------------------------------------------------------------|--------------------------------|
| Entire circle: $A = \pi r^2 \approx 3.14(15\text{ in.})(15\text{ in.})$ | 706.50 in. <sup>2</sup>        |
| Inner circle: $A = \pi r^2 \approx 3.14(3\text{ in.})(3\text{ in.})$    | <u>- 28.26 in.<sup>2</sup></u> |
| Net area                                                                | <b>678.24 sq in.</b>           |
- |                                                               |                             |
|---------------------------------------------------------------|-----------------------------|
| Large rectangle: $A = LW = (60\text{ ft})(30\text{ ft}) =$    | 1,800 ft <sup>2</sup>       |
| Missing rectangle: $A = LW = (15\text{ ft})(5\text{ ft}) =$   | - 75 ft <sup>2</sup>        |
| Rectangle at bottom: $A = LW = (30\text{ ft})(5\text{ ft}) =$ | <u>+ 150 ft<sup>2</sup></u> |
| Total square footage                                          | <b>1,875 sq ft</b>          |
- $A = \pi r^2 \approx 3.14(50\text{ mi})(50\text{ mi}) \approx \mathbf{7,850\text{ sq mi}}$
- $V = LWH = (15\text{ in.})(15\text{ in.})(15\text{ in.}) = \mathbf{3,375\text{ cu in.}}$
- |                                                                           |                               |
|---------------------------------------------------------------------------|-------------------------------|
| Entire cube: $V = LWH = (25\text{ ft})(15\text{ ft})(20\text{ ft}) =$     | 7,500 ft <sup>3</sup>         |
| Missing portion: $V = LWH = (10\text{ ft})(15\text{ ft})(10\text{ ft}) =$ | <u>- 1,500 ft<sup>3</sup></u> |
| Net volume                                                                | <b>6,000 cu ft</b>            |
- $V = \pi r^2 h \approx 3.14(5\text{ in.})(5\text{ in.})(10\text{ in.}) \approx \mathbf{785\text{ cu in.}}$
- $V = LWH = (90\text{ ft})(40\text{ ft})(18\text{ ft}) = 64,800\text{ cu ft}$      $64,800 \div 250 = 259.20 = \mathbf{259\text{ tickets}}$
- $V = \pi r^2 h \approx 3.14(14\text{ ft})(14\text{ ft})(15\text{ ft}) \approx \mathbf{9,231.60\text{ cu ft}}$
- $V = LWH = (18\text{ yd})(18\text{ yd})(18\text{ yd}) = \mathbf{5,832\text{ cu yd}}$

### Unit 23.2 Unit costs and converting measurements (U.S. to U.S.)

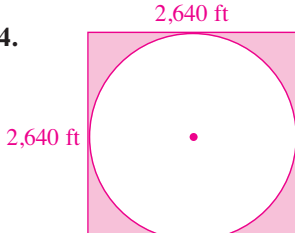
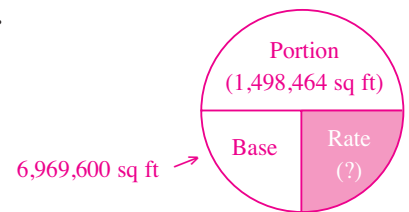
- 68-oz:    Cost per ounce =  $\frac{\text{Cost}}{\text{Number of ounces}} = \frac{\$1.19}{68\text{ oz}} = \$0.0175\text{ per oz} = \mathbf{1.75\text{¢ per oz}}$     (This one is cheaper)

Six-pack: Cost per ounce =  $\frac{\text{Cost}}{\text{Number of ounces}} = \frac{\$1.49}{72\text{ oz}} \approx \$0.0207\text{ per oz} \approx 2.07\text{¢ per oz}$
- $P = 2(L + W) = 2(40\text{ ft} + 30\text{ ft}) = 2(70\text{ ft}) = 140\text{ ft}$     Cost =  $140 \times \$4.75 = \mathbf{\$665}$
- |                                                                                |                                           |
|--------------------------------------------------------------------------------|-------------------------------------------|
| Area of rectangle: $A = LW = (70\text{ ft})(40\text{ ft}) =$                   | 2,800                                     |
| Area of circle: $A = \pi r^2 \approx 3.14(20\text{ ft})(20\text{ ft}) \approx$ | <u>+ 1,256</u>                            |
| Total area                                                                     | $4,056 \times \$6.50 = \mathbf{\$26,364}$ |
- $A = LW = (74\text{ ft})(62\text{ ft}) = 4,588\text{ sq ft}$     Cost:  $(4,588 \times \$0.22) + \$35 = \$1,009.36 + \$35 = \mathbf{\$1,044.36}$
- $1,875\text{ sq ft} \times \$120\text{ per sq ft} = \mathbf{\$225,000}$



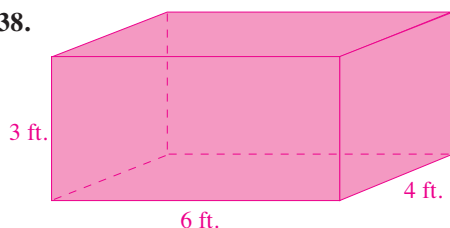
25. Weight of each can, with beans: 12 oz + 1 oz = 13 oz  
 Number of cans  $\times 24$   
 Total weight of cans, filled 312 oz  
 Weight of carton  $+ 10$  oz  
 Total weight of carton, filled 322 oz =  $(322 \div 16)$  lb  $\approx$  **20.13 pounds**
26.  $A = LW = (24 \text{ ft})(15 \text{ ft}) = 360 \text{ sq ft} = (360 \div 9) \text{ sq yd} = 40 \text{ sq yd}$  Cost =  $40 \text{ sq yd} \times \$21.50 \text{ per sq yd} =$  **\$860**
27.  $A = LW = (2,640 \text{ ft})(100 \text{ ft}) = 264,000 \text{ sq ft} = (264,000 \div 43,560) \text{ acres} \approx 6.06060606 \text{ acres}$   
 $6.06060606 \text{ acres} \times \$22,000 \text{ per acre} =$  **\$133,333.33**
28.  $65 \text{ ft} \times 150 \text{ times} = 9,750 \text{ ft} = (9,750 \div 5,280) \text{ mi} \approx$  **1.85 mi**
29.  $100 \text{ yds} = (100 \times 36) \text{ in.} = 3,600 \text{ in.}$   $3,600 \text{ in.} \div 30 \text{ in. per day} =$  **120 days**

### Challenge problems

30.  $C = 2\pi r \approx 2(3.14)(15 \text{ in.}) \approx 94.20 \text{ in.}$  (The car travels 94.20 inches for each revolution of the tires.)  
 $3,403 \text{ mi} = (3,403 \times 5,280) \text{ ft} = 17,967,840 \text{ ft} = (17,967,840 \div 94.20) \text{ in.} = 215,614,080 \text{ in.}$   
 (The car travels 215,614,080 in.)  
 Tire revolutions:  $215,614,080 \text{ in.} \div 94.20 \text{ in. per revolution} \approx$  **2,288,897 revolutions**
31. Diameter of earth:  $d = \frac{c}{\pi} \approx \frac{25,000 \text{ mi}}{3.14} \approx 7,961.783439 \text{ mi}$   
 Diameter of satellite orbit:  $7,961.783439 \text{ mi} + 400 \text{ mi} = 8,361.783439 \text{ mi}$   
 Circumference of orbit:  $C = \pi d \approx 3.14(8,361.783439 \text{ mi}) \approx$  **26,256 mi**
32. Area of ceiling:  $14 \text{ ft} \times 18 \text{ ft} = 252 \text{ sq ft}$   
 Gallons required:  $252 \text{ sq ft} \div 200 \text{ sq ft per gallon} \approx 1.26 \text{ gal} \approx 2 \text{ gal}$  (Can't buy part of a gallon)  
 Area of walls:  
 2 walls 14 ft wide:  $2(14 \text{ ft} \times 9 \text{ ft}) = 2(126 \text{ sq ft}) = 252 \text{ sq ft}$   
 2 walls 18 ft wide:  $2(18 \text{ ft} \times 9 \text{ ft}) = 2(162 \text{ sq ft}) = 324 \text{ sq ft}$   
 Less windows:  $3(3 \text{ ft} \times 4 \text{ ft}) = 3(12 \text{ sq ft}) = 36 \text{ sq ft}$   
 Less door:  $3 \text{ ft} \times 7 \text{ ft} = 21 \text{ sq ft}$   
 Net area  $519 \text{ sq ft}$   
 Gallons required:  $519 \text{ sq ft} \div 200 \text{ sq ft per gallon} \approx 2.60 \text{ gal} \approx 3 \text{ gal}$  (Can't buy part of a gallon)  
 Cost:  $5 \text{ gal} \times \$32.95 =$  **\$164.75**
33.  $27 \text{ in.} = (\frac{27}{12}) \text{ ft} = 2.25 \text{ ft}$   
 $V = LWH = (115 \text{ ft})(280 \text{ ft})(2.25 \text{ ft}) = 72,450 \text{ cu ft} = (\frac{72,450}{27}) \text{ cu yd} \approx$  **2,683.33 cu yd**
34.  Total sq ft of land:  $A = LW = (2,640 \text{ ft})(2,640 \text{ ft}) = 6,969,600 \text{ sq ft}$   
 Sq ft in circular part:  $A = \pi r^2 \approx (3.14)(1,320 \text{ ft})(1,320 \text{ ft}) = 5,471,136 \text{ sq ft}$   
 Area not farmed **1,498,464 sq ft**
35.  Rate =  $\frac{\text{Portion}}{\text{Base}} = \frac{1,498,464 \text{ sq ft}}{6,969,600 \text{ sq ft}} = 0.2150 =$  **21.50%**
36.  $7,122 \text{ yd} + 125 \text{ yd (to first hole)} + (17 \times 50 \text{ yd}) + 125 \text{ yd (back to clubhouse)} = 8,222 \text{ yd} = (\frac{8,222}{1,760}) \text{ mi} \approx$  **4.67 mi**

37.  $V = LWH = (27 \text{ ft } 6 \text{ in.})(18 \text{ ft})(4 \text{ in.}) \approx (27.5 \text{ ft})(18 \text{ ft})(\frac{1}{3} \text{ ft}) = 165 \text{ cu ft} = (\frac{165}{27}) \text{ cu yd} \approx 6.11111111 \text{ cu yd}$   
 $6.11111111 \text{ cu yd} \times \$85 \text{ per cu yd} = \text{\$519.44}$

38.



|                                                       |                  |
|-------------------------------------------------------|------------------|
| Top and bottom: $2(6 \text{ ft} \times 4 \text{ ft})$ | 48 sq ft         |
| Front and back: $2(6 \text{ ft} \times 3 \text{ ft})$ | 36 sq ft         |
| Two ends: $2(4 \text{ ft} \times 3 \text{ ft})$       | <u>+24</u> sq ft |
| Total                                                 | <b>108 sq ft</b> |

39.  $100 \text{ yds} = (100 \div 1,760) \text{ mi} \approx .05681818 \text{ mi}$   
 $10.5 \text{ sec} = (10.5 \div 60) \text{ min} = .175 \text{ min} = (.175 \div 60) \text{ hr} \approx .00291667 \text{ hr}$   
miles per hour means miles  $\div$  number of hours, so:  $.05681818 \text{ mi} \div .00291667 \text{ hr} \approx \textbf{19.5 mph}$

40.  $A = LW$       *Formula for area of rectangle*  
 $452 = L(24)$       *Substitute:  $W = 24 \text{ in.}$*   
 $\frac{452}{24} = L$       *Divide both sides by 24*  
 $\textbf{18.83} \approx L$

*Check answer:  $18.83 \text{ in.} \times 24 \text{ in.} \approx 452 \text{ sq in.}$*

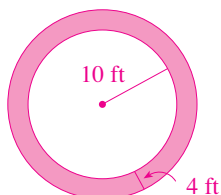
## Practice Test

1.  $P = 2(L + W) = 2(1,200 \text{ ft} + 600 \text{ ft}) = 2(1,800 \text{ ft}) = \textbf{3,600 ft}$

2.  $d = \frac{c}{\pi} \approx \frac{31.5 \text{ in.}}{3.14} \approx \textbf{10.03 in.}$

3. Rectangle:  $A = LW = (150 \text{ ft})(120 \text{ ft}) = 18,000 \text{ sq ft}$   
Triangle:  $A = \frac{1}{2}bh = \frac{1}{2}(80 \text{ ft})(150 \text{ ft}) = \textbf{+ 6,000 sq ft}$   
Total area      **24,000 sq ft**

4.



|                                                                                 |                       |
|---------------------------------------------------------------------------------|-----------------------|
| Entire circle: $A = \pi r^2 \approx 3.14(14 \text{ ft})(14 \text{ ft}) \approx$ | 615.44 sq ft          |
| Inner circle: $A = \pi r^2 \approx 3.14(10 \text{ ft})(10 \text{ ft}) \approx$  | <u>- 314.00</u> sq ft |
| Net area                                                                        | <b>301.44 sq ft</b>   |

5.  $V = LWH = (1,000 \text{ ft})(270 \text{ ft})(12 \text{ ft}) = 3,240,000 \text{ cu ft} = (\frac{3,240,000}{27}) \text{ cu yd} = \textbf{120,000 cu yd}$

6.  $V = \pi r^2 h \approx 3.14(12 \text{ ft})(12 \text{ ft})(45 \text{ ft}) \approx \textbf{20,347.20 cu ft}$

7.  $\text{Cost per sq ft} = \frac{\text{Cost}}{\text{Number of sq ft}} = \frac{\$242,000}{2,320 \text{ sq ft}} = \textbf{\$104.31 per sq ft}$  (Yes, it is within range.)

8.  $A = LW = (1,320 \text{ ft})(660 \text{ ft}) = 871,200 \text{ sq ft} = (\frac{871,200}{43,560}) \text{ acres} = \textbf{20 acres}$

## Chapter 24 International Business: Exchange Rates and Metrics

### Unit 24.1 Monetary exchange rates: Significance in international business

1. **False;** a worldwide currency has never existed.
2.  $\$2,300 = (2,300 \times .90006) = \textbf{2,070.14 euros}$
3.  $\$2,300 = (2,300 \times .65159) = \textbf{1,498.66 pounds}$
4.  $\$2,300 = (2,300 \times 120.270) = \textbf{276,621.00 yen}$

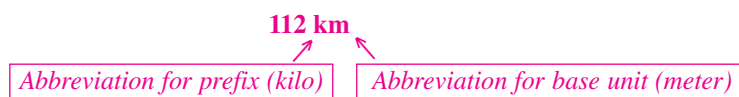
5. 21,300 Canadian dollars =  $\frac{21,300}{1.32818}$  U.S. dollars = **\$16,036.98**
6. 975,000 British pounds =  $\frac{975,000}{.65159}$  U.S. dollars = **\$1,496,339.72**
7. 65 Swiss francs =  $\frac{65}{.97604}$  U.S. dollars = **\$66.60**
8. \$128,000 =  $(128,000 \times 1.5247)$  francs = **195,161.60 francs**
9. 195,161.60 Swiss francs =  $\frac{195,161.60}{1.3822}$  U.S. dollars = **\$141,196.35**
10. 195,161.60 Swiss francs =  $\frac{195,161.60}{1.6744}$  U.S. dollars = **\$116,556.14**
11. **True**
12. **False**
13. 5,300,000 Canadian dollars =  $\frac{5,300,000}{1.0510}$  U.S. dollars = **\$5,042,816.37**
14. 5,500,000 Canadian dollars =  $\frac{5,500,000}{1.1587}$  U.S. dollars = **\$4,746,698.89**
15.
 

|               |                        |
|---------------|------------------------|
| Sold for      | \$4,746,698.89         |
| Purchased for | <u>-5,042,816.37</u>   |
| Loss          | <b>(\$ 296,117.48)</b> |

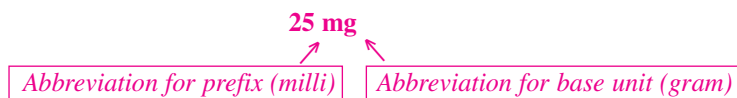
## Unit 24.2 Metric system: Significance in international business

16. **False**
17. **200 g**; a raisin weighs about 1 g
18. **2 m**; a meter is a bit more than a yard
19. **650 km**
20. **65 ℓ**; a liter is a bit more than a quart

21.



22.



23.



24. **cm.** mm is the abbreviation for millimeter and means  $\frac{1}{1,000}$  of a meter; cm is the abbreviation for centimeter and means  $\frac{1}{100}$  of a meter.
25. **km.** km is the abbreviation for kilometer and means 1,000 meters; m has no prefix and simply means 1 meter.
26. **kg.** cg is the abbreviation for centigram and means  $\frac{1}{100}$  of a gram; kg means 1,000 grams.
27. Start at milli on the line indicator of Illustration 24-3. Move to centi (1 place to the left). Move the decimal point 1 place to the left: 850 mm = 850 mm = **85 cm**
28. Start at hecto on the line indicator. Move to centi (4 places to the right). Move the decimal point 4 places to the right: 12 hg = 12.0000 hg = **120,000 cg**
29. Start at milli on the line indicator. Move to base unit (3 places to the left). Move the decimal point 3 places to the left: 1,300 mℓ = 1,300 mℓ = **1.3ℓ**
30. We will convert from kg to lb (see left side of the Weight section of Ill. 26-4): 24 kg ≈  $(24 \times 2.2046)$  lb ≈ **52.91 lb**
31. We will convert from m to yd (see left side of the Distance section): 100 m ≈  $(100 \times 1.09361)$  yd ≈ **109.36 yd**
32. We will convert from ℓ to gal (see left side of the Volume section): 62 ℓ ≈  $(62 \times .26417762)$  gal ≈ **16.38 gal**
33. We will convert from in. to cm (see right side of Distance section): 17.5 in. ≈  $(17.5 \times 2.54)$  cm ≈ **44.45 cm**

34. We will convert from  $\text{yd}^3$  to  $\text{m}^3$  (see right side of Volume section):  $38 \text{ yd}^3 \approx (38 \times .76456) \text{ m}^3 \approx \mathbf{29.05 \text{ m}^3}$
35. We will convert from oz to g (see right side of Weight section):  $14.2 \text{ oz} \approx (14.2 \times 28.3495) \text{ g} \approx \mathbf{402.56 \text{ g}}$
36. Illustration 26-4 gives the choice of converting from in. to (a) cm or (b) m. Converting to meters will result in a value less than 1; it will be much more meaningful to convert to centimeters:

$$8.5 \text{ in.} \approx (8.5 \times 2.54) \text{ cm} \approx \mathbf{21.59 \text{ cm}} \quad 11 \text{ in.} \approx (11 \times 2.54) \text{ cm} \approx \mathbf{27.94 \text{ cm}}$$

37.  $60 \text{ oz} \approx (60 \times 28.3495) \text{ g} \approx \mathbf{1,701 \text{ g}}$
38. To compare the temperatures, we must state both using the same scale. Let's convert the Fahrenheit temperature ( $95^\circ$ ) to a Celsius (C) temperature

$$C = \frac{5}{9}(F - 32) = \frac{5}{9}(95 - 32) = \frac{5}{9}(63) = 35^\circ\text{C}$$

**The temperature in Rome ( $38^\circ\text{C}$ ) was higher than that of Chicago ( $35^\circ\text{C}$ ).**

39.  $C = \frac{5}{9}(F - 32) = \frac{5}{9}(98.6 - 32) = \frac{5}{9}(66.6) = \mathbf{37^\circ\text{C}}$
40.  $C = \frac{5}{9}(F - 32) = \frac{5}{9}(-60 - 32) = \frac{5}{9}(-92) \approx \mathbf{-51.1^\circ\text{C}}$

### Challenge problems

41.  $15 \text{ T} \approx (15 \times .9072) \text{ t} \approx \mathbf{13.608 \text{ t}}$
42.  $975 \text{ British pounds} = \left(\frac{975}{62570}\right) \text{ U.S. dollars} = \mathbf{\$1,558.25}$
43.  $13.608 \text{ (t)} \times \$1,558.25 \text{ (per t)} = \mathbf{\$21,204.67}$
44.  $83 \text{ cm} = .83 \text{ m} \quad 1.6 \text{ m} + 2.5 \text{ m} + .83 \text{ m} + 4.7 \text{ m} = \mathbf{9.63 \text{ m}}$
45.  $483 \text{ km} \approx (483 \times .62137) \text{ mi} \approx 300 \text{ mi} \quad 300 \text{ mi} \div 50 \text{ mph} = \mathbf{6 \text{ hr}}$
46. Cost in U.S. dollars for one liter:  $1.40 \text{ Canadian dollars} = \left(\frac{1.40}{1.05}\right) \text{ U.S. dollars} \approx \$1.33333333$   
 $1 \text{ liter} \approx (1 \times .26417762) \text{ gal} \approx .26417762 \text{ gal}$   
 Price per gallon means price  $\div$  gallons:  $\frac{\$1.33333333}{.26417762 \text{ gal}} \approx \mathbf{\$5.05 \text{ per gallon}}$
47. Let's determine how many meters per second for each record. Meters per second means the number of meters divided by the number of seconds.

#### Washington High School

$$\frac{100 \text{ m}}{10.94 \text{ sec.}} \approx 9.14 \text{ m per sec. For each second, the runner traveled 9.14 m.}$$

#### Lincoln High School

$$100 \text{ yd} \approx (100 \times .9144) \text{ m} \approx 91.44 \text{ m}$$

$$\frac{91.44 \text{ m}}{10.03 \text{ sec.}} \approx 9.12 \text{ m per sec. For each second, the runner traveled 9.12 m.}$$

**The Washington High School recordholder ran the fastest.**

### Practice Test

1.  $\$38,000 = (38,000 \times 10.2350) \text{ pesos} = \mathbf{388,930 \text{ pesos}}$
2. Sold for:  $7,500,000 \text{ British pounds} = \left(\frac{7,500,000}{.71450}\right) \text{ U.S. dollars} = \mathbf{\$10,496,850.94}$   
 Purchased for:  $6,800,000 \text{ British pounds} = \left(\frac{6,800,000}{.65320}\right) \text{ US dollars} = \mathbf{-10,410,287.81}$   
 Profit  $\mathbf{\$ 86,563.13}$
3. **25 km**      4.  $1.05 \text{ mg} = \underline{001.05 \text{ mg}} = \mathbf{.00105 \text{ g}}$
5.  $12.5 \text{ oz} \approx (12.5 \times 28.3495) \text{ g} \approx \mathbf{354 \text{ g}}$       6.  $F = \frac{9}{5}C + 32 = \frac{9}{5}(30) + 32 = 54 + 32 = \mathbf{86^\circ\text{F}}$

# Chapter 25 Statistics: An Introduction

## Unit 25.1 The three Ms: Mean, median, and mode

1.  $\frac{79 + 87 + 94 + 67 + 92 + 94 + 82}{7} = \frac{595}{7} = 85$

2. Values, high to low: 94, 94, 92, **87**, 82, 79, 67

↑  
Midpoint =  $\frac{\text{Number of values} + 1}{2} = \frac{7 + 1}{2} = \frac{8}{2} = 4$

3. The value “**94**” occurs the most often (twice), so it is the mode.

4.  $\frac{\$125,000 + \$115,000 + \$195,000 + \$88,000 + \$150,000 + \$135,000 + \$245,000 + \$110,000 + \$165,000 + \$88,000 + \$665,000 + \$145,000}{12} = \frac{\$2,226,000}{12} = \$185,500$

5. Values, high to low: \$665,000, \$245,000, \$195,000, \$165,000, \$150,000, \$145,000, \$135,000, \$125,000, \$115,000, \$110,000, \$88,000, \$88,000

↑  
Midpoint =  $\frac{\text{Number of values} + 1}{2} = \frac{12 + 1}{2} = \frac{13}{2} = 6.5$        $(\$145,000 + \$135,000) \div 2 = \$140,000$

6. The value “**\$88,000**” occurs the most often (twice).

7. **The median.** The mean (\$185,500) is distorted by the unusually large value of \$665,000. The mode (\$88,000) happens to be the lowest value. Neither the mean nor mode represents the average value. The median (\$140,000) best reflects the average selling price.

8.  $\frac{\$4,700 + \$5,900 + \$6,800 + \$8,700}{4} = \frac{\$26,100}{4} = \$6,525$

9. 
$$\begin{array}{r} \$4,700 \times 8 \\ \$5,900 \times 13 \\ \$6,800 \times 11 \\ \$8,700 \times 5 \\ \hline 37 \end{array} \quad \begin{array}{r} \$ 37,600 \\ 76,700 \\ 74,800 \\ 43,500 \\ \hline \$232,600 \end{array} \quad \$232,600 \div 37 = \$6,286.49$$

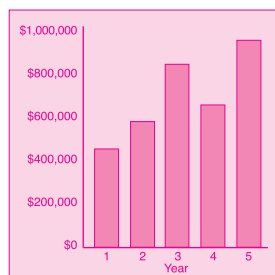
| 10. Course       | Grade | Hours    | Grade-point units                           |
|------------------|-------|----------|---------------------------------------------|
| Accounting       | B+    | 5        | $3.3 \times 5 = 16.50$                      |
| Computer Science | B-    | 3        | $2.7 \times 3 = 8.10$                       |
| Golf             | A     | 1        | $4.0 \times 1 = 4.00$                       |
| Management       | A-    | <u>3</u> | <u><math>3.7 \times 3 = 11.10</math></u>    |
|                  |       | 12       | $39.70 \div 12 = 3.31$ (about a B+ average) |

## Unit 25.2 Graphs: Presenting data so it is easy to understand

### 11. Revenues, Rocky Mountain River Expeditions



### 12. Revenues, Rocky Mountain River Expeditions



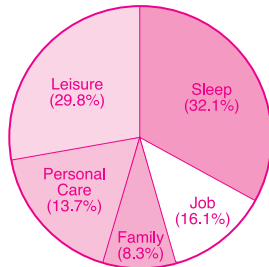
13. **Nile.** The end of the horizontal bar for the Nile extends farther to the right than the bars for the other rivers.

14. **About 3,900 mi.**

15. 4,150 mi (Nile) - 3,850 (Mississippi-Missouri) = **about 300 mi**

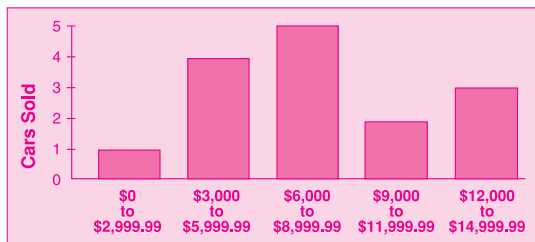
|            |                   |                                                                   |                                                    |
|------------|-------------------|-------------------------------------------------------------------|----------------------------------------------------|
| <b>16.</b> | <b>Department</b> | <b>Percent of total</b>                                           | <b>Degrees</b>                                     |
|            | Sleep             | $54 \div 168 \approx .321 \approx 32.1\%$                         | $\times 360^\circ \approx 115.7^\circ$             |
|            | Job               | $27 \div 168 \approx .161 \approx 16.1\%$                         | $\times 360^\circ \approx 57.9^\circ$              |
|            | Family care       | $14 \div 168 \approx .083 \approx 8.3\%$                          | $\times 360^\circ = 30.0^\circ$                    |
|            | Personal care     | $23 \div 168 \approx .137 \approx 13.7\%$                         | $\times 360^\circ \approx 49.3^\circ$              |
|            | Leisure           | $\underline{50} \div 168 \approx .298 \approx \underline{29.8\%}$ | $\times 360^\circ \approx \underline{107.1^\circ}$ |
|            |                   | 168                                                               | 100.0%                                             |
|            |                   |                                                                   | 360.0°                                             |

17.



Percent of time spent for various activities

18. Weekly car sales, by price range



| Value range          | Tallies |
|----------------------|---------|
| \$0–\$2,999.99       | I       |
| \$3,000–\$5,999.99   | IIII    |
| \$6,000–\$8,999.99   | IIII    |
| \$9,000–\$11,999.99  | II      |
| \$12,000–\$14,999.99 | III     |

19. **c.** The line on graph c is the flattest; the graphs of a and b have a steeper downward trend.

20. **\$4,000 to \$5,999.99** (10 cars)      21. **7 cars**      22. **3 cars**

## Unit 25.3 Measures of dispersion

23. Range = highest value - lowest value = 14 hours - 1 hour = **13 hours**

24. **Step 1** Mean =  $\frac{5+7+1+14+8}{5} = \frac{35}{5} = 7$  hours

| Step 2<br>(Subtract Mean) | Step 3<br>(Square the result) |
|---------------------------|-------------------------------|
| $5 - 7 = -2$              | $(-2)(-2) = 4$                |
| $7 - 7 = 0$               | $(0)(0) = 0$                  |
| $1 - 7 = -6$              | $(-6)(-6) = 36$               |
| $14 - 7 = 7$              | $(7)(7) = 49$                 |
| $8 - 7 = 1$               | $(1)(1) = 1$                  |

**Step 4 (add squared deviations):**  $4 + 0 + 36 + 49 + 1 = 90$

**Step 5 (divide by  $n$ ):**  $90 \div 5 = 18$

**Step 6 (square root):** The square root of 18 is 4.24. The standard deviation for the 5 students is **4.24**.

25. We will be treating the 5 students as a sample study and finding the standard deviation for a sample study. Steps 1-4 are identical to those of Problem 24, so let's start with Step 4:

**Step 4 (add squared deviations):** 90

**Step 5 (divide by  $n - 1$ ):**  $90 \div 4 = 22.50$

**Step 6 (square root):** The square root of 22.50 is 4.74. The standard deviation for the entire class, based on your sample study of 5 classmates, is **4.74**.

## Challenge problems

26.

$$\begin{array}{r}
 4 \text{ days} \times \$400 \quad \$1,600 \\
 23 \text{ days} \times \$625 \quad 14,375 \\
 \underline{3 \text{ days} \times \$475} \quad \underline{+ 1,425} \\
 30 \quad \$17,400 \div 30 = \$580
 \end{array}$$

27.

$$\begin{array}{r}
 \text{Total points required to have an average of 90: } 6 \text{ tests} \times 90 \quad 540 \\
 \text{Points so far: } 84 + 93 + 87 + 94 + 88 \quad \underline{-446} \\
 \text{Points needed on last test} \quad 94
 \end{array}$$

28.

$$\begin{array}{r}
 \text{Prior cumulative grade-point units: } 2.92 \times 42 \text{ hrs} \quad 122.64 \\
 \text{Grade-point units for this semester (see Problem 10)} \quad \underline{+ 39.70} \\
 \text{Cumulative grade-point units for all 54 hrs} \quad 162.34 \div 54 = 3.01
 \end{array}$$

## Practice Test

1.  $\frac{\$120,000 + \$140,000 + \$210,000 + \$178,000 + \$2,400,000 + \$120,000}{6} = \frac{\$3,168,000}{6} = \$528,000$

2. Values, high to low: \$2,400,000, \$210,000, \$178,000, \$140,000, \$120,000, \$120,000

$$\text{Midpoint} = \frac{\text{Number of values} + 1}{2} = \frac{6 + 1}{2} = \frac{7}{2} = 3.5 \quad (\$178,000 + \$140,000) \div 2 = \$159,000$$

3. **\$120,000** occurs the most often (twice)

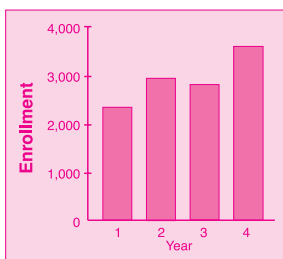
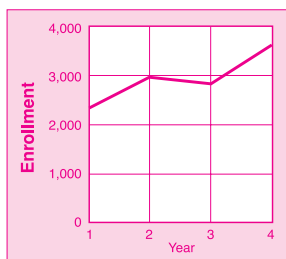
4. **The median.** The mean (\$528,000) is distorted by the \$2,400,000 sale. The mode (\$120,000) happens to be the lowest value.

5.

| Model      | Price   | Number sold |
|------------|---------|-------------|
| Workmaster | \$550   | 52          |
| Auto-Feed  | \$850   | 18          |
| Deluxe     | \$2,300 | 6           |

$$\begin{array}{r}
 \text{Value} \quad \text{Frequency} \quad \text{Product} \\
 \$550 \times 52 = \$28,600 \\
 \$850 \times 18 = 15,300 \\
 \$2,300 \times \underline{6} = \underline{13,800} \\
 76 \quad \$57,700 \div 76 = \$759.21
 \end{array}$$

6.



7.

| Model   | Number sold |
|---------|-------------|
| 4 × 7   | 252         |
| 5 × 8   | 144         |
| 10 × 12 | 211         |
| 12 × 15 | 128         |

$$\begin{array}{l}
 \text{Total number sold: } 252 + 144 + 211 + 128 = 735 \\
 211 \div 735 \approx .287; .287 \times 360^\circ \approx 103.3^\circ
 \end{array}$$

8. **Step 1** Mean =  $\frac{45 + 38 + 42 + 51}{4} = \frac{176}{4} = 44$  yards

| Step 2<br>(Subtract Mean) | Step 3<br>(Square the result) |
|---------------------------|-------------------------------|
| $45 - 44 = 1$             | $(1)(1) = 1$                  |
| $38 - 44 = -6$            | $(-6)(-6) = 36$               |
| $42 - 44 = -2$            | $(-2)(-2) = 4$                |
| $51 - 44 = 7$             | $(7)(7) = 49$                 |

**Step 4 (add squared deviations):**  $1 + 36 + 4 + 49 = 90$

**Step 5 (divide by  $n - 1$ ):**  $90 \div 3 = 30$

**Step 6 (square root):** The square root of 30 is **5.48**. If you were to throw a football as far as you can 50 times, you could expect to average 5.48 yards more, or 5.48 yards less, than the average distance of 44 yards.