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. The following pages include solutions to all Chapter Review Problems and Practice Tests found in the 4th edition of the text. Here are a few suggestions for using these solutions:

- While these solutions are 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 these solutions as a crutch. Try to solve the problems without referring to the solutions; you will learn more by struggling a bit, trying to define the problem. First, compare your answer with that found in Appendix B of the text. If your answer is wrong, compare your approach with the solution on the following pages.

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

John Webber

***Note*: To go directly to the chapter you are looking for, find the page number shown in the Table of Contents, below. Then type that page number in the page number box at the bottom of this page and hit Enter. For example, to go to Chapter 4, type in 12 at the bottom of the page and hit Enter.**

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Chapter 1 Whole Numbers and Decimals

Unit 1.1 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 ⟶ 4,8 ⟶ 4,800,000,000,000
10. 76.12506 ⟶ 76.13
11. 123,678,499 ⟶ 123,678,000
12. 23,467.5000001 ⟶ 23,468
13. 45,951 ⟶ 46,000

Unit 1.2 Working with whole numbers

14.

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

15.

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

16.

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

17.

$$\begin{array}{r} {\scriptstyle 5\ 12\ \ } \\ 127 \\ -\ 12 \\ \hline 115 \end{array}$$

↑ Check by adding up. 5 + 2 = 7, etc.

18.

$$\begin{array}{r} {\scriptstyle 1\ 1\ 7\ 1\ \ } \\ 1{,}171 \\ -\ 489 \\ \hline 682 \end{array}$$

↑ Check by adding up.

19.

$$\begin{array}{r} {\scriptstyle 0\ 10\ 16\ 11\ \ } \\ 12{,}762 \\ -\ 1{,}134 \\ \hline 11{,}628 \end{array}$$

↑ Check by adding up.

20.

$$\begin{array}{r} 123 \\ \times\ 45 \\ \hline 615 \\ 4\ 92\ \ \\ \hline 5{,}535 \end{array}$$

21.

$$\begin{array}{r} 1{,}832 \\ \times\ 45 \\ \hline 9\ 160 \\ 73\ 28\ \ \\ \hline 82{,}440 \end{array}$$

22.

1,800 ×120 *Pretend* ⟶ 18 ×12 — 2 *zeros*, + 1 *zero*

36 3

18

216 *attach 3 zeros* ⟶ 216,000

23.

```
  16
3)48
 3↓
 18
 18
```

24.

```
  147
24)3528
 24↓ |
 112 |
  96↓
  168
  168
```

25.

```
  212  R32
41)8724
 82↓ |
  52 |
  41↓
  114
   82
   32
```

Unit 1.3 Strategy for solving word problems

26. $22,700 - $4,570 = **$18,130**

27.

53 pretend 53 → ×40 → × 4 (1 *zero ignored*) → 212 → **2,120 seats**

28. Your score: 4 + 5 + 3 + 4 + 7 + 6 + 4 + 2 + 5 = 40 Over par: 40 - 36 = **4**

29.

```
 96
×3
```

288 cans

30.

```
  12 cases
24)288
 24↓
  48
  48
```

31.

	Rounded
$ 980	$1,000
425	400
+ 310	+ 300
	$1,700

Think: 10 + 4 = 14; + 3 = 17

Unit 1.4 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.

1000 (*3 zeros*) 47.000 → (*3 places right*) **47,000**

45.

100 (*2 zeros*) 4.68 → 04.68 → (*2 places left*) **.0468**

46. $45.10 + $32 + $450 + 92.16 = **$619.26**

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

48. 22 acres + 105.643 acres + .92 acres = **128.563 acres**

49. $50 - $8.52 = **$41.48**

50. 322 sq ft × $9.50 per sq ft = **$3,059**

51. 18.5 lb × $0.39 per lb = $7.215 = **$7.22** (rounded)

52. 1,872.4 miles × $0.55 per mile = **$1,029.82**

53. 295.75 sq ft ÷ 3.5 sq ft per glove = 84.5 gloves = **84 full gloves**

Challenge problems

54. 26,007.4 ending miles - 23,578.9 beginning miles = **2,428.5 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 gal + 17.4 gal + 11.7 gal + 15.6 gal + 17.1 gal + 9.4 gal = **85.8 gal**

56. miles per gallon means "miles divided by gallons," so: 2,428.5 miles ÷ 85.8 gal = **28.3 mpg**

57. Miles: 34,428.3 - 34,122.8 = 305.5
Charge

For miles: 305.5 mi ×$0.24	$ 73.32
Daily charge: 2 days × $49	+ 98.00
	$171.32

58.

Heartbeats per minute	73
	×60
a. Heartbeats per hour	**4,380**
	×24
b. Heartbeats per day	**105,120**
	×365.25
c. Heartbeats per year	**38,395,080**
	×70
d. Heartbeats per 70-year life	**2,687,655,600**

59. $3,450 × 12 months = **$41,400**

60. Rent per square foot means "rent divided by square feet," so $41,400 ÷ 9,720 sq ft = **$4.26 per sq ft**

61. 151 lb - 124 lb = **27 lb**

62. Pounds per month means "pounds divided by months," so: 27 lb ÷ 3 months = **9 lb per month**

63.

10 × $700	$7,000
4 × $725	2,900
2 × $750	1,500
Total monthly rent	$11,400
	×12
Total annual rent	**$136,800**

64.

Total annual rent	$136,800
Less expenses	- 41,000
Amount after expenses	$ 95,800
Less mortgage payments: 12 × $7,730	- 92,760
Amount after mortgage payments	**$ 3,040**

65.

Lodging: 14 nights × $85 =	$1,190.00
Meals:	
Cost per day: 4 people × $24 per day = $96	
Cost for 15 days: $96 per day × 15 days =	1,440.00
Gas:	
Gallons required: 3,300 miles ÷ 15 miles per gallon = 220 gallons	
Cost of gas: 220 gallons × $3.29 per gallon	723.80
Entertainment: 15 days × $60 =	+ 900.00
Total budget	**$4,253.80**

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

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

Practice Test

1. **Eighty-seven thousand, twenty-two and thirty-five hundredths**
2. **300.084**
3. 26.1 billion ⟶ 26,1 ⟶ **26,100,000,000**
4. 618.7665 ⟶ **618.77**
5. $28,958 ⟶ **$29,000**
6. **3,275**
7. **126**
8. **322,000**
9. **127.4**
10. $4 + $5 + $2 = **$11**
11. $22,400 - $4,200 + $1,228.50 + $135 = **$19,563.50**
12. 112 acres + 84.625 acres + .82 acres = **197.445 acres**
13.

Carpet	$21.25	
Pad	4.65	
Installation	4.00	
Total cost per sq yd	$29.90 × 182.5 sq yd =	**$5,456.75**

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) Used 53.82 gallons of gas
3. Procedure	Miles per gallon means "miles divided by gallons," so 1,051.6 miles ÷ 53.82 gallons = **19.5 mpg**

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

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

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

9. $2\overline{)3}$ → $2\overline{)3}$ → $\mathbf{1\frac{1}{2}}$ (remainder) (divisor)

   2 → 2

   1 (remainder) → 1

10. $3\overline{)8}$ → $3\overline{)8}$ → $\mathbf{2\frac{2}{3}}$

    6 → 6

    2 → 2

11. $\frac{3}{4} = \frac{?}{12}$ (×3, ×3) → $\frac{3}{4} = \mathbf{\frac{9}{12}}$ (×3, ×3)

12. $\frac{7}{6} = \frac{?}{30}$ (×5, ×5) → $\frac{7}{6} = \mathbf{\frac{35}{30}}$ (×5, ×5)

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

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

$19\overline{)437}$ → $19\overline{)76}$ → $19\overline{)57}$

380 → 57 → 57

57 → 19 → 0

Unit 2.2 Working with fractions and mixed numbers

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

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

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

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

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

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

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

22. $= \frac{\cancel{4}}{5} \times \frac{3}{\cancel{8}_2} = \mathbf{\frac{3}{10}}$

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

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

25. $4\frac{1}{4} \rightarrow 4\frac{3}{12}$

$+2\frac{1}{3} \rightarrow +2\frac{4}{12}$

Need LCD $\mathbf{6\frac{7}{12}}$

26. $2\frac{3}{4} \rightarrow 2\frac{9}{12}$

$+2\frac{2}{3} \rightarrow +2\frac{8}{12}$

Need LCD $4\frac{17}{12} = 4 + 1\frac{5}{12} = \mathbf{5\frac{5}{12}}$

27. $4\frac{3}{4} \rightarrow 4\frac{3}{4}$

$-2\frac{1}{2} \rightarrow -2\frac{2}{4}$

Need LCD $\mathbf{2\frac{1}{4}}$

28. $4\frac{1}{4} \rightarrow 4\frac{3}{12} \rightarrow 3\frac{15}{12}$

$-2\frac{1}{3} \rightarrow -2\frac{4}{12} \rightarrow -2\frac{4}{12}$

Need LCD — Must borrow $\mathbf{1\frac{11}{12}}$

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

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

31. $9\frac{1}{2} \rightarrow 9\frac{2}{4}$

$+\frac{3}{4} \rightarrow +\frac{3}{4}$

$+\frac{1}{2} \rightarrow +\frac{2}{4}$

Need LCD $9\frac{7}{4} = 9 + \frac{7}{4} = 9 + 1\frac{3}{4} = \mathbf{10\frac{3}{4}}$ **inches**

32. $3\frac{2}{3} \div \frac{1}{3} = \frac{11}{3} \div \frac{1}{3} = \frac{11}{\cancel{3}} \times \frac{\cancel{3}}{1} = \mathbf{11}$ **loaves**

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

34. $\$150{,}000 \times \frac{4}{5} = \frac{\overset{\$30{,}000}{\cancel{\$150{,}000}}}{1} \times \frac{4}{\cancel{5}} = \$120{,}000$ $\$150{,}000$ Price - $\$120{,}000$ Loan = **$30,000**

35. $150 \div 1\frac{1}{4} = 150 \div \frac{5}{4} = \frac{^{30}\cancel{150}}{1} \times \frac{4}{\cancel{5}} =$ **120 days**

36. $\$120 \times 2\frac{1}{2} = \$120 \times \frac{5}{2} = \frac{^{\$60}\cancel{\$120}}{1} \times \frac{5}{\cancel{2}} =$ **\$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: $\$8 \times 1\frac{1}{2} = \frac{^{\$4}\cancel{\$8}}{1} \times \frac{3}{\cancel{2}} = \$12$ per hour 5 hours × \$12 per hour = **\$60**

39. $2\frac{3}{4} \div \frac{1}{4} = \frac{11}{4} \div \frac{1}{4} = \frac{11}{\cancel{4}} \times \frac{\cancel{4}}{1} =$ **11 feet**

40. Discount: $\$44 \times \frac{1}{4} = \frac{^{11}\cancel{44}}{1} \times \frac{1}{\cancel{4}} = \$11$ Sale price: \$44 - \$11 = **\$33**

41. $85 \div 2\frac{1}{3} = 85 \div \frac{7}{3} = \frac{85}{1} \times \frac{3}{7} = \frac{255}{7} = 36\frac{3}{7} =$ **36 whole shirts**

Unit 2.3 Fraction/decimal conversions

42. Fifteen and twenty-two hundredths = $15\frac{22}{100} =$ **$15\frac{11}{50}$**

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.
```
.3125
16)5.0000
  48
  20
  16
  40
  32
  80
  80
```

46.
```
.66 = .66̄
3)2.00
 18
  20
  18
   2  (repeating)
```

47.
```
.4545 = .45̄
11)5.0000
  44
  60
  55
  50
  44
  60
  55
```

48.
```
.8 + 3 = 3.8
5)4.0
  40
```

49. **Problems 45 and 48 are terminating; 46 and 47 are repeating.**

50. $\frac{1}{2} \times .57 = .5 \times .57 =$ **.285 acres**

51. $\frac{1}{7} \times \frac{\$12{,}320{,}000}{1} = \frac{\$12{,}320{,}000}{7} =$ **\$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 × 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 slats × \$1.25 = **\$472.50**

55. Flour: $1\frac{2}{3} \times 3\frac{1}{2} = \frac{5}{3} \times \frac{7}{2} = \frac{5 \times 7}{3 \times 2} = \frac{35}{6} =$ **$5\frac{5}{6}$ cups**
Peanut butter: $\frac{1}{3} \times 3\frac{1}{2} = \frac{1}{3} \times \frac{7}{2} = \frac{7}{6} =$ **$1\frac{1}{6}$ cups**
Eggs: $2 \times 3\frac{1}{2} = \frac{\cancel{2}}{1} \times \frac{7}{\cancel{2}} =$ **7 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. $168 \div \frac{3}{8} = \frac{^{56}\cancel{168}}{1} \times \frac{8}{\cancel{3}} =$ **448 homesites**

60.

Revenue: 448 × $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. $195 \div 8\frac{1}{8} = 195 \div \frac{65}{8} = \frac{^{3}\cancel{195}}{1} \times \frac{8}{\cancel{65}} =$ **24 suits**

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

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

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

$153\overline{)198}\ 1$, remainder 45

$45\overline{)153}\ 3$, remainder 18

$18\overline{)45}\ 2$, remainder 9

$9\overline{)18}\ 2$, remainder 0

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. $16\overline{)11.0000} = .6875$, so $.6875 + 4 =$ **4.6875**

96

140

128

120

112

80

80

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 $3\frac{14}{8} = 3 + \frac{14}{8} = 3 + 1\frac{6}{8} = 4\frac{6}{8} = \mathbf{4\frac{3}{4}\ inches}$

12. Length of fence (inches): $155 \times 12 = 1{,}860$ inches

Number of slats: $1{,}860 \div 3.75 = 496$ slats

Cost: 496 slats $\times$ \$1.45 = **\$719.20**

Chapter 3 Equations: A Guide to Finding the Unknown

Unit 3.1 Mathematical symbols and expressions

1. **False**. $\neq$ means "is not equal to"
2. 7×12 $7 \cdot 12$ $7(12)$
3. **False.** Means 17 divided by 13.
4. a. **Yes** b. **No** c. **Yes**
5. 7^5
6. $3^5 = 3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 = \mathbf{243}$
7. $= 4 + 10 = \mathbf{14}$
8. $= (11)^2 = \mathbf{121}$
9. $= 8 + 9 = \mathbf{17}$
10. $= 5[2 + 3(2) - 5] + 3 = 5[2 + 6 - 5] + 3 = 5[3] + 3 = 15 + 3 = \mathbf{18}$
11. $= 3 + (+5) + (-2) - (+2) - (-6) = 3 + 5 - 2 - 2 + 6 = \mathbf{10}$
12. $= \mathbf{12}$
13. $= \mathbf{-7}$
14. $(2)(-3) = -6$; $(-6)(2) = -12$; $(-12)(4) = -48$; $(-48)(-3) = 144$; $(144)(-2) = \mathbf{-288}$
15. $= \mathbf{6}$
16. $= \mathbf{2m + 2n}$
17. $= \mathbf{15a + 10b}$
18. $= 2y - y + 2 = \mathbf{y + 2}$
19. $= 3m + 4m + 2 - 3m + 6 = \mathbf{4m + 8}$
20. **Cannot simplify**

Unit 3.2 Equations: Solving for the unknown

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

22. $x - 8 = 27$

$+8 \quad +8$

$x = \mathbf{35}$

23. $y + 17 = 23$

$-17 \quad -17$

$y = \mathbf{6}$

24. $3a = 15$

$\frac{3a}{3} = \frac{15}{3}$

$a = \mathbf{5}$

25. $\frac{t}{8} = 3$

$\frac{8}{1}\left(\frac{t}{8}\right) = 8(3)$

$t = \mathbf{24}$

26. $\frac{2}{7}y = 3$

$\frac{7}{2}\left(\frac{2}{7}\right)y = \frac{7}{2}\left(\frac{3}{1}\right)$

$y = \mathbf{\frac{21}{2}}$

27. $2b + 7 = 43$

$-7 \quad -7$

$2b = 36$

$\frac{2b}{2} = \frac{36}{2}$

$b = \mathbf{18}$

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

$3m - m + 4 = 14$

$2m + 4 = 14$

$-4 \quad -4$

$2m = 10$

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

$m = \mathbf{5}$

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

$-2p \quad -2p$

$-4 = 3p + 8$

$-8 \quad -8$

$-12 = 3p$

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

$\mathbf{-4} = p$

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

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

$9x - 4 = 2x + 10$

$-2x \quad -2x$

$7x - 4 = 10$

$+4 \quad +4$

$7x = 14$

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

$x = \mathbf{2}$

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

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

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

$3(11) - 19 = 14$

$33 - 19 = 14$

$\mathbf{14 = 14}$

Unit 3.3 Guideline for solving word problems

32. $\mathbf{4b}$

33. $\mathbf{x + 12}$ or $\mathbf{12 + x}$

34. $\mathbf{a - 8}$

35. $\mathbf{2(x + y + z)}$

36. $\mathbf{y = x + 4}$

37. $\mathbf{r + 2 = t + 4}$

38. $\mathbf{\frac{n}{3} = 18}$

39.

$? = \$65{,}000$

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

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

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

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

$B = \$28{,}500$

Britney	**$28,500**
Megan: $28,500 + $8,000	**36,500**
	$65,000

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

$? = 6{,}100$

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

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

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

$3S = 4{,}800$

$S = 1{,}600$

Offices	1,300 sq ft
Showroom	**1,600 sq ft**
Warehouse: 2(1,600 sq ft)	**3,200 sq ft**
	6,100 sq ft

41.

$? = \$280{,}000$

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

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

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

$L = \mathbf{\$\ 80{,}000}$

Land	$ 80,000
Home: 2.5($80,000)	200,000
	$280,000

42.

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

$$\begin{array}{l} \frac{7}{3}W = \$350{,}000 \\ \frac{\cancel{3}}{\cancel{7}}\left(\frac{\cancel{7}}{\cancel{3}}\right)W = \frac{3}{7}(\$350{,}000) \\ W = \$150{,}000 \end{array}$$

Wife	**$150,000**
Child #1: $150,000 × $\frac{2}{3}$	**100,000**
Child #2: $150,000 × $\frac{2}{3}$	**100,000**
	$350,000

43.

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

Trucks	**34**
Cars: 6(34)	**204**
	238

44.

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

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

Challenge problems

45. **a.** 1.5 (4,000 lb) = **6,000 lb**

b.

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

Water	**400 lb**
Sand: 5(400 lb)	**2,000 lb**
Cement: 2(400 lb)	**800 lb**
Gravel: 7(400 lb)	**2,800 lb**
	6,000 lb

46.

Home	$190,000
Additional	+ 19,000
Total	**$209,000**

47. **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	$180,000
Additional	+ 18,000
Total	**$198,000** (works!)

48.

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

$P + .07P = 1.07P$

Price of products	$3,355.14
Sales tax: $3,355.14 × .07	+ **234.86**
Total collected from customers	$3,590.00

49

$$\begin{aligned} ? &= 18 \text{ oz} \\ C + A + M &= 18 \text{ oz} \\ 2M + 3C + M &= 18 \text{ oz} \\ 2M + 3(2M) + M &= 18 \text{ oz} \\ 2M + 6M + M &= 18 \text{ oz} \\ 9M &= 18 \text{ oz} \\ M &= 2 \text{ oz} \end{aligned}$$

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

Macadamia nuts	**2 oz**
Cashews: 2(2 oz)	**4 oz**
Almonds: 3(4 oz)	**12 oz**
	18 oz

50.

$$\begin{aligned} F + V &= R \\ \$13{,}000 + \$8C &= \$28C \\ \$13{,}000 &= \$20C \\ \mathbf{650} &= C \end{aligned}$$

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

51. 650 customers ÷ 25 days = **26 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.

$$\begin{aligned} m - 12 &= 28 \\ m &= \mathbf{40} \end{aligned}$$

8. $\frac{5}{4} \cdot \frac{4}{5} y = \frac{5}{4}\left(\frac{28}{1}\right)$

$y = \mathbf{35}$

9.

$$\begin{aligned} 3p &= 12 \\ p &= \mathbf{4} \end{aligned}$$

10.

$$\begin{aligned} 8p - 4 - 3p + 4 &= 2p + 5 \\ 5p &= 2p + 5 \\ 3p &= 5 \\ p &= \mathbf{\frac{5}{3}} \end{aligned}$$

11. $\boldsymbol{m + 4 = n + 3}$

12.

$$\begin{aligned} ? &= \$30{,}000 \\ B + C &= \$30{,}000 \\ B + B + \$5{,}000 &= \$30{,}000 \\ 2B + \$5{,}000 &= \$30{,}000 \\ 2B &= \$25{,}000 \\ B &= \$12{,}500 \end{aligned}$$

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

13.

$$\begin{aligned} F + V &= R \\ \$4{,}800 + \$.015C &= \$.06C \\ \$4{,}800 &= \$.045C \\ \frac{\$4{,}800}{\$.045} &= C \\ \mathbf{106{,}667} &\approx C \end{aligned}$$

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

Chapter 4 Percents

Unit 4.1 Percent conversions

1. = .079 = **7.9%**

2. = 1.35 = **135%**

3. = 52.1% = **.521**

4. = 08.3% = **.083**

5. = 137.5% = **1.375**

6. = 00.625% = **.00625**

7. = .875 = **87.5%**

8. = 1.25 = **125%**

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

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

Unit 4.2 The percent formulas

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

12. Portion = Base × Rate = 250 × 35% = 250 × .35 = **87.5**

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

    Check answer: 150 × 40% = 60

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

    Check answer: 320 × 75% = 240

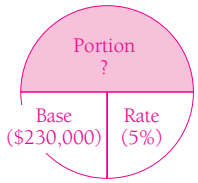
15. $\text{Rate} = \frac{\text{Portion}}{\text{Base}} = \frac{25}{50} = .50 = \mathbf{50\%}$

    Check answer: 50 × 50% = 25

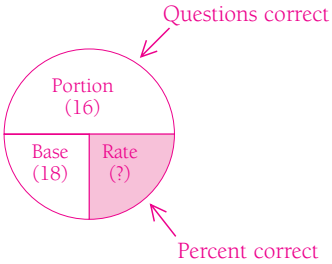
16. $\text{Rate} = \frac{\text{Portion}}{\text{Base}} = \frac{117}{90} = 1.30 = \mathbf{130\%}$

    Check answer: 90 × 130% = 117

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



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

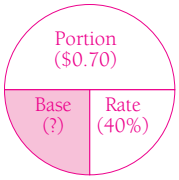


19. Matt: Portion = Base × Rate = \$42,700 × 60% = \$42,700 × .60 = **\$25,620**
    Robbie: Portion = Base × Rate = \$42,700 × 40% = \$42,700 × .40 = **17,080**
    \$42,700

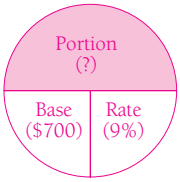
20. Questions you must answer correctly: Portion = Base × Rate = 35 × 85% = 35 × .85 = 29.75
    Because it is not possible to get .75 of a question correct, you must get at least 30 questions correct to get at least 85%.
    This means **you can miss no more than 5 questions** to get a B.

21. $\text{Base} = \frac{\text{Portion}}{\text{Rate}} = \frac{\$0.70}{40\%} = \frac{\$0.70}{.40} = \mathbf{\$1.75}$

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

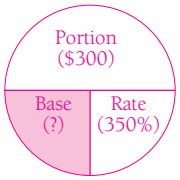


22. Portion = Base × Rate = \$700 × 9% = \$700 × .09 = **\$63**



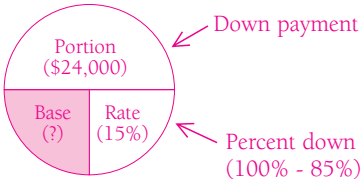
23. Base = $\frac{\text{Portion}}{\text{Rate}} = \frac{\$300}{350\%} = \frac{\$300}{3.50} =$ **$85.71**

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

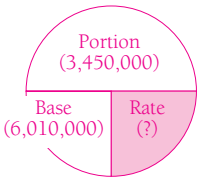


24. Base = $\frac{\text{Portion}}{\text{Rate}} = \frac{\$24{,}000}{15\%} = \frac{\$24{,}000}{.15} =$ **$160,000**

Check answer: $160,000 × 15% = $24,000



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



Unit 4.3 Increase and decrease problems

26. Sales tax: Portion = Base × Rate = $970 × 6.75% = $970 × .0675 = **$65.48**
Total amount due: $970 (original amount) + $65.48 (increase) = **$1,035.48**

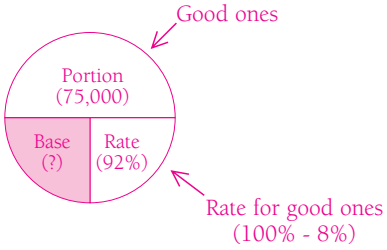
27. Amount of decrease: Portion = Base × Rate = $872 × 3% = $872 × .03 = $26.16
New amount: $872 (original amount) - $26.16 (decrease) = **$845.84**

28. Pay raise: Portion = Base × Rate = $9.75 × 10% = $9.75 × .10 = $0.98
New hourly rate: $9.75 (original amount) + $0.98 (increase) = **$10.73**

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

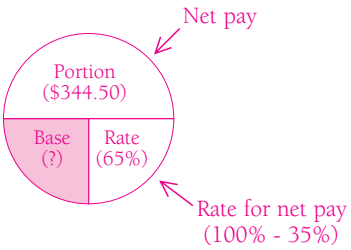
Note: .74 of a battery is not much good, so we round up to 81,522.

Check answer: 81,522 - 8%(81,522) ≈ 75,000



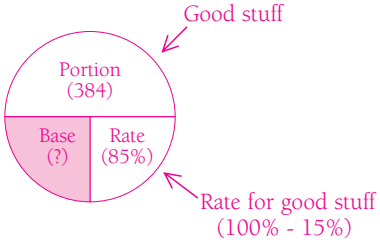
30. Base = $\frac{\text{Portion}}{\text{Rate}} = \frac{\$344.50}{65\%} = \frac{\$344.50}{.65} =$ **$530**

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



31. Base = $\frac{\text{Portion}}{\text{Rate}} = \frac{384}{85\%} = \frac{384}{.85} \approx 451.76$ sq ft ≈ **452 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 × 7% = $235,000 × .07 = $16,450
Company share: $16,450 × 60% = $16,450 × .60 = $9,870
Your share: $9,870 × 70% = $9,870 × .70 = **$6,909**

41. Portion = Base × Rate = $42,378 × 13% = $42,378 × .13 = **$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 × 7%	+ 3.85
Cost, including sales tax	$58.85
Tip: $58.85 × 15%	+ 8.83
Total cost	**$67.68**

No, the total cost is more than you have.

45. Amount of increase: Portion = Base × Rate = $1,250 × 20% = $250
New amount: $1,250 (original amount) + $250 (increase) = **$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

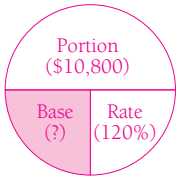
1. $.065 = .065 = \mathbf{6.5\%}$ 2. $87\frac{1}{2}\% = 87.5\% = \mathbf{.875}$ 3. $\frac{5}{16} = .3125 = \mathbf{31.25\%}$

4. $12.5\% = 12\frac{1}{2}\% = \frac{25}{2}\% = \frac{25}{2} \times \frac{1}{100} = \frac{25}{200} = \mathbf{\frac{1}{8}}$

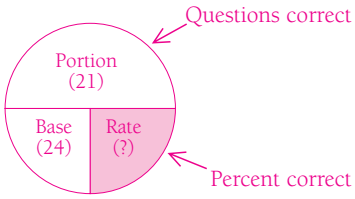
5. Portion = Base × Rate = $210,000 × 20% = $210,000 × .20 = **$42,000**

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

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



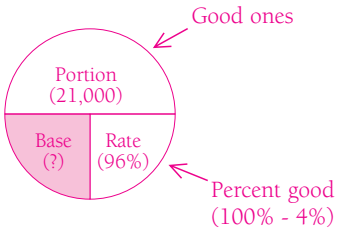
7. $\text{Rate} = \frac{\text{Portion}}{\text{Base}} = \frac{21}{24} \approx .875 = \mathbf{87.5\%}$



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

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

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



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

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 × 30% = **$360**	$1,200 - $360 = **$840**
2.	Copy machine	$700	25%	$700 × 25% = **$175**	$700 - $175 = **$525**

	Product	List price	Trade discount rate	Complement of rate	Net price
3.	Computer	$1,200	30%	100% - 30% = 70%	$1,200 × 70% = **$840**
4.	Copy machine	$700	25%	100% - 25% = 75%	$700 × 75% = **$525**

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

6.

List price	$6,400
First discount: $6,400 × 25%	- 1,600
Price after first discount	$4,800
Second discount: $4,800 × 10%	- 480
Price after second discount	$4,320
Third discount: $4,320 × 10%	- 432
Net price	**$3,888**

7.

Step 1 (complements)	**Step 2 (multiply complements)**	**Step 3 (complement of Step 2)**
25% 10% 10%	75% × 90% × 90%	100.00%
↓ ↓ ↓	= .75 × .90 × .90	- 60.75%
75% 90% 90%	= .6075	**39.25%**
	= 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 × 39.25%	- 2,512
Net price	**$3,888**

Unit 5.2 Cash discounts

10.

List price	$800.00
Less returned goods	- 50.00
Price of goods after returns	$750.00
Less trade discount: $750 × 20%	- 150.00
Net price	$600.00
Less cash discount: $600 × 4%	- 24.00
Net price, less cash discount	$576.00
Add freight	+ 20.00
Net amount due	**$596.00**

11. **a.** Cash discount: $240 × 3% = **$7.20**
b. Net amount due: $240 - $7.20 = **$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 × 1% = $0.75; net amount due = $75.20 - $0.75 = **$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 $= \frac{\text{Amount paid}}{\text{Complement of cash discount rate}} = \frac{\$10{,}000}{100\% - 3\%} = \frac{\$10{,}000}{97\%} = \frac{\$10{,}000}{.97} =$ **$10,309.28**

17. $\frac{6}{94} \times \frac{365}{30 - 10} = \frac{6}{94} \times \frac{365}{20} = \frac{6 \times 365}{94 \times 20} = \frac{2{,}190}{1{,}880} \approx 1.1649 \approx$ **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) = **$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.	Computer	$1,200	30%	**$840.00**	2%	**$823.20**
23	Copy machine	$700	30/10	**$441.00**	8%	**$405.72**
24.	Desk	$800	25/15/5	**$484.50**	4%	**$465.12**

25.

List price	$455.00
Trade discount amount: $455 × 25%	- 113.75
Net price	**$341.25**

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

27.

Net price	$341.25
Cash discount: $341.25 × 3%	- 10.24
Net amount due	**$331.01**

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

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

30. 15 × $183.25 = **$2,748.75**
3 × $195.50 = **$586.50**
24 × $34.98 = **$839.52**

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

Subtotal	$586.50
First discount: $586.50 × 20%	- 117.30
Price after first discount	$469.20
Second discount: $469.20 × 5%	- 23.46
Net price	**$445.74**

32. Total Net Prices: $2,199.00 + $445.74 + $671.62 = $3,316.36
Balance Due: $3,316.36 + $182.00 = **$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 × 3%	- 99.49	*Remember, the discount does not apply to freight*
Net price, less cash discount	$3,216.87	
Add freight	+ 182.00	
Net amount due	**$3,398.87**	

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

? = $8.78	*Something = $8.78*
P - D = $8.78	*Price - trade discount = $8.78*
P - 30%P = $8.78	*Substitute: D = 30%P*
70%P = $8.78	*Combine terms on left (100%P - 30%P = 70%P)*
P = **$12.54**	*Divide both sides of equation by 70% (or .70)*

36.

List price	$12.54
Trade discount: $12.54 × 30%	- 3.76
Net price	**$8.78**

Practice Test

1. List price $820.00
   Trade discount amount: $820 × 25% -205.00
   Net price **$615.00**

2. List price $22.00
   First discount: $22 × 20% - 4.40
   Price after first discount $17.60
   Second discount: $17.60 × 10% - 1.76
   Net price **$15.84**

3. **Step 1 (complements)** 20% 15% 5% → 80% 85% 95%
   Step 2 (multiply complements) 80% × 85% × 95% = .80 × .85 × .95 = .646 = 64.6%
   Step 3 (complement of Step 2) 100.0% - 64.6% **35.4%**

4. October 28 is day 301; 301 + 20 = 321. Day 321 is **November 17.**

5. List price $820.00
   Trade discount: $820 × 25% -205.00
   Net price $615.00
   Cash discount: $615 × 2% - 12.30
   Net amount due **$602.70**

6. Amount credited $= \frac{\text{Amount paid}}{\text{Complement of cash discount rate}} = \frac{\$11,500}{100\% - 5\%} = \frac{\$11,500}{95\%} = \frac{\$11,500}{.95} =$ **$12,105.26**

7. $\frac{8}{92} \times \frac{365}{60 - 10} = \frac{8}{92} \times \frac{365}{50} = \frac{8 \times 365}{92 \times 50} = \frac{2,920}{4,600} \approx .6348 \approx$ **63.48%**

Chapter 6 Markup and Markdown

Unit 6.1 Markup

	Cost	Markup($)	Selling price
1.	$2450	$800	**$3,250**
2.	$1.57	$0.50	**$2.07**
3.	$100	**$70**	$170
4.	**$300**	$200	$500

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

7. $S = C + M$
   $S = \$700 + 20\%(\$700)$
   $S = \$700 + \$140$
   $S =$ **$840**

8. $S = C + M$
   $\$360 = 100\%C + 20\%C$
   $\$360 = 120\%C$
   $\$360 = 1.20C$
   $\frac{\$360}{1.20} = \frac{1.20}{1.20}C$
   $300 $= C$

9. $S = C + M$
   $\$250 = C + 30\%(\$250)$
   $\$250 = C + \$75$
   $175 $= C$

10. $S = C + M$
$100\%S = \$168 + 30\%(S)$
$70\%S = \$168$
$.70S = \$168$
$\frac{.70}{.70}S = \frac{\$168}{.70}$
$S = \mathbf{\$240}$

11. $S = C + M$
$S = \$10.50 + 20\%(\$10.50)$
$S = \$10.50 + \$2.10$
$S = \mathbf{\$12.60}$

12. $S = C + M$
$\$12 = 100\%C + 20\%C$
$\$12 = 120\%C$
$\$12 = 1.20C$
$\frac{\$12}{1.20} = \frac{1.20}{1.20}C$
$\mathbf{\$10} = C$

Unit 6.2 Percent markup

13. **a.** $M = S - C = \$72 - \$48 = \mathbf{\$24}$

b. Percent markup on cost $= \frac{M}{C} = \frac{\$24}{\$48} = .50 = \mathbf{50\%}$

c. Percent markup on selling price $= \frac{M}{S} = \frac{\$24}{\$72} \approx .333 \approx \mathbf{33.3\%}$

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

18. Markup = $60\%(\$40) = .60(\$40) = \mathbf{\$24}$

19. $S = C + M = \$40 + \$24 = \mathbf{\$64}$

20. $\frac{60\%}{100\% + 60\%} = \frac{60\%}{160\%} = \frac{.60}{1.60} = .375 = \mathbf{37.5\%}$

21. Markup = $37.5\%(\$64) = .375(\$64) = \mathbf{\$24}$ (This is the same dollar amount of markup found in Problem 18)

Unit 6.3 Markdown

22. **False**

23. $\$250 - \$50 = \mathbf{\$200}$

24.

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

25.

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

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

27.

Original marked price	\$500
Markdown 1: \$500 × 25%	- 125
Reduced price, after markdown 1	\$375
Markdown 2: \$375 × 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**

$S = C + M$
$S = \$120 + 25\%(\$120)$ *(C = 200 × $0.60 = $120)*
$S = \$120 + \$30$
$S = \$150$

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 mangos (200 × 15% = 30) × $0.60	- 18
Proceeds required from top-quality mangos	$132

Step 3 Find original marked price

200 total mangos - 30 sold at cost - 40 discarded (200 × 20% = 40) = 130 mangos
130 mangos will sell at original marked price, so: $132 ÷ 130 ≈ $1.015 ≈ **$1.02 each** (Always round *up*.)

30.

130 mangos at full price: 130 × $1.02	$132.60
30 mangos at cost: 30 × $0.60	18.00
+ 40 mangos discarded	+ 0.00
200	**$150.60** ←

Total sales proceeds are slightly more than the desired $150 because we rounded *up* 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 × 1.70 = **$1.19 each**

Challenge problems

	Cost	Markup			Selling price
		% of cost	Dollar amount	% of selling price	
33.	$1,300	40%	**$520**	—	**$1,820**
34.	$180	**97.2%**	**$175**	**49.3%**	$355
35.	**$2,550**	—	**$850**	25%	$3,400
36.	$28.50	—	—	30%	**$40.71**
37.	**$3,913.04**	15%	**$586.96**	**13.0%**	$4,500
38.	—	20%	—	**16.7%**	—
39.	—	**150%**	—	60%	—

40. $165 - $95 = **$70**

41. $\frac{\$70}{\$95} \approx .737 \approx$ **73.7%**

42. $\frac{\$70}{\$165} \approx .424 \approx$ **42.4%**

43.

Original marked price	$165.00
Markdown 1: $165 × 20%	- 33.00
Reduced price, after markdown 1	$132.00
Markdown 2: $132 × 15%	- 19.80
Reduced price, after markdown 2	$112.20
Markdown 3: $112.20 × 10%	- 11.22
Reduced price, after markdown 3	**$100.98**

44. $100.98 reduced price - $95.00 cost = **$5.98**

45. $\frac{\$5.98}{\$95} \approx .063 \approx$ **6.3%**

46. $165 original marked price - $100.98 reduced price = **$64.02**

47. $\frac{\$64.02}{\$165} = .388 =$ **38.8%**

48. $M = S - C = 7.90 - 2.45 = 5.45$ Percent markup on cost = $\frac{5.45}{2.45} \approx 2.224 \approx$ **222.4%**

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

Cost	$20.00
Markup: $20 × 100%	+20.00
Original marked price	$40.00
Markdown: $40.00 × 50%	- 20.00
Reduced price	**$20.00**

50.

Cost to manufacturer	$192.45
Markup: $192.45 × 30%	+ 57.74
Manufactrer's list price	$250.19
Less trade discount: $250.19 × 15%	- 37.53
Net price to wholesaler	$212.66
Less cash discount: $212.66 × 1%	- 2.13
Net amount due	$210.53
Markup: $210.53 × 35%	+ 73.69
Wholesaler's list price	$284.22
Less trade discount: $284.22 × 10%	- 28.42
Net price to retailer	$255.80*
Less cash discount: $255.80 × 2%	- 5.12
Net amount due	$250.68

Retailer's original marked price:

$S = C + M$
$S = \$250.68 + 30\%S$
$70\%S = \$250.68$
$S = \$358.11$*

Original marked price	$358.11
Markdown: $358.11 × 25%	- 89.53
Reduced price	**$268.58**

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

Practice Test

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

2.
$S = C + M$
$\$45 = 100\%C + 125\%C$
$\$45 = 225\%C$
$\$45 = 2.25C$
$\frac{\$45}{2.25} = \frac{2.25}{2.25}C$
$20 $= C$

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

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

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

6.

Original marked price	$5,500
Markdown 1: $5,500 × 10%	- 550
Reduced price, after markdown 1	$4,950
Markdown 2: $4,950 × 10%	- 495
Reduced price, after markdown 2	**$4,455**

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

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

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

$S = C + M$
$S = \$96 + 25\%(\$96)$ *(C = 300 lb × $0.32 = $96)*
$S = \$96 + \$24$
$S = \$120$

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 × 25% = 75) × $0.24 ($0.32 cost × 75% = $0.24)	- 18
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 × 15% = 45) = 180 lb
180 lb will sell at original marked price, so: $102 ÷ 180 ≈ $0.567 ≈ **$0.57 per pound** (Always round *up*.)

Check answer

180 lb at full price: 180 × $0.57	$102.60
75 lb at 75% of cost: 75 × $0.24	18.00
+ 45 lb discarded	+ 0.00
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**

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 = **$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	
1. Ending balance in your check register	$12,434.74
2. Add:	
June interest	12.51
Error ck 579	20.00
3. Subtotal	$12,467.25
4. Subtract:	
Check printing charges	82.00
5. **TOTAL**	**$12,385.25**

BANK STATEMENT	
1. Ending balance on bank statement	$13,556.25
2. Add: Outstanding deposits	
June 30	900.00
3. Subtotal	$14,456.25
4. Subtract: Outstanding checks	
ck 583	220.00
ck 585	1,851.00
5. **TOTAL**	**$12,385.25**

21. Reconciliation Period Ending October 31, 20xx

CHECKBOOK BALANCE	
1. Ending balance in your check register	$18,837.00
2. Add:	
October interest	32.18
Ck 858 error	27.00
3. Subtotal	$18,896.18
4. Subtract:	
Debit memo (October 18)	11.00
5. **TOTAL**	**$18,885.18**

BANK STATEMENT	
1. Ending balance on bank statement	$18,443.18
2. Add: Outstanding deposits	
October 31	1,400.00
3. Subtotal	$19,843.18
4. Subtract: Outstanding checks	
ck 844	180.00
ck 863	778.00
5. **TOTAL**	**$18,885.18**

Challenge problems

22.

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

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	
1. Ending balance in your check register	$2,324.75
2. Add:	
ck 102 (written for $167, not $176)	9.00
October interest	11.32
3. Subtotal	$2,345.07
4. Subtract:	
ck printing charges	28.75
5. **TOTAL**	**$2,316.32**

BANK STATEMENT	
1. Ending balance on bank statement	$843.57
2. Add: Outstanding deposits	
October 31	1,800.00
3. Subtotal	$2,643.57
4. Subtract: Outstanding checks	
ck 104	327.25
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

1. **(a) Debit memo.** Your checking account balance must be *decreased* to reflect the correct amount of the deposit.

2. $482.33 + $700 + $145.45 + $1,200 - $228 - $145.22 - $950 - $45 = **$1,159.56**

3. Reconciliation Period Ending April 30, 20xx

CHECKBOOK BALANCE	
1. Ending balance in your check register	$5,545.90
2. Add:	
April interest	18.45
3. Subtotal	$5,564.35
4. Subtract:	
Check printing charges	78.00
Cash withdrawal April 22	200.00
5. **TOTAL**	**$5,286.35**

BANK STATEMENT	
1. Ending balance on bank statement	$5,466.35
2. Add: Outstanding deposits	
April 30	650.00
3. Subtotal	$6,116.35
4. Subtract: Outstanding checks	
ck 928	320.00
ck 930	510.00
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 × 12	$15,540.00
Betty:	$640 × 24	$15,360.00
Brad:	$310 × 52.14 weeks	**$16,163.40**
Meg:	$600 × 26.07 biweekly periods	$15,642.00

5. 8 cars × $150 = **$1,200**

6.

Base salary:	40 hours × $5.50	$220.00
Piecework:	32 sleeping bags × $1.50	+ 48.00
Gross pay		**$268.00**

7.

100 × $1.75	$175
100 × $2.00	200
+144 × $2.25	+324
344	**$699**

8. Net sales: $125,800 - $2,592 returns = $123,208

Commission: $123,208 × 3%		$3,696.24
Less draw: 2 draws × $1,200		- 2,400.00
Commission still due		**$1,296.24**

9.

Salary: 2 × $800				$1,600
Commission:				
Net sales: $128,300 - $3,400	$124,900			
Base amount	- 80,000			
Overage	$ 44,900	×	3%	+1,347
Total earnings				**$2,947**

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**	**143.10**	**63.75**	50.00	Savings	**354.39**	**920.61**
Ashlie Dobbs	S-1	14,580	810	**810**	**810**	**50.22**	**11.75**	**105.37**	**40.50**	—	—	**207.84**	**602.16**
Ian Rice	M-3	6,500	1,140	**1,140**	**1,140**	**70.68**	**16.53**	**102.66**	**57.00**	—	—	**246.87**	**893.13**
Totals	—	**84,830**	**3,225**	**3,225**	**3,225**	**199.95**	**46.77**	**351.13**	**161.25**	**50.00**	—	**809.10**	**2,415.90**

13. **False**

14. Social Security:

Limit	$102,000	
Prior earnings	- 101,250	
Amount subject to Social Security tax	$ 750 × 6.2% =	**$46.50**

Medicare: $2,250 × 1.45% = **$32.63**

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			×0.8%	×2.5%
Tax			**$4.00**	**$39.00**

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)	4.00
SUT (from Problem 19)	39.00
Health insurance premiums: 3 employees × $100	300.00
Contribution to employees' retirement plans: $3,225 × 8%	+ 258.00
Total payroll expenses	**$4,072.72**

21. **True**

22. **True**

23.

Step 1	$140,000 × 92.35% = $129,290	
Step 2	FICA tax on first $102,000: $102,000 × 15.3%	$15,606.00
	FICA tax on remainder: 2.9%($129,290 - $102,000)	+ 791.41
	Total, rounded	**$16,397.00**

24.

Federal income tax	$17,211
Self-employment FICA tax (from Problem 23)	+ 16,397
Total tax liability	**$33,608**

25. Total tax liability (from Problem 24) $33,608
Amounts already paid to IRS: 4 × $9,000 $36,000
Lee has paid too much to the IRS; he will get a **refund of $2,392** ($36,000 - $33,608).

Challenge problems

26.

Base salary: 40 hours × $8.50	$340.00
Piecework: 48 tents × $2.50	+120.00
Gross pay	**$460.00**

27. $460 gross pay ÷ 40 hours = **$11.50 per hour**

28. Social Security tax: $2,500 × 6.2% = **$155.00**
Medicare tax: $2,500 × 1.45% = **$36.25**
Federal income tax:

Step 1 Illustration 8-2, semimonthly: $145.83 × 2 = $291.66
Step 2 $2,500 - $291.66 = $2,208.34
Step 3 Illustration 8-3, Table 3 (semimonthly), married, over $981 but not over $3,006:

$64.80 + 15%($2,208.34 - $981) = $64.80 + 15%($1,227.34) = $64.80 + $184.10 = **$248.90**

State income tax: $2,500 × 6.5% = **$162.50**

29.

Gross pay		$2,500.00
Less deductions:		
Social Security tax	$155.00	
Medicare tax	36.25	
Federal income tax	248.90	
State income tax	162.50	
Savings plan deduction	+ 75.00	
Total deductions		- 677.65
Net pay		**$1,822.35**

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	× 0.8%	**$16.00**

d. SUT: $2,500 × 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	+ 7,489	Estimated payments: 4 × $4,500	+18,000
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 regular rate × 1.5 = $14.625

Pay for regular hours: 40 hours × $9.75	$390.00
Pay for overtime: 4 hours × $14.625	+ 58.50
Gross pay for week	**$448.50**

2.

Monthly: $3,500 × 12	$42,000.00
Weekly: $820 × 52.14	**$42,754.80**

3. Base salary: 40 hours × $7.50 $300.00
Piecework: 63 coats × $2.50 +157.50
Gross pay **$457.50**

4. Social Security tax:
Limit $102,000
Prior earnings - 100,100
Amount subject to Social Security tax $ 1,900 × 6.2% $117.80
Medicare tax: $2,000 × 1.45% + 29.00
Total FICA tax **$146.80**

5. **Step 1** Using Illustration 8-2, weekly: $67.31 × 1 allowance = $67.31
Step 2 $800.00 - $67.31 = $732.69
Step 3 Using Illustration 8-3, Table 1 (weekly), single person, over $653 but not over $1,533:

$82.95 + 25%($732.69 - $653) = $82.95 + 25%($79.69) = $82.95 + $19.92 = **$102.87**

6. **False**

7. Limit: $7,000
Prior earnings - 6,400
Amount subject to FUT $ 600 × 0.8% = **$4.80**

8. **Step 1** $105,200 × 92.35% = $97,152 (rounded)
Step 2 FICA tax: $97,152 × 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 × $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, 2010**

4. $I = PRT = \$10{,}000 \times 8\% \times 1 =$ **$800** 5. $M = P + I = \$10{,}000 + \$800 =$ **$10,800**

6. $I = PRT = \$10{,}000 \times 8\% \times \frac{8}{12} = \$533.33$ $M = P + I = \$10{,}000 + \$533.33 =$ **$10,533.33**

7. $I = PRT = \$10{,}000 \times 8\% \times \frac{14}{12} = \$933.33$ $M = P + I = \$10{,}000 + \$933.33 =$ **$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, 2010	Oct. 28, 2010	**290 days**
11.	July 13, 2010	Feb. 21, 2011	**223 days**
12.	Dec. 18, 2011	Mar. 23, 2012 (leap year)	**96 days**

10. Oct. 28 → Day 301
Jan. 11 → 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 → + 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 → 82 + 1 (for leap year) = + 83
96

	Date of loan	Term	Maturity date
13.	May 15, 2010	60 days	135 + 60 = 195 $\longrightarrow$ **July 14**
14.	Aug. 2, 2010	180 days	214 + 180 = 394; 394 - 365 = 29 $\longrightarrow$ **Jan. 29**
15.	Jan. 18, 2012	90 days	18 + 90 = 108 $\longrightarrow$ **Apr. 17 (leap year)**

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	**\$189.04**	**\$7,810.96**	**\$17,189.04**
89	**\$17,541.06**	**\$352.02**	**\$17,189.04**	\$0.00
Totals	**\$25,541.06**	**\$541.06**	**\$25,000.00**	—

Procedure for payment on day 24
$I = PRT = \$25{,}000.00 \times 11.5\% \times \frac{24}{365} =$ **\$189.04**
Principal = \$8,000.00 - \$189.04 = **\$7,810.96**
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** *(89 days - 24 days = 65 days)*
Principal = **\$17,189.04** (previous balance)
Total payment = \$352.02 + \$17,189.04 = **\$17,541.06**

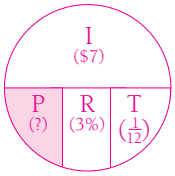
24. Problem 21: **\$945.21** Problem 22: **\$701.03** Problem 23: **\$541.06**

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.	**\$320.83**	\$5,000	11%	7 months
27.	\$63.75	**\$4,500**	8.5%	2 months
28.	2,964.75	\$35,400	**16.75%**	6 months
29.	\$275	\$2,000	11%	**1.25 yrs = 15 months**

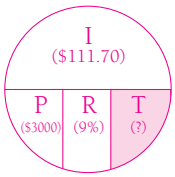
30.



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

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

31.

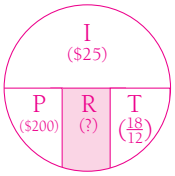


$$T = \frac{I}{PR} = \frac{\$111.70}{\$3{,}000 \times 9\%} = \frac{\$111.70}{\$270} \approx .4137037$$

365 days × .4137037 = **151 days**

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 fee = \$4,900
Interest (I) for APR purposes is total finance charges:

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

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

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 per week × 2 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. $\frac{8}{2} = \mathbf{4(\%)}$ **38.** $\frac{7}{4} = \mathbf{1.75(\%)}$ **39.** $\frac{7.5}{12} = \mathbf{.625(\%)}$

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 × 5% = \$35.00	\$735.00
2 years	\$735 × 5% = \$36.75	\$771.75
3 years	\$771.75 × 5% = \$38.59	**\$810.34**

42.

	Interest	Balance
Beginning	—	$700.00
6 months	$700 × 2.5% = $17.50	$717.50
12 months	$717.50 × 2.5% = $17.94	$735.44
18 months	$735.44 × 2.5% = $18.39	$753.82*
24 months	$753.82 × 2.5% = $18.85	$772.67
30 months	$772.67 × 2.5% = $19.32	$791.99
36 months	$791.99 × 2.5% = $19.80	**$811.79**

**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 ⟶ APY = **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 ⟶ APY = **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 ⟶ APY = **5.83%**

Challenge problems

46. Number of days: Oct. 16 ⟶ Day 289
Aug. 23 ⟶ Day −235
54

$I = PRT = \$285 \times 18\% \times \frac{54}{365} = \$7.59$

$M = P + I = \$285 + \$7.59 = \mathbf{\$292.59}$

47.

Invoice amount	$2,450
Discount: $2,450 × 4%	− 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. Number of days left in first year: 365 − 334 (day number for Nov. 30) = 31
Number of days in next year: May 4 ⟶ + 124
155

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

49. $845.23 × 6% = **$50.71**

50. $845.23 + $43.07 interest + $50.71 penalty = **$939.01**

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

52. The second bond pays 8.5% compounded annually, resulting in an APY of 8.5%. Let's find the APY for the first bond.

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

$100 + 4.175% = $104.18
+ 4.175% = $108.52 → APY = **8.52%**

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

53. **10.69% simple interest**
$I = PRT$ = $1,000 × 10.69% × 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 42 months: + 4.375% =	$1,349.51
Balance in 48 months: + 4.375% =	$1,408.55
Balance in 54 months: + 4.375% =	$1,470.17
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.
2. $I = PRT$ = $12,000 × 9.5% × $\frac{8}{12}$ = $760 $M = P + I$ = $12,000 + $760 = **$12,760**
3. June 22 → Day 173 + 120 = 293 → **Oct. 20**
4. Number of days left in first year: 365 - 357 (day number for Dec. 23) 8
   Number of days in next year: Apr. 10 → 100 + 1 (for leap year) + 101
   109
   $I = PRT$ = $1,500 × 9% × $\frac{109}{365}$ = **$40.32**
5.

Day number	Total payment	Interest	Principal	Balance
0	—	—	—	$15,000.00
22	$3,000.00	$81.37	$2,918.63	**$12,081.37**

$I = PRT$ = $15,000.00 × 9% × $\frac{22}{365}$ = $81.37
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 fee = $2,900.
   Interest (I) for APR purposes is total finance charges:

$I = PRT$ = $3,000 × 7% × $\frac{90}{360}$ =	$ 52.50
Set-up fee	+100.00
Total finance charges	$152.50

$R = \frac{I}{PT} = \frac{\$152.50}{\$2{,}900 \times \frac{90}{365}} \approx \frac{\$152.50}{\$715.07} \approx .2133 \approx$ **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 × 3% = \$15.00	\$515.00
12 months	\$515.00 × 3% = \$15.45	\$530.45
18 months	\$530.45 × 3% = \$15.91	\$546.36
24 months	\$546.36 × 3% = \$16.39	**\$562.75**

9. Periodic rate = $\frac{7.15}{2} = 3.575(\%)$

\$100 + 3.575% = \$103.58
+ 3.575% = \$107.28 → APY = **7.28%**

Chapter 10 Future Value and Present Value: Using Formulas

Unit 10.1 Time-value-of-money terminology

1. **12** (3 years × 4 periods per year)
2. **1.5%** (6% ÷ 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 ($n = 170$; $i = 4\% = .04$): $FV = PV(1 + i)^n = \$42(1.04)^{170} =$ **\$33,030.64**

10. Formula 1B ($n = 30$; $i = 8\% = .08$): $FV = PMT\left[\frac{(1 + i)^n - 1}{i}\right] = \$2{,}000\left[\frac{(1.08)^{30} - 1}{.08}\right] =$ **\$226,566.42**

11. Formula 1B ($n = 40$; $i = 8\% = .08$): $FV = PMT\left[\frac{(1 + i)^n - 1}{i}\right] = \$365\left[\frac{(1.08)^{40} - 1}{.08}\right] =$ **\$94,555.63**

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 $(1 + i)$:

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

14.

Ending balance	\$962,653.18
Total amount deposited: 612 × \$135 =	- 82,620.00
Interest earned	**\$880,033.18**

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

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

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

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

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

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

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

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

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

Unit 10.3 Present value

19. Formula 2A ($n = 10$; $i = 12\% = .12$): $PV = \frac{FV}{(1+i)^n} = \frac{\$5{,}000}{(1.12)^{10}} =$ **$1,609.87**

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

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

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

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

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

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

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

25. $100 \times \$700 =$ **$70,000**

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

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

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). $n = 13 \times 2 = 26$; $i = 8\% \div 2 = 4\% = .04$:

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

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

Total PV **$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 ($n = 20$, $i = 8\% = .08$): $PV = \dfrac{FV}{(1 + i)^n} = \dfrac{\$1{,}000}{(1.08)^{20}} = \mathbf{\$214.55}$

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

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:

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

Total FV **$9,786.03**

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

33. $3,442.50 (employee share) + $3,442.50 (employer share) = **$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 ($n = 28 \times 12 = 336$; $i = 9\% \div 12 = .75\% = .0075$):

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

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 $(1 + i)$. ($n = 20 \times 12 = 240$; $i = 9\% \div 12 = .75\% = .0075$):

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

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

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

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. $n = 5$ years $\times$ 4 periods per year = **20**

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

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

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

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

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

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

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

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

Total PV **$70,252.22**

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

Unit 11.1 Sinking funds

1. Formula 2A ($n = 6.5 \times 4 = 26$; $i = 8\% \div 4 = 2\% = .02$): $PV = \frac{FV}{(1+i)^n} = \frac{\$50{,}000}{(1.02)^{26}} = \mathbf{\$29{,}878.96}$

2. Formula 4A ($n = 6.5 \times 4 = 26$; $i = 8\% \div 4 = 2\% = .02$): $PMT = \frac{FV\,(i)}{(1+i)^n - 1} = \frac{\$50{,}000\,(.02)}{(1.02)^{26} - 1} = \mathbf{\$1{,}484.96}$

3. Formula 4A ($n = 4.5 \times 4 = 18$; $i = 6\% \div 4 = 1.5\% = .015$): $PMT = \frac{FV\,(i)}{(1+i)^n - 1} = \frac{\$40{,}000\,(.015)}{(1.015)^{18} - 1} = \mathbf{\$1{,}952.23}$

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

5. Formula 4A ($n = 20$; $i = 8\% = .08$): $PMT = \frac{FV\,(i)}{(1+i)^n - 1} = \frac{£86{,}500{,}000\,(.08)}{(1.08)^{20} - 1} = \mathbf{£1{,}890{,}216.06}$

6. £5,190,000 (interest to bondholders) + £1,890,216.06 (sinking fund deposit) = **£7,080,216.06**

7. 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

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

9. Formula 4B ($n = 40 \times 12 = 480$; $i = 6.75\% \div 12 = .5625\% = .005625$):

$$PMT = \frac{PV\,(i)}{1 - \frac{1}{(1+i)^n}} = \frac{\$500{,}000\,(.005625)}{1 - \frac{1}{(1.005625)^{480}}} = \mathbf{\$3{,}016.78}$$

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

$$PMT = \frac{PV\,(i)}{1 - \frac{1}{(1+i)^n}} = \frac{\$500{,}000\,(.005625)}{1 - \frac{1}{(1.005625)^{360}}} = \mathbf{\$3{,}242.99}$$

11. Using the right-hand column of Ill. 10-1: $\$3{,}242.99 \div (1+i) = \$3{,}242.99 \div 1.005625 = \mathbf{\$3{,}224.85}$

12. 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 ÷ 1.055 = **$208,598.64**

Unit 11.3 Loan payments

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

$$PMT = \frac{PV\,(i)}{1 - \frac{1}{(1+i)^n}} = \frac{\$27{,}500\,(.00541667)}{1 - \frac{1}{(1.00541667)^{72}}} = \mathbf{\$462.27}$$

14. $72 \times \$462.27 = \$33{,}283.44$; $\$33{,}283.44 - 27{,}500.00 = \mathbf{\$5{,}783.44}$

15. 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. 15-year (i = 7.25% ÷ 12 ≈ .604167% ≈ .0064167): $\text{PMT} = \dfrac{\text{PV}(i)}{1 - \dfrac{1}{(1+i)^n}} = \dfrac{\$150{,}000\,(.00604167)}{1 - \dfrac{1}{(1.00604167)^{180}}} = \mathbf{\$1{,}369.29}$

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

17. \$1,369.29 - \$1,048.82 = **\$320.47**

18. 15-year loan: 180 × \$1,369.29 = \$246,472.20; \$246,472.20 - \$150,000 = **\$96,472.20**
30-year loan: 360 × \$1,048.82 = \$377,575.20; \$377,575.20 - \$150,000 = **\$227,575.20**

19. \$227,575.20 - \$96,472.20 = **\$131,103**

20. n = 20 × 12 = 240; i = 8.875% ÷ 12 ≈ .7395833% ≈ .007395833

$$\text{PMT} = \frac{\text{PV}(i)}{1 - \dfrac{1}{(1+i)^n}} = \frac{\$365{,}000\,(.007395833)}{1 - \dfrac{1}{(1.007395833)^{240}}} = \mathbf{\$3{,}254.71}$$

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

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

Unit 11.4 Solving for rate (i)

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

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

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

$i = \left(\dfrac{\text{FV}}{\text{PV}}\right)^{\frac{1}{n}} - 1 = \left(\dfrac{215.1}{100}\right)^{\frac{1}{25}} - 1 = .0311 = \mathbf{3.11\%}$ $\quad$ $i = \left(\dfrac{\text{FV}}{\text{PV}}\right)^{\frac{1}{n}} - 1 = \left(\dfrac{215.1}{9.9}\right)^{\frac{1}{95}} - 1 = .0329 = \mathbf{3.29\%}$

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

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

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%:

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

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

Total PV $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%:

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

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

Total PV $1,208.30

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

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

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

Total PV $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:

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

Balance in 40 years **$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 = negative $650,000; PMT = $3,500; FV = 0):

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

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

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

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): $\text{PMT} = \dfrac{\text{FV}\,(i)}{(1+i)^n - 1} = \dfrac{\$5{,}212.64\,(.005)}{(1.005)^{30} - 1} = \mathbf{\$161.48}$

35. *Note:* 35.9 cents, written in terms of dollars, is $0.359, so: $i = \left(\dfrac{\text{FV}}{\text{PV}}\right)^{\frac{1}{n}} - 1 = \left(\dfrac{\$4.399}{\$0.359}\right)^{\frac{1}{35}} - 1 = .0742 = \mathbf{7.42\%}$

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

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

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 ($n = 30 \times 12 = 360$; $i = 6\% \div 12 = .5\% = .005$):

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

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: $420 \times \$234.14 =$	- 98,338.80
Interest earned	**$621,661.20**

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):

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

Adjust, because withdrawals are at *beginning* of each year: $28,453.40 (rounded) × 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.

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

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% ÷ 12 = .5% = .005; PV = negative \$5,500; PMT = negative \$400; FV = \$22,000):

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

3. Formula 4B (n = 30 × 12 = 360; i = 6.5% ÷ 12 ≈ .5416667% ≈ .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 × 12 = 48; i = 6.5% ÷ 12 ≈ .5416667% ≈ .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 × 12 = 360; i = 6.75% ÷ 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 × \$1,556.64) - \$240,000 = \$560,390.40 - 240,000.00 = **\$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 Tables

Unit 12.1 Time-value-of-money terminology

1. **12** (3 years × 4 periods per year)
2. **1.5%** (6% ÷ 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 Future value

9. Table 1 (n = 100, i = 4%): FV = PV × Decimal Value = \$42 × 50.50495 = **\$2,121.21**
10. Table 2 (n = 30, i = 8%): FV = PMT × Decimal Value = \$2,000 × 113.28321 = **\$226,566.42**
11. Table 2 (n = 40, i = 8%): FV = PMT × Decimal Value = \$365 × 259.05652 = **\$94,555.63**
12. Table 2 (n = 50, i = 6%): FV = PMT × Decimal Value = \$1,800 × 290.33590 = **\$522,604.62**
13.

Ending balance	\$ 522,604.62
Total amount deposited: 50 × \$1,800 =	- 90,000.00
Interest earned	**\$432,604.62**

14. Table 1 (n = 100, i = 12%): FV = PV × Decimal Value = \$500 × 83,522.26573 = **\$41,761,132.87**

15. Table 1 (n = 18, i = 5%): FV = PV × Decimal Value = $2,550 × 2.40662 = **$6,136.88**

Unit 12.3 Present value

16. Table 3 (n = 10, i = 12%): PV = FV × Decimal Value = $5,000 × .321973 = **$1,609.87**

17. Table 4 (n = 4 × 4 = 16; i = 6% ÷ 4 = 1.5%):

PV = PMT × Decimal Value = 600,000 euros × 14.131264 = **8,478,758.40 euros**

18. 15 × $17,000 = **$255,000**

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

20. Table 4 (n = 15, i = 10%): PV = PMT × Decimal Value = $17,000 × 7.606080 = **$129,303.36**

21. **No**; the value of the device ($129,303.36) is considerably less than its $150,000 cost.

22. 100 × $700 = **$70,000**

23. Table 4 (n = 100; i = 6% ÷ 12 = 0.5%): PV = PMT × Decimal Value = $700 × 78.542645 = **$54,979.85**

24. 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 Table 4), then the PV of the maturity value (using Table 3). n = 13 × 2 = 26; i = 8% ÷ 2 = 4%:

PV of interest checks: PV = PMT × Decimal Value = $30 × 15.982769 =	$479.48
PV of the maturity value: PV = FV × Decimal Value = $1,000 × .360689 =	+360.69
Total PV	**$840.17**

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

26. Table 3 (n = 20, i = 8%): PV = FV × Decimal Value = $1,000 × .214548 = **$214.55**

Challenge problems

27. What $5,800 will grow to. Table 1 (n = 5 × 2 = 10; i = 8% ÷ 2 = 4%):

FV = PV × Decimal Value = $5,800 × 1.48024 =	$8,585.39
What $100 each 6 months will grow to. Table 2 (n = 5 × 2 = 10; i = 8% ÷ 2 = 4%):	
FV = PMT × Decimal Value = $100 × 12.00611 =	+1,200.61
Total FV	**$9,786.00**

28. $45,000 × 7.65% = **$3,442.50**

29. $3,442.50 (employee share) + $3,442.50 (employer share) = **$6,885**

30. $6,885 ÷ 4 = **$1,721.25**

31. Table 2 (n = 40 × 4 = 160; i = 6% ÷ 4 = 1.5%): FV = PMT × Decimal Value = $1,721.25 × 655.23077 = **$1,127,815.96**

32. Table 4 (n = 10, i = 8%): PV = PMT × Decimal Value = $500,000 × 6.710081 = **$3,355,040.50**

33. Table 2 (n = 10, i = 8%): FV = PMT × Decimal Value = $500,000 × 14.48656 = **$7,243,280**

34. Let's find what $750 per quarter will accumulate to. Table 2 (n = 25 × 4 = 100; i = 6% ÷ 4 = 1.5%):

FV = PMT × Decimal Value = $750 × 228.80304 = $171,602.28

Now find what $171,602.28 will grow to over 10 years. Table 1 (n = 10 × 4 = 40; i = 6% ÷ 4 = 1.5%):

FV = PV × Decimal Value = $171,602.28 × 1.81402 = **$311,289.97**

35. (40 × $6,000) + (20 × $9,000) = **$420,000**

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

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

PV = PMT × Decimal Value = $6,000 × 27.355479 = $164,132.87

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

PV = PMT × Decimal Value = $9,000 × 16.351433 = $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 $147,162.90 to be received 10 years from now. We will use Table 3 ($n = 10 \times 4 = 40$; $i = 8\% \div 4 = 2\%$):

PV = FV × Decimal Value = $147,162.90 × .452890 = $66,648.61

Step 4. The present value of the first stream of payments ($6,000 per quarter for 10 years) is $164,132.87. The present value (as of today) of the second stream of payments ($9,000 per quarter for 5 years) is $66,648.61. The present value of all of the cash flows is: $164,132.87 + $66,648.61 = **$230,781.48**.

38. **She should accept Ishiro's offer**, because his $240,000 cash offer is better than Michael's offer, which has a present value of $230,781.48.

Practice Test

1. n = 5 years × 4 periods per year = **20**
2. **$420** (this is the amount that happened at the beginning of the first period)
3. Table 1 ($n = 50$, $i = 12\%$): FV = PV × Decimal Value = $500 × 289.00219 = **$144,501.10**
4. Table 2 ($n = 50$, $i = 6\%$): FV = PMT × Decimal Value = $1,200 × 290.33590 = **$348,403.08**
5. Table 1 ($n = 18$, $i = 4\%$): FV = PV × Decimal Value = $3,800 × 2.02582 = **$7,698.12**
6. Table 3 ($n = 20$, $i = 8\%$): PV = FV × Decimal Value = $1,000 × .214548 = **$214.55**
7. n = 12 and i = 10%, so:

PV of annual savings (Table 4): PV = PMT × Decimal Value = $9,500 × 6.813692 =	$64,730.07
PV of salvage value (Table 3): PV = FV × Decimal Value = $8,000 × .318631 =	+ 2,549.05
Total PV	**$67,279.12**

Chapter 13 Sinking Funds, Annuities, and More: Using Tables

Unit 13.1 Sinking funds

1. Table 3 ($n = 6.5 \times 4 = 26$, $i = 8\% \div 4 = 2\%$): PV = FV × Decimal Value = $50,000 × .597579 = **$29,878.95**
2. Table 5 ($n = 6.5 \times 4 = 26$; $i = 8\% \div 4 = 2\%$): PMT = FV × Decimal Value = $50,000 × .02970 = **$1,485.00**
3. Table 5 ($n = 4.5 \times 4 = 18$; $i = 6\% \div 4 = 1.5$): PMT = FV × Decimal Value = $40,000 ×.04881 = **$1,952.40**
4. $I = PRT$ = £86,500,000 ×6% ×1 = **£5,190,000**
5. Table 5 ($n = 20$, $i = 8\%$): PMT = FV × Decimal Value = £86,500,000 ×.02185 = **£1,890,025**
6. £5,190,000 (interest to bondholders) + £1,890,025 (sinking fund deposit) = **£7,080,025**

Unit 13.2 Loan payments

7. Table 6 (72 mo, 6.5%): PMT = Loan Amount ÷ $1,000 × Dec. Val. = $27,500 ÷ $1,000 × 16.8099 = **$462.27**
8.

Total paid: 72 × $462.27 =	$33,283.44
Less principal portion (loan amount)	- 27,500.00
Interest portion of payments	**$ 5,783.44**

9. Table 7 (15 yrs, 7.25%): PMT = Loan Amt ÷ $1,000 × Dec. Val. = $150,000 ÷ $1,000 × 9.1286 = **$1,369.29**
Table 7 (30 yrs, 7.5%): PMT = Loan Amt ÷ $1,000 × Dec. Val. = $150,000 ÷ $1,000 × 6.9921 = **$1,048.82**

10. $1,369.29 - $1,048.82 = **$320.47**

11. 15-year loan: 180 × $1,369.29 = $246,472.20; $246,472.20 - $150,000 = **$96,472.20**
30-year loan: 360 × $1,048.82 = $377,575.20; $377,575.20 - $150,000 = **$227,575.20**

12. $227,575.20 - $96,472.20 = **$131,103.00**

Unit 13.3 Annuities

13. $I = PRT$ = $500,000 × 6.75% × $\frac{1}{12}$ = **$2,812.50**

14. Table 7 (40 yrs, 6.75%): PMT = Loan Amt ÷ $1,000 × Dec. Val. = $500,000 ÷ $1,000 × 6.0336 = **$3,016.80**

15. Table 7 (30 yrs, 6.75%): PMT = Loan Amt ÷ $1,000 × Dec. Val. = $500,000 ÷ $1,000 × 6.4860 = **$3,243.00**

Unit 13.4 Timing of periodic payments

16. We are trying to find PV, and we know PMT, so we use Table 4. Table 4 is designed to find PV assuming payments are made at the end of each period. Let's first find that amount.

Table 4 (n = 100; i = 8%): PV = PMT × Decimal Value = $85,000 × 12.494318 = $1,062,017.03

Because withdrawals are made at the *beginning* of each year the fund will deplete quicker, so we must deposit more than $1,062,017.03. To find the amount, we multiply by (1 + i). i = 8% = .08, so:

$1,062,017.03 (1 + i) = $1,062,017.03 (1.08) = **$1,146,978.39**

17. Ted could deposit less because his savings plan would start earning interest sooner. So, we *divide* the answer of Problem 2 ($1,485) by (1 + i). i = 8% ÷ 4 = 2% = .02, so: $1,485 ÷ (1 + i) = $1,485 ÷ 1.02 = **$1,455.88**

Challenge problems

18. $I = PRT$ = $650,000 × 6% × 1 = **$39,000**

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

20. What $650,000 will grow to:

Table 1 (n = 40, i = 6%): FV = PV × Decimal Value = $650,000 × 10.28572 =	$6,685,718.00
Decrease in FV because of the $35,000 annual withdrawal:	
Table 2 (n = 40, i = 6%): FV = PMT × Decimal Value = $35,000 × 154.76197 =	- 5,416,668.95
Balance in 40 years	**$1,269,049.05**

(In spite of making hefty withdrawals, the balance has increased from $650,000 to $1,269,049.05.)

21. We need to find PV and we know FV, so we use Table 3 (n = 2.5 × 12 = 30; i = 6% ÷ 12 = 0.5%):

PV = FV × Decimal Value = $8,000 × .861030 = **$6,888.24**

22. We need to find PMT and we know FV, so we use Table 5 (n = 2.5 × 12 = 30; i = 6% ÷ 12 = 0.5%):

PMT = FV × Decimal Value = $8,000 × .03098 = **$247.84**

23. What $2,400 will grow to (Table 1): FV = PV × Decimal Value = $2,400 × 1.16140 = $2,787.36
Additional FV required: $8,000 - $2,787.36 = $5,212.64
PMT needed to accumulate $5,212.64 (Table 5): PMT = FV × Dec. Val. = $5,212.64 × .03098 = **$161.49**

24. Projected tuition, 8 years from now (Table 1; n = 8, i = 4%):

FV = PV × Dec. Val. = $6,000 × 1.36857 = $8,211.42

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

(Table 4; n = 4, i = 6%): PV = PMT × Dec. Val. = $8,211.42 × 3.465106 = $28,453.44

Adjust, because withdrawals are at *beginning* of each year: $28,453.44 × 1.06 = $30,160.65
Amount to be deposited at the end of each year to accumulate $30,160.65 in 8 years:

(Table 5; n = 8, i = 6%): PMT = FV × Dec. Val. = $30,160.65 × .10104 = **$3,047.43**

Practice Test

1. Table 5 (n = 30, i = 6%): PMT = FV × Decimal Value = $150,000 × .01265 = **$1,897.50**
2. Table 3 (n = 7 × 4 = 28; i = 6% ÷ 4 = 1.5%): PV = FV × Dec. Val. = $15,000 × .659099 = **$9,886.49**
3. Table 6 (48 mo, 6.5%): PMT = Loan Amt ÷ $1,000 × Dec. Val. = $13,500 ÷ $1,000 × 23.7150 = **$320.15**
4. Table 7 (30 yrs, 6.75%): PMT = Loan Amt ÷ $1,000 × Dec. Val. = $240,000 ÷ $1,000 × 6.4860 = $1,556.64
   Total interest: (360 × $1,556.64) - $240,000 = $560,390.40 - $240,000 = **$320,390.40**
5. Table 7 (30 yrs, 6.5%): PMT = Loan Amt ÷ $1,000 × Dec. Val. = $250,000 ÷ $1,000 × 6.3207 = **$1,580.18**
6. First, figure the required deposit assuming deposits are made at the *end* of each year.

   Table 5 (n = 18, i = 6%): PMT = FV × Decimal Value = $35,000 × .03236 = $1,132.60

   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):

   $1,132.60 ÷ (1 + i) = $1,132.60 ÷ 1.06 = **$1,068.49**

Chapter 14 Future Value and Present Value: Using Financial Calculators

Unit 14.1 Time-value-of-money terminology

1. **12** (3 years × 4 periods per year = 12)
2. **1.5%** (6% ÷ 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 14.2 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 14.3 Future value

16.

N	i	PV	PMT	FV
170	4	-42		**33,030.64**

17.

N	i	PV	PMT	FV
30	8		-2,000	**226,566.42**

18.

N	i	PV	PMT	FV
40	8		-365	**94,555.63**

19.

N	i	PV	PMT	FV
51 × 12 = 612	7.5 ÷ 12 = 0.625		-135	**956,673.97**

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 × $135 =	- 82,620.00
Interest earned	**$880,033.18**

22.

N	i	PV	PMT	FV
10 × 12 = 120	7 ÷ 12 = 0.583		-100	**17,308.48**
20 × 12 = 240	↑		↑	**52,092.67**
30 × 12 = 360	↑		↑	**121,997.10**
40 × 12 = 480	↑		↑	**262,481.34**

23.

N	i	PV	PMT	FV
100	12	-500		**41,761,132.86**

24.

N	i	PV	PMT	FV
18	5	-2,550		**6,136.88**

25.

N	i	PV	PMT	FV
40	-5	-4,400		**565.45**

There will be about **565 elephants**.

Unit 14.4 Present value

26.

N	i	PV	PMT	FV
10	12	**-1,609.87**		5,000

27.

N	i	PV	PMT	FV
4 × 4 = 16	6 ÷ 4 = 1.5	**-8,478,758.43 euros**	600,000	

28. 180 × $1,300 = **$234,000**

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

30.

N	i	PV	PMT	FV
15 × 12 = 180	9 ÷ 12 = 0.75	**-128,171.43**	1,300	

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

32. 100 × $700 = **$70,000**

33.

N	i	PV	PMT	FV
100	6 ÷ 12 = 0.50	**-54,979.85**	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 × 2 = 26	8 ÷ 2 = 4	**-840.17**	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	**-214.55**		1,000

37.

N	i	PV	PMT	FV
6	9 ÷ 12 = 0.75	**4,122.61**	-700 Begin*	

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

Challenge problems

38.

N	i	PV	PMT	FV
5 × 2 = 10	8 ÷ 2 = 4	-5,800	-100	**9,786.03**

39. $45,000 × 7.65% = **$3,442.50**

40. $3,442.50 (employee share) + $3,442.50 (employer share) = **$6,885**

41. $6,885 ÷ 4 = **$1,721.25**

42.

N	i	PV	PMT	FV
40 × 4 = 160	7 ÷ 4 = 1.75		-1,721.25	**1,480,390.69**

43.

N	i	PV	PMT	FV
28 × 12 = 336	9 ÷ 12 = 0.75	**3,062,600.87**	-25,000	

44.

N	i	PV	PMT	FV
20 × 12 = 240	9 ÷ 12 = 0.75	**-615,881.98**	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	**-3,355,040.70**	500,000	

46.

N	i	PV	PMT	FV
↑	↑	0	-500,000	**7,243,281.23**

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

N	i	PV	PMT	FV
25 × 4 = 100	6 ÷ 4 = 1.5		-750	**171,602.28**

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

N	i	PV	PMT	FV
10 × 4 = 40	↑	-171,602.28	0	**311,289.69**

**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 years × 4 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		**144,501.09**

4.

N	i	PV	PMT	FV
50 × 12 = 600	6.75 ÷ 12 = 0.5625		-100	**496,875.02**

5.

N	i	PV	PMT	FV
18	4	-3,800		**7,698.10**

6.

N	i	PV	PMT	FV
20	8	**-214.55**		1,000

7.

N	i	PV	PMT	FV
12 × 12 = 144	9.75 ÷ 12 = 0.8125	**-70,252.22**	800	8,000

Chapter 15 Sinking Funds, Annuities, and More: Using Financial Calculators

Unit 15.1 Sinking funds

1.

N	i	PV	PMT	FV
6.5 × 4 = 26	8 ÷ 4 = 2	**-29,878.96**		50,000

2.

N	i	PV	PMT	FV
↑	↑	0	**-1,484.96**	↑

3.

N	i	PV	PMT	FV
↑	↑	-4,700	**-1,251.38**	50,000

4.

N	i	PV	PMT	FV
4.5 × 4 = 18	6 ÷ 4 = 1.5		**-1,952.23**	40,000

5. $I = PRT$ = £86,500,000 × 6% × 1 = **£5,190,000**

6.

N	i	PV	PMT	FV
20	8		**-1,890,216.06**	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
547.60	8 ÷ 12 = 0.66		-180	1,000,000

547.60 months ÷ 12 = 45.63 years. 28 years (Kristi's age now) + 45.63 years = 73.63 **(73 years old)**

Unit 15.2 Annuities

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

10.

N	i	PV	PMT	FV
40 × 12 = 480	6.75 ÷ 12 = 0.5625	-500,000	**3,016.78**	0

11.

N	i	PV	PMT	FV
30 × 12 = 360	↑	↑	**3,242.99**	0

12.

N	i	PV	PMT	FV
290.14 months	↑	↑	3,500	0

290.14 months ÷ 12 = **24.18 years**

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

14.

N	i	PV	PMT	FV
25 × 12 = 300	↑	↑	2,700	**587,608.96**

15.

N	i	PV	PMT	FV
150	5.5	-4,000,000	**208,598.64** Begin*	

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

Unit 15.3 Loan payments

16.

N	i	PV	PMT	FV
6 × 12 = 72	6.5 ÷ 12 = 0.5416	27,500	**-462.27**	

17. 72 × \$462.27 = \$33,283.44; \$33,283.44 - 27,500.00 = **\$5,783.44**

18.

N	i	PV	PMT	FV
24	1.75*	900	**-46.25**	

**Note*: The periodic rate is 1.75(%), not 1.75 ÷ 12.

19.

N	i	PV	PMT	FV
15 × 12 = 180	7.25 ÷ 12 = 0.60416	150,000	**-1,369.29**	
30 × 12 = 360	7.5 ÷ 12 = 0.625	↑	**-1,048.82**	

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

21. 15-year loan: 180 × $1,369.29 = $246,472.20; $246,472.20 - $150,000 = **$96,472.20**
30-year loan: 360 × $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 × 12 = 240	8.875 ÷ 12 = 0.739583*	365,000	**-3,254.71**	

**Note*: We can find the decimal equivalent of $\frac{7}{8}$ by dividing 7 by 8, getting 0.875. So, $8\frac{7}{8} = 8.875$.

24.

N	i	PV	PMT	FV
268.00 months	8.75 ÷ 12 = 0.72916	138,743.03	-1,180.05	

25.

N	i	PV	PMT	FV
261.22 months	↑	↑	-1,190.05	
215.03 months	↑	↑	-1,280.05	

Challenge problems

26.

N	i	PV	PMT	FV
5	4	-400,000		**486,661.16**

27.

N	i	PV	PMT	FV
5 × 4 = 20	6 ÷ 4 = 1.5	0	**-20,735.00** Begin*	↑

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

28.

N	i	PV	PMT	FV
165.34 months	8 ÷ 12 = 0.66	500	-5	

29.

N	i	PV	PMT	FV
61.02 months	↑	↑	-10	

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

31.

N	i	PV	PMT	FV
54 months	11 ÷ 12 = 0.916	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 × 12 = 60	8.5 ÷ 12 = 0.7083	22,000*	**-451.36**	
b. 2.9%	↑	2.9 ÷ 12 = 0.2416	25,500	**-457.07**	

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

34.

N	i	PV	PMT	FV
30 × 12 = 360	6.75 ÷ 12 = 0.5625	**169,596.55**	-1,100	

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

N	i	PV	PMT	FV
30 × 12 = 360	6 ÷ 12 = 0.50	**-333,583.23**	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 × 12 = 420	↑	0	**-234.14**	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 × $2,000 =	$720,000.00
Total amount to be deposited: 420 × $234.14 =	- 98,338.80
Interest earned	**$621,661.20**

37. Projected tuition, 8 years from now:

N	i	PV	PMT	FV
8	4	-6,000		**8,211.41**

Amount needed in fund 8 years from now:

N	i	PV	PMT	FV
4	6	**-30,160.61**	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		**-3,047.31**	30,160.61

Practice Test

1.

N	i	PV	PMT	FV
18 × 12 = 216	6 ÷ 12 = 0.50		**-89.91** 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 ÷ 12 = 0.50	-5,500	-400	22,000

3.

N	i	PV	PMT	FV
30 × 12 = 360	6.5 ÷ 12 = 0.5416	-250,000	**1,580.17**	

4.

N	i	PV	PMT	FV
4 × 12 = 48	6.5 ÷ 12 = 0.5416	13,500	**-320.15**	

5.

N	i	PV	PMT	FV
20 × 12 = 240	7.625 ÷ 12 = 0.635416	140,000	**-1,138.56**	

6.

N	i	PV	PMT	FV
40 × 12 = 480	7.25 ÷ 12 = 0.60416	180,000	**-1,151.41**	

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

Chapter 16 Installment Loans and Open-End Credit

Unit 16.1 Cost of installment buying

1. **(c) greater than $177.08.** If Maria's credit union charged no interest, her monthly payment would be $177.08 ($8,500 ÷ 48 = $177.08); with interest, her payment will be more than $177.08.

2. **(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	**$27,500**

4.

Step 1	Total of all payments: 48 × $664.92	$31,916.16
Step 2	Less loan amount	-27,500.00
	Interest portion of payments	$ 4,416.16
Step 3	Plus prepaid loan costs	+ 300.00
	Total finance charges	**$ 4,716.16**

5.

Step 1	Cost of the purchase: $28,500 + $1,700 tax and license	$30,200.00
Step 2	Add finance charges (from Problem 2)	+ 4,716.16
	Total cost, including finance charges	**$34,916.16**

6.

Cost of the purchase: $6,200 + $500.00 tax and license			$6,700.00
Finance charge			
	Total of all payments: 24 × $235.18	$5,644.32	
	Less loan amount	-5,200.00	
	Interest portion of payments		444.32
Total cost, including finance charges			**$7,144.32**

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 toal cost to $7,144.32.

Unit 16.2 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	**$6.66**	**$248.05**	**$751.95**
Sep. 1	Aug. 29	$254.71	**$5.93**	**$248.78**	**$503.17**
Oct. 1	Sep. 27	$254.71	**$3.60**	**$251.11**	**$252.06**
Nov. 1	Nov. 1	**$254.24**	**$2.18**	**$252.06**	$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	**$2,203.63**	$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 16.3 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
+ 6 (July 5, 6, 7, 8, 9, 10)	×	440	=	+ 2,640
30				$12,320

Average daily balance = $\frac{\$12{,}320}{30}$ = **$410.67**

16. $410.67 (average daily balance) × 1.25% = **$5.13**

17. Daily periodic rate: $\frac{8.75}{365} \approx 0.02397260(\%)$ Interest = $48,700 × 0.02397260% × 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 × $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	**$34.60**	**$213.01**	**$7,986.99**
Nov. 8	Nov. 10	$300.00	**$42.12**	**$257.88**	**$7,729.11**

Procedure for October 8 payment
Number of days: 22 days in Sep. (30 - 8 = 22) + 6 days in Oct. = 28
Interest: $I = PRT$ = $8,200 × 5.5% × $\frac{28}{365}$ = $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. = 35
Interest: $I = PRT$ = $7,986.99 × 5.5% × $\frac{35}{365}$ = $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	**$419.80**	$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 × $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)	+ 3,199.60
	Total 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	**$2,318.41**

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	**$1,492.13**	$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 × 0.02328767% × 30 = **$648.45**

Chapter 17 Home Ownership and Mortgage Loans

Unit 17.1 Home ownership and mortgage payments

1. **False**; your home is real estate, not personal property.
2. **True**
3. The first lender gets $123,200; the second lender gets $16,800.
4. The first lender gets $123,200; the second lender gets $24,400; Nash gets the remaining $7,400.
5.

Loan amount	$155,000
Less loan costs	- 3,800
Net proceeds from lender	$151,200
Add down payment	+ 14,500
Maximum price	**$165,700**

6.

Total amount to be repaid: 360 × $1,074.62	$386,863.20
Subtract principal portion (loan amount)	-150,000.00
Interest portion of payments	**$236,863.20**

7. ($1,725 + $575) ÷ 12 = $2,300 ÷ 12 = **$191.67**
8. $1,074.62 (PI) + $191.67 (TI) = **$1,266.29** (PITI)
9. **Yes.** If taxes or insurance change, the TI portion of the payment changes, resulting in a change in the total (PITI) payment.

Unit 17.2 Paying off a mortgage loan and increasing equity

10. 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	**$968.75**	**$105.87**	**$149,894.13**
2	$1,074.62	**$968.07**	**$106.55**	**$149,787.58**

Payment 1 Interest: $I = PRT = \$150{,}000 \times 7.75\% \times \frac{1}{12} =$ **$968.75**
Principal = $1,074.62 - $968.75 = **$105.87**
Balance = $150,000 - $105.87 = **$149,894.13**

Payment 2 Interest: $I = PRT = \$149{,}894.13 \times 7.75\% \times \frac{1}{12} =$ **$968.07**
Principal = $1,074.62 - $968.07 = **$106.55**
Balance = $149,894.13 - $106.55 = **$149,787.58**

11. **True**
12. **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.
13. $315,000 - $147,300 = **$167,700**

Unit 17.3 Repayment variations and loan charges

14. 6.10% + 0.50% = 6.60%. However, because of the 1% annual cap, the rate will be 5.50% + 1% = **6.50%.**
15. **It increases** with the increase in the interest rate.
16. $I = PRT = \$340{,}000 \times 9.75\% \times \frac{1}{12} =$ **$2,762.50.**
17. **$340,000;** the balance remains unchanged because payments cover interest, but no principal.

18. 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.)

19.

Maximum total balances allowed: \$265,000 × 75% =	\$198,750
Less current loan balances	-172,200
Available line of credit	**\$ 26,550**

20. **True.**

21. $\$700{,}000 \times 1\frac{1}{4}\% = \$700{,}000 \times 1.25\% =$ **\$8,750**

22. (\$320,000 × 0.5%) + (\$320,000 × 0.75%) + \$750 + \$70 + \$700 + \$970 + \$400 + \$200 + \$95 = **\$7,185**

23. **True.**

Challenge problems

24.

30-year: (360 × \$3,540.34) - \$440,000 = \$1,274,522.40 - \$440,000 =	\$ 834,522.40
15-year: (180 × \$4,397.57) - \$440,000 = \$791,562.60 - \$440,000 =	- 351,562.60
	\$482,959.80

25.

PI	\$ 714.65
TI: (\$948 + \$520) ÷ 12 =	+122.33
PITI	**\$836.98**

26.

Initial deposit into escrow account	\$270.00
Add monthly deposits: 7 × \$122.33 =	+ 856.31
Less property taxes paid	- 948.00
Ending escrow balance	**\$178.31**

27. $I = PRT = \$115{,}000 \times 7\% \times \frac{1}{12} = \$670.83$
Principal = \$714.65 (PI portion of payment) - \$670.83 = \$43.82
Balance = \$115,000 - \$43.82 = **\$114,956.18**

28. **Fixed-rate loan**

Total amount to be repaid: 180 × \$1,390.52 =	\$ 250,293.60
Less principal portion of payments (loan amount)	- 150,000.00
Interest portion	**\$100,293.60**

GEM

Total amount to be repaid: (36 × \$1,100) + (36 × \$1,300) + (108 × \$1,623.64) =	\$ 261,753.12
Less principal portion of payments (loan amount)	- 150,000.00
Interest portion	**\$111,753.12**

29. **The GEM results in more interest because the balance decreases more slowly at the first part of the loan.**

Practice Test

1. \$180,000 loan - \$5,300 loan costs = \$174,700 net proceeds; \$174,700 + \$24,000 cash = **\$198,700**
2. (300 × \$3,774.64) - \$600,000 = \$1,132,392 - \$600,000 = **\$532,392**

3. $I = PRT = \$105{,}000 \times 6.5\% \times \frac{1}{12} = \$568.75$
Principal: \$663.67 - \$568.75 = \$94.92
Balance: \$105,000 + \$94.92 = **\$104,905.08**

4.

PI	\$ 872.55
TI: (\$1,325 + \$710) ÷ 12	+ 169.58
PITI	**\$1,042.13**

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 × 80% = $139,600; $139,600 - $103,200 = **$36,400**

7. ($170,000 × 0.5%) + ($170,000 × 0.875%) + $70 + $475 + $630 + $400 + $125 + $70 = **$4,107.50**

Chapter 18 Stocks, Bonds, and Mutual Funds

Unit 18.1 Stocks

1. **False**

2. **False**. Preferred stockholders are paid before common stockholders but after creditors.

3.

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 ÷ 1,150,000 shares = $0.50
Your dividend: 75 shares × $0.50 per share = **$37.50**

4. **False**. Commissions vary, depending on the services the stockbroker provides.

5. **False**. The largest stock exchange in the United States is the New York Stock Exchange.

6. **True**

7.

52 weeks Hi	52 weeks Lo	Div	Yld%	PE Ratio	Vol 100s	Close	Net Chg
92.13	78.25	1.40	1.6	27	352	86.56	-0.63

a. **$92.13** per share
b. **$78.25** per share
c. **$86.56** per share
d. **Decreased $0.63** per share
e. **35,200 shares** (352 × 100 = 35,200)
f. 1.40 (amount in "Div" column) ÷ 86.56 (amount in "Close" column) ≈ .016 ≈ **1.6%**
g. PE = $\frac{P}{E} = \frac{\$86.56}{\$3.21} \approx 26.97 \approx$ **27**

8. (100 shares × $38.50) + $80 = $3,850 + $80 = **$3,930**

9. (100 shares × $46) - $120 = $4,600 - $120 = **$4,480**

10.

Company	Price per share	Earnings per share	PE ratio
A	$65.00	$8.13	**8.0**
B	$65.00	$5.91	**11.0**
C	$65.00	$2.22	**29.3**

11. 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).

12. **Company A**. The price–earnings ratio for Company A is the lowest (8.0), indicating the investor pays the least per dollar of earnings.

13. **Investors apparently feel Company C has a much better future than is indicated by current earnings.**

Unit 18.2 Bonds

14. **True** 15. **True** 16. **False** 17. **True**

18. **(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.

19. **(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. 8⅝% = **8.625%** 21. **2026** 22. **30 bonds** 23. $1,000 × 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 × 0.583% = $5.83; price **decreased $5.83**

26. Cur Yld $= \frac{\text{Coupon rate}}{\text{Close column value}} = \frac{8.625}{126.765} \approx .0680 \approx$ **6.80%**

27.

Price per bond: $5,000 × 133 13/32% = $5,000 × 133.40625% =	$6,670.3125
Number of bonds	× 3
Total price	**$ 20,010.94**

Unit 18.3 Mutual funds

28. **True**

29.

Total of closing prices	Liabilities	Shares outstanding	NAV
$23,478,000	$4,122,000	800,000	$\frac{\$23,478,000 - \$4,122,000}{800,000} = \frac{\$19,356,000}{800,000} =$ **$24.20**
$8,155,000	$1,050,000	450,000	$\frac{\$8,155,000 - \$1,050,000}{450,000} = \frac{\$7,105,000}{450,000} =$ **$15.79**
$745,000,000	$192,000,000	5,820,000	$\frac{\$745,000,000 - \$192,000,000}{5,820,000} = \frac{\$553,000,000}{5,820,000} =$ **$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 × 28% =	-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% ÷ 2 = 3.75%	
Balance in 6 months: $100 + 3.75% =	$103.75
Balance in 12 months: + 3.75% =	$107.64

Because it's 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 - 600,000
   Dividends available to common stockholders $ 675,000

   Dividends per share of common stock: $675,000 ÷ 562,500 shares = $1.20
   Your dividend: 150 shares × $1.20 per share = **$180**

2.

52 weeks Hi	52 weeks Lo	Div	Yld%	PE Ratio	Vol 100s	Close	Net Chg
51.38	38.25	.60	1.3	25	1613	44.94	-0.88

   a. $51.38 per share **b. 161,300 shares** (1,613 × 100 = 161,300) **c. 60¢ per share**

3. (125 × $44.94) + $120 = $5,617.50 + $120 = **$5,737.50**

4. $PE = \frac{P}{E} = \frac{\$86.75}{\$2.28} \approx 38.05 \approx$ **38**

5.

Bond	Cur Yld	Vol	Close	Net Chg
IBM 8⅜ 18	6.3	30	132.758	+ 1.27

   ($1,000 × 132.758%) - $75 = $1,327.58 - $75 = **$1,252.58**

6. $1,000 × 8⅜% = $1,000 × 8.375% = **$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 × 112 17/32% = $5,000 × 112.53125% = $5,626.5625
   Number of bonds × 4
   Total price **$ 22,506.25**

9. $NAV = \frac{\$12,742,000 - \$3,450,000}{900,000} = \frac{\$9,292,000}{900,000} =$ **$10.32**

Chapter 19 Additional Applications Using Financial Calculators

Unit 19.1 Amortization

1.

N	i	PV	PMT	FV
30 × 12 = 360	6 ÷ 12 = 0.50	120,000	**-719.46**	

Note: Don't clear time-value-of-money registers; Problem 3 is a continuation.

2.

Payment number	Payment (PI)	Interest	Principal	Balance
New loan	—	—	—	$120,000.00
1	$719.46	**$600.00**	**$119.46**	**$119,880.54**

Step 1 $I = PRT$ = $120,000 × 6% × $\frac{1}{12}$ = $600.00
Step 2 Principal = $719.46 - $600.00 = $119.46
Step 3 Balance = $120,000.00 - $119.46 = $119,880.54

3. Be sure to set decimal at 2 places when amortizing. And give your calculator ample time between keystrokes. (Look at yor display after pressing each key.)

HP 10BII

(a) first payment

[ ] [AMORT]	1 - 1
[=]	**-119.46** PRIN
[=]	**-600.00** INT
[=]	**119,880.54** BAL

(b) interest, first 8 payments

1 [INPUT] 8 [ ] [AMORT]	1 - 8
[=] [=]	**-4,783.10** INT

(c) balance after payment 102

1 [INPUT] 102 [ ] [AMORT]	1 - 102
[=] [=] [=]	**104,155.45** BAL

(d) interest, all 360 payments

1 [INPUT] 360 [ ] [AMORT]	1 - 360
[=] [=]	**-139,006.67** INT

(e) final monthly payment

[=]	1.07 BAL*
[+] 719.46 [=]	**720.53**

TI BAII PLUS

(a) first payment

[2nd] [AMORT] [2nd] [CLR WORK]	P1=1.00
↓	P2=1.00
↓	BAL=**119,880.54**
↓	PRN=**-119.46**
↓	INT=**-600.00**

(b) interest, first 8 payments

↓ ↓ 8 [ENTER]	P2=8.00
↓ ↓ ↓	INT=**-4,783.10**

(c) balance after payment 102

↓ ↓ 102 [ENTER]	P2=102.00
↓	BAL=**104,155.45**

(d) interest, all 360 payments

↑ 360 [ENTER]	P2=360.00
↓ ↓ ↓	INT=**-139,006.67**

(e) final monthly payment

↑ ↑	BAL=1.07*
[+] 719.46 [=]	**720.53**
[2nd] [QUIT]	

*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.

4. **True**

5.

N	i	PV	PMT	FV
25 × 12 = 300	10.25 ÷ 12 = 0.85416	350,000	**-3,242.34**	

6.

HP 10BII

first calendar-year

1 [INPUT] 5 [ ] [AMORT]	1 - 5
[=]	**-1,285.56** PRIN
[=]	**-14,926.14** INT
[=]	**348,714.44** BAL

second calendar-year

6 [INPUT] 17 [ ] [AMORT]	6 - 17
[=]	**-3,317.85** PRIN
[=]	**-35,590.23** INT
[=]	**345,396.59** BAL

third calendar-year

[ ] [AMORT] *	18 - 29
[=]	**-3,674.38** PRIN
[=]	**-35,233.70** INT
[=]	**341,722.21** BAL

TI BAII PLUS

first calendar-year

[2nd] [AMORT] [2nd] [CLR WORK]	P1=1.00
↓ 5 [ENTER]	P2=5.00
↓	BAL=**348,714.44**
↓	PRN=**-1,285.56**
↓	INT=**-14,926.14**

second calendar-year

↓ 6 [ENTER] ↓ 17 [ENTER]	P2=17.00
↓	BAL=**345,396.59**
↓	PRN=**-3,317.85**
↓	INT=**-35,590.23**

third calendar-year

↓ [CPT] *	P1=18.00
↓	P2=29.00
↓	BAL=**341,722.21**
↓	PRN=**-3,674.38**
↓	INT=**-35,233.70**

*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.

7. **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.

Unit 19.2 Solving for interest rate paid

8.

N	i	PV	PMT	FV
4 × 12 = 48	7.2 ÷ 12 = 0.60	27,500	**-661.08**	
↑	**0.65 × 12 ≈ 7.77**	27,200	↑	

9.

N	i	PV	PMT	FV
36	**1.49 × 12 ≈ 17.92**	2,150	-77.64	

10.

N	i	PV	PMT	FV
36	**1.09 × 12 ≈ 13.12**	4,000	-135	

You should borrow from your credit union at 11.75% because your friend is charging you 13.12% interest.

11. **Step 1 (dollar amount of interest)**: $I = PRT$ = $800 × 10% × 1 = $80.00
Step 2 (add to loan amount): $800 + $80 = $880
Step 3 (divide by total number of payments): $880 ÷ 12 = **$73.33**

N	i	PV	PMT	FV
12	**1.50 × 12 ≈ 17.96**	800	-73.33*	

**Note*: Entered as a rounded amount (not the unrounded result of Step 3, above).

12.

N	i	PV	PMT	FV
6	**2.63 × 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.

13.

N	i	PV	PMT	FV
25 × 12 = 300	6.5 ÷ 12 = 0.5416	90,000	**-607.69**	
↑	**0.59 × 12 ≈ 7.07**	85,475*	↑	

**Note*: The *reportable APR* reflects origination fee, points, and mortgage insurance: $90,000 - $4,525 = $85,475.

14.

N	i	PV	PMT	FV
↑	**0.60 × 12 ≈ 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.

15. **More**. By prepaying the loan, loan costs must be spread over a shorter period of time; this has the effect of increasing the APR.

16.

N	i	PV	PMT	FV
25 × 12 = 300	6.5 ÷ 12 = 0.5416	90,000	**-607.69**	
6 × 12 = 72	**0.66 × 12 ≈ 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.

17.

N	i	PV	PMT	FV
25 × 12 = 300	6.875 ÷ 12 = 0.572916	90,000	**-628.94**	
6 × 12 = 72	**0.65 × 12 ≈ 7.82**	86,147	↑	-79,936.39*

**Note*: FV amount ($79,936.39) is the balance after payment 72, found by amortizing 72 payments.

18. **The 6.875% loan has a lower APR (7.82%) than the 6.5% loan (7.89%).**

19.

N	i	PV	PMT	FV
30 × 12 = 360	9.5 ÷ 12 = 0.7916	80,000	**-672.68**	
8 × 12 = 96	**0.90 × 12 ≈ 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.

20. **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 19.3 Growth rates

21.

N	i	PV	PMT	FV
62	**7.03**	-2,450		165,000

22.

N	i	PV	PMT	FV
50	**2.28**	-9.9		30.6
20	**6.10**	-30.6		100
25	**3.11**	-100		215.1
95	**3.29**	-9.9		↑

23.

N	i	PV	PMT	FV
12	**3.29**	-15,600		23,000

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

24.

N	i	PV	PMT	FV
65	**2.93**	-0.62		4.05

25.

N	i	PV	PMT	FV
35	**7.42**	-0.359		4.399

Unit 19.4 Solving for interest rate earned

26.

N	i	PV	PMT	FV
4	**8.84**	-28,500		40,000

27.

N	i	PV	PMT	FV
8	**8.05**	-940	70	1,000

28. **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.

29. **Because you were able to buy the note at a discount.**

30.

N	i	PV	PMT	FV
5	**10.71**	-940	70	1,130

31. **Because you were able to sell the bond at a premium.**

32. **True**

33. **False**

34.

N	i	PV	PMT	FV
5	**23.51**	-305.75		878.95

35.

N	i	PV	PMT	FV
6 × 12 = 72	**-0.37 × 12 = -4.45**		-40 Begin*	2,522

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

36.

N	i	PV	PMT	FV
14	**59.83**	-750		532,500

Unit 19.5 Cash flow problems

37. (66 × $500) + (120 × $750) = **$123,000**

38.

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	99		Nj	99.00	↓ 750 ENTER ↓ 120 ENTER	F02=120.00
750	CFj	21		Nj	21.00	IRR CPT	IRR=0.79
	IRR/YR				0.79	× 12 =	**9.52**
×	12	=			**9.52**	2nd QUIT	

You will earn **9.52% compounded monthly.**

39.

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 = *	
	IRR/YR				**14.04**	ENTER	C05=94,000.00
						IRR CPT	IRR=**14.04**
						2nd QUIT	

**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.

40. (42 × $700) + (180 × $800) = **$173,400**

41.

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	99		Nj**	99.00	↓ 800 ENTER ↓ 180 ENTER	F02=180.00
800	CFj	81		Nj	81.00	NPV 8.75 ÷ 12 = ENTER	I=0.73
8.75	÷	12	=	I/YR	0.73	↓ CPT	NPV=**84,240.19**
	NPV				**84,240.19**	2nd QUIT	

**Note*: Because we do not know the amount, we enter a zero cash flow at the beginning of the first period.
***Note: For the HP 10BII, the maximum value that can go in the Nj register is 99.

42. $(48 \times \$5{,}000) + (24 \times \$6{,}500) = \mathbf{\$396{,}000}$

43.

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
5,000 CFj 48 [ ] Nj	48.00	↓ 5,000 ENTER ↓ 48 ENTER	F01=48.00
6,500 CFj 24 [ ] Nj	24.00	↓ 6,500 ENTER ↓ 24 ENTER	F02=24.00
8.5 ÷ 12 = I/YR	0.71	NPV 8.5 ÷ 12 = ENTER	I=0.71
[ ] NPV	**304,756.40**	↓ CPT	NPV=**304,756.40**
		2nd QUIT	

**Note*: The cash flow at the beginning of the first period is zero.

44. **Darby's**. Hannah will pay a total of $396,000 (see Problem 42); Darby will pay only $320,000. However, Darby's price of $320,000 is greater than the equivalent cash price of Hannah's offer ($304,756.40).

Challenge problems

45. **b and d**; we can find a YTM on a bond and a yield on a note (based on a certain price).

46.

N	i	PV	PMT	FV
4	**3.33**	-3,930		4,480

47.

N	i	PV	PMT	FV
↑	**5.15**	↑	75	↑

48.

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	

49.

N	i	PV	PMT	FV
$30 \times 12 = 360$	$9 \div 12 = 0.75$	100,000	**-804.62**	

50.

HP 10BII		TI BAII PLUS	
1 INPUT 180 [ ] AMORT	1 - 180	2nd AMORT 2nd CLR WORK	P1=1.00
= = =	**79,331.49** BAL	↓ 180 ENTER	P2=180.00
		↓	BAL=**79,331.49**

51. **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.**

52.

N	i	PV	PMT	FV
83.98 months	↑	50,000	↑	

53. 360 months - 83.98 months left (see Problem 52) ≈ 276 months elapsed; 276 months ÷ 12 = 23 years.
It will take about 23 years for the loan to be half repaid.

54.

N	i	PV	PMT	FV
200	**2.46**	-4,000		520,000

55. **a.** Before-tax return 6.75
Portion to taxman: 6.75 × 28% = -1.89
After-tax return 4.86

b. After-tax return 5.25 **(The municipal bond has the greater after-tax return)**

56. 157 × $550 = **$86,350**

57.

N	i	PV	PMT	FV
157	**0.62 × 12 = 7.47**	-55,000	550	

Your yield will be 7.47% compounded monthly.

58. To earn a rate greater than 7.47% you must pay **less than $55,000.**

59.

N	i	PV	PMT	FV
↑	8.5 ÷ 12 = 0.7083	**-52,010.73**	↑	

60.

N	i	PV	PMT	FV
268.00 months	8.75 ÷ 12 = 0.72916	138,743.03	-1,180.05*	

**Note:* $1,365.28 - $185.23 = $1,180.05

61.

N	i	PV	PMT	FV
261.22 months	↑	↑	-1,190.05	
215.03 months	↑	↑	-1,280.05	

62. 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 → 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.

HP 10BII

calculate monthly payment

[▬] [C ALL]	0.00
140,000 [PV]	140,000.00
15 [×] 12 [=] [N]	180.00
7 [÷] 12 [=] [I/YR]	0.58
[PMT]	-1,258.36

calculate interest, second calendar-year

5 [INPUT] 16 [▬] [AMORT]	5-16
[=] [=]	**-9,497.74 INT**

TI BAII PLUS

calculate monthly payment

[2nd] [CLR TVM]	?.??
140,000 [PV]	PV=140,000.00
15 [×] 12 [=] [N]	N=180.00
7 [÷] 12 [=] [I/Y]	I/Y=0.58
[CPT] [PMT]	PMT=-1,258.36

calculate interest, second calendar-year

[2nd] [AMORT] [2nd] [CLR WORK]	P1=1.00
5 [ENTER]	P1=5.00
↓ 16 [ENTER]	P2=16.00
↓ ↓ ↓	INT=**-9,497.74**
[2nd] [QUIT]	

2.

N	i	PV	PMT	FV
6	**3.46 × 12 ≈ 41.54**	345	-62.50 Begin*	

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

3.

N	i	PV	PMT	FV
20 × 12 = 240	6.75 ÷ 12 = 0.5625	220,000	**-1,672.80**	
6 × 12 = 72	**0.62 × 12 ≈ 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.

4.

N	i	PV	PMT	FV
10	**4.38**	-155,000		238,000

5.

N	i	PV	PMT	FV
17 × 2 = 34	**3.94 × 2 ≈ 7.88**	-965	37.50	1,000

Your YTM is **7.88% compounded semiannually.**

6.

HP 10BII			TI BAII PLUS	
[ ]	C ALL	0.00	CF 2nd CLR WORK	CFo=0.00
12,000	+/- CFj	-12,000.00	12,000 +/- ENTER	CFo=-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	

**Note*: The last $250 dividend happened at the same time as the sale, so the two cash flows are combined.

7.

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
650	CFj 34 [ ] Nj	34.00	↓ 650 ENTER ↓ 34 ENTER	F01=34.00
850	CFj 99 [ ] Nj	99.00	↓ 850 ENTER ↓ 180 ENTER	F02=180.00
850	CFj 81 [ ] Nj	81.00	NPV 9 ÷ 12 = ENTER	I=0.75
9	÷ 12 = I/YR	0.75	↓ CPT	NPV=**84,446.54**
[ ]	NPV	**84,446.54**	2nd QUIT	

**Note*: Because we do not know the amount, we enter a zero cash flow at the beginning of the first period.

Chapter 20 Financial Statements: How to Read and Interpret

Unit 20.1 Income statements

1. **(a) net income**
2. **(b) over a given period of time**
3. **False**

	4.	5.	6.
Revenues	$108,000	$120,000	**$ 69,000**
Total expenses	$ 28,000	**$130,000**	$42,000
Net income (or loss)	**$ 80,000**	($10,000)	$27,000

7. Net sales = Gross sales - Sales returns - Sales discounts = $805,000 - $5,400 - $15,700 = **$783,900**

8. Cost of goods sold = Beginning inventory + Cost of goods purchased - Ending inventory
= $82,400 + $264,000 - $94,800 = **$251,600**

9. Gross profit = Net sales - Cost of goods sold = $783,900 - $251,600 = **$532,300**

10. Net income = Gross profit - Operating expenses = $532,300 - $371,300 = **$161,000**

Unit 20.2 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	**$219,000**
Total liabilities	$ 65,000	**$148,000**	$192,000
Equity	**$ 63,000**	$672,000	$27,000

26. **False**. The equity section is called stockholders' equity.

27. **True**

28. **False.** The difference is called net worth.

Unit 20.3 Trend and ratio analysis

29. **True**

30.

BBB OFFICE SUPPLY, INC.
Comparative Income Statement (2010 vs 2009)

	Annual Amounts		Percent of Net Sales		Increase (or Decrease)	
	2010	2009	2010	2009	Amount	Percent
Gross sales	$346,200	$364,900	**101.1**	**100.5**	**($18,700)**	**(5.1)**
Sales returns	3,800	1,700	**1.1**	**0.5**	**2,100**	**123.5**
Net sales	$342,400	$363,200	**100.0**	**100.0**	**($20,800)**	**(5.7)**
Cost of goods sold	153,100	148,700	**44.7**	**40.9**	**4,400**	**3.0**
Gross profit	$189,300	$214,500	**55.3**	**59.1**	**($25,200)**	**(11.7)**
Total operating expenses	177,700	153,400	**51.9**	**42.2**	**24,300**	**15.8**
Net income (before income taxes)	$11,600	$61,100	**3.4**	**16.8**	**($49,500)**	**(81.0)**
Less income taxes	4,000	22,000	**1.2**	**6.1**	**(18,000)**	**(81.8)**
Net income (after income taxes)	$7,600	$39,100	**2.2**	**10.8**	**($31,500)**	**(80.6)**

(continued on next page)

BBB OFFICE SUPPLY, INC.
Comparative Balance Sheet (Dec. 31, 2010 vs Dec. 31, 2009)

	Year-end Amounts		Percent of Total		Increase (or Decrease)	
	2010	2009	2010	2009	Amount	Percent
Assets						
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)
Liabilities						
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)
Stockholders' Equity						
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 $= \frac{\text{Cash + Accounts receivable}}{\text{Current liabilities}} = \frac{\$23,100 + \$42,000}{\$18,000} = \frac{\$65,100}{\$18,000} \approx 3.6$

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 × 34%		$408,000
Income tax paid by stockholders:		
Profit	$1,200,000	
Less income tax paid by corporation	- 408,000	
Available for dividends	$ 792,000 × 35%	+277,200
Total		$685,200

Percent of profit paid as income tax = $\frac{\$685,200}{\$1,200,000}$ = .571 = **57.1%**

50.

FISHER'S CLOTHING STORE, INC.
Income Statement for the Quarter Ended March 31, 2011

Revenue from sales				
Gross sales				$1,653,800
Less: Sales returns				143,700
Net sales				$1,510,100
Cost of goods sold				
Merchandise inventory, January 1, 2006			$436,000	
Purchases		$922,800		
Less: Purchase returns	$5,300			
Purchase discounts	13,800			
Subtotal		19,100		
Net purchases		$903,700		
Add transportation in		3,400		
Cost of goods purchased			907,100	
Goods available for sale			$1,343,100	
Merchandise inventory, March 31, 2006			461,900	
Cost of goods sold				881,200
Gross profit from sales				$628,900
Less operating expenses				296,600
Net income (before income taxes)				$332,300
Less income tax expense				110,000
Net income (after income taxes)				$222,300

51.

WAYNE'S CORNER MARKET, INC.
Balance Sheet: June 30, 2011

Assets		
Current assets		
Cash	$22,800	
Merchandise inventory	42,200	
Prepaid expenses	800	
Total current assets		$65,800
Plant and equipment		
Store equipment	$42,000	
Less accumulated depreciation	10,500	
		31,500
Total assets		$97,300
Liabilities		
Current liabilities		
Accounts payable	$38,100	
Long-term liabilities		
Notes payable	5,000	
Total liabilities		$43,100
Stockholders' Equity		
Common stock: 1,000 shares @ $20	$20,000	
Retained earnings	34,200	
Total stockholders' equity		54,200
Total liabilities and stockholders' equity		$97,300

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 2006," "For quarter ending June 30, 2011," or "For six months ending June 30, 2011."

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	**$168,000**

4. $42,100 ÷ $152,800 ≈ .276 ≈ **27.6%**

5.

Item	2011	2010	Increase (or Decrease)	
			Amount	Percent
Cash	$27,000	$23,000	**$4,000**	**17.4**
Accounts receivable	$52,000	$58,000	**($6,000)**	**(10.3)**

6. **a.** Current ratio $= \frac{\text{Current assets}}{\text{Current liabilities}} = \frac{\$120{,}000}{\$72{,}000} \approx$ **1.7**

   For each dollar of current liabilities, the company has about $1.70 of current assets.

   b. Debt ratio $= \frac{\text{Total liabilities}}{\text{Total assets}} = \frac{\$150{,}000}{\$280{,}000} \approx .536 \approx$ **53.6%**

   For each dollar of assets, the company owes about 53.6¢.

   c. Inventory turnover $= \frac{\text{Cost of goods sold}}{\text{Average inventory}} = \frac{\$140{,}000}{(\$60{,}000 + \$68{,}000) \div 2} = \frac{\$140{,}000}{\$64{,}000} \approx$ **2.2**

   Inventory was sold 2.2 times during the year.

Chapter 21 Inventory and Overhead

Unit 21.1 Inventory methods: Assigning a cost to ending inventory

1. True

2.

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:	15 × $12.47	+187.05
Totals	**77**	**$919.89**

3.

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:	3 × $12.47	+37.41
Totals	7	**$84.88**

4. Average unit cost = $\frac{\text{Total cost available for sale}}{\text{Number of units available for sale}} = \frac{\$919.89}{77} = \$11.95$ (From Problem 2)

Ending inventory = 7 × $11.95 = **$83.65**

5. 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**

6. LIFO method assumes that the ending inventory consists of the oldest goods.

7 hammers × $11.35 (from beginning inventory) = **$79.45**

7.

Specific identification:	COGS = Cost of goods available for sale - ending inventory = $919.89 - $84.88 = **$835.01**
Weighted average:	COGS = Cost of goods available for sale - ending inventory = $919.89 - $83.65 = **$836.24**
FIFO:	COGS = Cost of goods available for sale - ending inventory = $919.89 - $87.29 = **$832.60**
LIFO:	COGS = Cost of goods available for sale - ending inventory = $919.89 - $79.45 = **$840.44**

8. By thinking of COGS as an expense, we find that the **FIFO** method (with the lowest COGS) will result in the greatest profit.

9. The method with the greatest ending inventory (**FIFO**) will produce the greatest total assets, and therefore the greatest equity.

Unit 21.2 Overhead: Spreading expenses to departments

10. 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.

11.

A:	$\frac{365{,}000}{1{,}850{,}000} \times \$65{,}000 = \$12{,}824.32 \approx$	**$12,800**
B:	$\frac{420{,}000}{1{,}850{,}000} \times \$65{,}000 = \$14{,}756.76 \approx$	**$14,800**
C:	$\frac{1{,}065{,}000}{1{,}850{,}000} \times \$65{,}000 = \$37{,}418.92 \approx$	**$37,400**
Total allocation		$65,000

12.

A:	$\frac{422{,}000}{1{,}612{,}000} \times \$40{,}000 = \$10{,}471.46 \approx$	**$10,471**
B:	$\frac{377{,}000}{1{,}612{,}000} \times \$40{,}000 = \$9{,}354.84 \approx$	**$ 9,355**
C:	$\frac{813{,}000}{1{,}612{,}000} \times \$40{,}000 = \$20{,}173.70 \approx$	**$20,174**
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 × $480	$ 1,920	$\frac{\$23,160}{46} = \$503.48$	3 × $520 = **$1,560.00**	3 × $480 = **$1,440.00**
10 × $490	4,900			
12 × $495	5,940	3 × $503.48 = **$1,510.44**		
20 × $520	+10,400			
46	$23,160			

Practice Test

1.

Available for sale		Weighted average	FIFO	LIFO
12 × $180	$ 2,160	$\frac{\$11,400}{59} = \$193.22$	8 × $200 = **$1,600.00**	8 × $180 = **$1,440.00**
10 × $190	1,900			
12 × $195	2,340	8 × $193.22 = **$1,545.76**		
25 × $200	+ 5,000			
59	$11,400			

2.

Available for sale		Specific identification		COGS
35 × $340	$11,900	12 × $340	$ 4,080	$76,150 - $11,510 = **$64,640**
40 × $350	14,000	4 × $350	1,400	
150 × $335	+50,250	18 × $335	+ 6,030	
225	$76,150	34	**$11,510**	

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 22 Depreciation

Unit 22.1 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 × 3 years = **$690**

7. $1,300 - $690 = **$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	—	—	**$2,400**
1	**$400**	**$ 400**	**$2,000**
2	**$400**	**$ 800**	**$1,600**
3	**$400**	**$1,200**	**$1,200**
4	**$400**	**$1,600**	**$800**
5	**$400**	**$2,000**	**$400**

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 × $0.0125 ≈ **$428**	$1,972
2	35,800 copies × $0.0125 ≈ **$448**	$1,524
3	30,100 copies × $0.0125 ≈ **$376**	$1,148
4	38,400 copies × $0.0125 = **$480**	$668
5	35,200 copies × $0.0125 = $440; limited to **$268***	$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 × 40% = **$960**	$1,440
2	$1,440 × 40% = **$576**	$864
3	$864 × 40% ≈ **$346**	$518
4	$518 × 40% ≈ $207; limited to **$118***	$400
5	**$0**	$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 deprecation 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 22.2 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 22-3)

19. **5 years**

20. **39 years**

21. **7 years**

22. Use the rates of Illustration 22-4: $2,500 × 20% = **$500**

23. $8,000 × 7.41% ≈ **$593**

24. $800 × 32% = **$256**

25. Illustation 22-5: $220,000 × 1.364% ≈ **$3,001**

26. Illustration 22-6: $970,000 × 2.564% ≈ **$24,871**

27. Illustration 22-7: $970,000 × 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 × 20%	**$300**
Year 2: $1,500 × 32%	**480**
Year 3: $1,500 × 19.20%	**288**
Year 4: $1,500 × 11.52%	**173**
Year 5: $1,500 × 11.52%	**173**
Year 6: $1,500 × 5.76%	**+ 86**
Total	$1,500

29. **You get only half a year's depreciation in year 1; this carries some depreciation into year 6.**

30. Building value = $250,000 × 80% = $200,000. Use Illustration 22-5, September column.

Year 1: $200,000 × 1.061%	**$2,122**
Year 2: $200,000 × 3.636%	**$7,272**
Year 3: $200,000 × 3.636%	**$7,272**

31. **Taxpayers are allowed only 11.5 months depreciation for year 1.**

32. **a.** Section 179 expense deduction (maximum for 2011) **$25,000**
b. MACRS depreciation
Depreciable basis: $36,200 - $25,000 = $11,200
Depreciation: $11,200 × 20% **$2,240**

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 × 40% = $14,000	$21,000
13–24	$21,000 × 40% = $8,400	$12,600
25–36	$12,600 × 40% = $5,040; limited to $4,600	$8,000

Calendar-year 1: $\$14,000 \times \frac{7}{12}$ ≈ **$8,167**
Calendar-year 2: $(\$14,000 \times \frac{5}{12}) + (\$8,400 \times \frac{7}{12})$ ≈ **$10,733**
Calendar-year 3: $(\$8,400 \times \frac{5}{12}) + (\$4,600 \times \frac{7}{12})$ ≈ **$6,183**

35. Calendar-year 1: $35,000 × 20% = **$7,000**
Calendar-year 2: $35,000 × 32% = **$11,200**
Calendar-year 3: $35,000 ×19.20% = **$6,720**

36. Straight-line: $3,150 + $5,400 + $5,400 = $13,950
200% declining-balance: $8,167 + $10,733 + $6,183 = **$25,083** ← *(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 copies × $0.02 = **$1,564** Year 2: 65,300 × $0.02 = **$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 × 15.625% ≈ **$313**	$1,687
2	$1,687 × 15.625% ≈ **$264**	$1,423

4. Get no depreciation for the first 9 months.

Year 1: $313 × $\frac{3}{12}$ ≈ **$78** Year 2: ($313 × $\frac{9}{12}$) + ($264 × $\frac{3}{12}$)
= $234.75 + $66 ≈ **$301**

5. Desks have 7-yr recovery period; salvage value is ignored.

Year 1: $2,000 × 14.29% ≈ **$286** Year 2: $2,000 × 24.49% ≈ **$490**

6. Building value = $850,000 × 80% = $680,000

Use Illustration 22-5, July column: Year 1: $680,000 × 1.667% ≈ **$11,336** Year 2: $680,000 × 3.636% ≈ **$24,725**

7. **a.** Section 179 expense deduction (maximum for 2011) **$25,000**
b. MACRS depreciation
Depreciable basis: $33,000 - $25,000 = $8,000
Depreciation: $8,000 × 14.29% **$1,143**

Chapter 23 Taxes: Income, Sales, and Property

Unit 23.1 Federal income tax

1. **False**

2. **(a) Tax tables**

3. Ill. 23-1, "$16,450–$16,500" range, single column: **$2,080**

4. **Step 1 (locate the schedule):** Ill. 23-2, Schedule Y-1
Step 2 (find the range): "over $128,500 but not over $195,850"
Step 3 (find difference): $133,400 - $128,500 = $4,900
Step 4 (multiply by rate): $4,900 × 28% = $1,372
Step 5 (find the tax): $1,372 + $24,972.50 = $26,344.50 ≈ **$26,345**

5. **Step 1 (locate the schedule):** Ill. 23-2, Schedule Y-1
Step 2 (find the range): "over $128,500 but not over $198,500"
Step 3 (find difference): $162,400 - $128,500 = $33,900
Step 4 (multiply by rate): $33,900 × 28% = $9,492
Step 5 (find the tax): $9,492 + $24,972.50 = $34,464.50 ≈ **$34,465**

6. **Tom ($42,000)**
Ill. 23-1, "$42,000–$42,050" range, married filing separately column: **$6,930**

Shauna ($120,400)
Step 1 (locate the schedule): Ill. 23-2, Schedule Y-2
Step 2 (find the range): "over $97,925 but not over $174,850"
Step 3 (find difference): $120,400 - $97,925 = $22,475
Step 4 (multiply by rate): $22,475 × 33% = $7,416.75
Step 5 (find the tax): $7,416.75 + $21,915.25 = **$29,332**

7. **Tom ($42,000)**
Ill. 23-1, "$42,000–$42,050" range, single column: **$6,930**

Shauna ($120,400)
Step 1 (locate the schedule): Ill. 23-2, Schedule X
Step 2 (find the range): "over $77,100 but not over $160,850"
Step 3 (find difference): $120,400 - $77,100 = $43,300
Step 4 (multiply by rate): $43,300 × 28% = $12,124
Step 5 (find the tax): $12,124 + $15,698.75 = $27,822.75 ≈ **$27,823**

8.

Married filing jointly:	**$34,465**	*This is the least tax*
Married filing separately: $6,930 (Tom) + $29,332 (Shauna)	**$36,262**	*This is the greatest tax*
Single: $6,930 (Tom) + $27,823 (Shauna)	$34,753	

9. **Step 1 (find the range):** Ill. 23-3, "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 23.2 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%	1,215.50	Sales tax: $18,300 × 7.25%	1,326.75
Total amount due	**$19,915.50**	Total amount due	**$19,626.75**

Unit 23.3 Property tax

15. **(b)** State and local governments

16. $350,000 × 50% = **$175,000**

17. Tax rate = $\frac{\text{Total budget of the taxing entity}}{\text{Total assessed value within the taxing entity}} = \frac{\$25,194,500}{\$3,825,876,200} \approx .0065853 \approx$ **.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 × .006585 = $25,193,394.78 (a bit short of the $25,194,500 needed).

19. $175,000 Assessed value × .024593 Tax rate = **$4,303.78**

20. Property tax = $\frac{\text{Assessed value}}{\$100} \times$ Tax rate = $\frac{\$175{,}000}{\$100} \times \$2.452 =$ **$4,291.00**

21. Property tax = Assessed value × Tax rate = $248,000 × 1.8565% = **$4,604.12**

22. Property tax = $\frac{\text{Assessed value}}{1{,}000} \times$ Mill levy = $\frac{\$720{,}000}{1{,}000} \times 21.344 =$ **$15,367.68**

Challenge problems

23. Ill. 23-1, "$70,800–$70,850" range, married filing jointly column: **$10,554**

24. **Step 1 (locate the schedule):** Ill. 23-2, Schedule Y-1
Step 2 (find the range): "over $63,700 but not over $128,500"
Step 3 (find difference): $70,824 - $63,700 = $7,124
Step 4 (multiply by rate): $7,124 × 25% = $1,781
Step 5 (find the tax): $1,781 + $8,772.50 = 10,553.50 ≈ **$10,554**

25. **Same**

26. A likely guess: **Tax tables are, for most people, easier to use than tax rate schedules.**

27. **25%** (found in Step 4 of Problem 24)

28. **The 25% means that for each additional dollar of taxable income, Cary and Judy must pay 25% to the IRS.** For example, if Cary and Judy had $100 of additional taxable income, they would pay an extra $25 to the IRS.

29. $\frac{\$10{,}554 \text{ (tax, Problem 23)}}{\$70{,}824 \text{ (taxable income)}} \approx .1490 \approx$ **14.90%**

30. Assessed value = $200,000 × 25% = $50,000

Property tax = $\frac{\text{Assessed value}}{1{,}000} \times$ Mill levy = $\frac{\$50{,}000}{1{,}000} \times 51.044 =$ **$2,552.20**

Practice Test

1. Ill. 23-1, "$41,800–$41,850" range, single column: **$6,880**

2. **Step 1 (locate the schedule):** Ill. 23-2, Schedule Y-1
Step 2 (find the range): "over $128,500 but not over $195,800"
Step 3 (find difference): $182,488 - $128,500 = $53,988
Step 4 (multiply by rate): $53,988 × 28% = $15,116.64
Step 5 (find the tax): $15,116.64 + $24,972.50 = $40,089.14 ≈ **$40,089**

3. Illustration 23-3: $35,911,080 × 35% = **$12,568,878**

4.

Cost of TV	$6,800
Sales tax: $6,800 × 6.75%	+ 459
Total amount due	**$7,259**

5.

Price of new vehicle	$47,500	
Less trade-in	- 8,000	
Net price	$39,500 × 7%	= **$2,765**

6. Tax rate = $\frac{\text{Total budget of the taxing entity}}{\text{Total assessed value within the taxing entity}} = \frac{\$8{,}255{,}500}{\$952{,}844{,}200} \approx .0086641 \approx$ **.008665** *(round up)*

7. Property tax = $\frac{\text{Assessed value}}{\$100} \times$ Tax rate = $\frac{\$450{,}000}{\$100} \times \$2.628 =$ **$11,826**

Chapter 24 Insurance

Unit 24.1 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 $\times \frac{218}{365}$	- 167.23
Refund	**$112.77**

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 × 5%	- 37.65	
Subtotal	$715.35	
Premium for additional liability coverage	+ 60.00	
Total annual premium	$775.35	(**$775** rounded)

8. **False.** Most homeowner's policies automatically cover personal belongings for a percent of the policy's face value.

9.

Basic premium: $\frac{\$1,550,000}{\$1,000}$ × $2.70	$4,185.00	
Discount for having $1,000 deductible: $4,185 × 4%	- 167.40	
Subtotal	$4,017.60	
Additional liabilities coverage: $\frac{\$1,550,000}{\$1,000}$ × $0.20	+ 310.00	
Total annual premium	$4,327.60	(**$4,328** rounded)

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 24.2 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. $\frac{\$200,000}{\$1,000}$ × $2.66 = **$532**

18. **$532** (The premium stays the same for the 15-year period.)

19. $\frac{\$200,000}{\$1,000}$ × $6.58 = **$1,316**

20. $\frac{\$200,000}{\$1,000}$ × $9.63 = **$1,926**

21. **$1,926** (The premium stays the same for life.)

22. Remember, the rates of Ill. 24-3 are for males. Rates for females are those of a male 4 years younger, so

    $\frac{\$120,000}{\$1,000}$ × $7.06 (rate for a 23 year old) = **$847.20**

23. **True**

24. Using Ill. 24-5, 10 years, Option 1: $\frac{\$100,000}{\$1,000}$ × $96 = **$9,600**

25. Using Ill. 24-5, 10 years, Option 2: $\frac{\$100,000}{\$1,000}$ × $258 = **$25,800 of coverage**

26. Using Ill. 24-5, 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 × 12 ≈ 63.57**	450	-85 Begin*	

**Note:* $450 ÷ 6 = $75; $75 + $10 carrying charge = $85.

29.

N	i	PV	PMT	FV
15	**6.15**		-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 × 12 = 240	**0.40 × 12 ≈ 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 × $\frac{145}{365}$	- 246.30
Refund	**$373.70**

3.

Basic premium (look across $180,000 row to column 3)	$641.00	
Burglar alarm discount: $641 × 5%	- 32.05	
Subtotal	$608.95	
Smoke alarm discount: $608.95 × 3%	- 18.27	
Subtotal	$590.68	
New home discount: $590.68 × 10%	- 59.07	
Annual premium	$531.61	(**$532** rounded)

4.

Basic premium: $\frac{\$700,000}{\$1,000}$ × $3.90	$2,730.00	
Discount for having $2,500 deductible: $2,730 × 6%	- 163.80	
Subtotal	$2,566.20	
Additional liability coverage: $\frac{\$700,000}{\$1,000}$ × $0.20	+ 140.00	
Total annual premium	$2,706.20	(**$2,706** rounded)

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. 24-3 are for males; for females, deduct 4 years, so: $\frac{\$70,000}{\$1,000}$ × $7.39 = **$517.30** (same for her entire life)

9. Ill. 24-5, 20 years, Option 2: $\frac{\$200,000}{\$1,000}$ × $548 = **$109,600**

Chapter 25 Measurements: Real-World Applications

Unit 25.1 Length, area, and volume: Applications

1. **90°** 2. **True** 3. 10 ft + 12 ft + 13 ft + 20 ft + 20 ft = **75 ft** 4. 23.32 in. + 12 in. + 20 in. = **55.32 in.**

5. 10 ft + 20 ft + 5 ft + 10 ft + 15 ft + 10 ft + 5 ft + 20 ft + 5 ft + 5 ft + 10 ft + 5 ft = **120 ft**

6. $P = 2(L + W) = 2(660 \text{ ft} + 330 \text{ ft}) = 2(990 \text{ ft}) =$ **1,980 ft**

7. ***r, d, c.*** Diameter is twice the radius; circumference is about 3.14 times the diameter.

8. $C = \pi d \approx 3.14(9 \text{ ft}) \approx$ **28.26 ft**

9. $d = \frac{c}{\pi} \approx \frac{44 \text{ ft}}{3.14} \approx$ **14.01 ft**

10.
Rectangle: $A = LW =$ (38 in.)(30 in.)	1,140 in.^{2}
Triangle: $A = \frac{1}{2}bh = \frac{1}{2}$(7 in.)(30 in.)	+ 105 in.^{2}
Total area	**1,245 sq in.**

11.
Entire circle: $A = \pi r^2 \approx 3.14$(15 in.)(15 in.)	706.50 in.^{2}
Inner circle: $A = \pi r^2 \approx 3.14$(3 in.)(3 in.)	- 28.26 in.^{2}
Net area	**678.24 sq in.**

12.
Large rectangle: $A = LW =$ (60 ft)(30 ft) =	1,800 ft^2
Missing rectangle: $A = LW =$ (15 ft)(5 ft) =	- 75 ft^2
Rectangle at bottom: $A = LW =$ (30 ft)(5 ft) =	+ 150 ft^2
Total square footage	**1,875 sq ft**

13. $A = \pi r^2 \approx 3.14(50 \text{ mi})(50 \text{ mi}) \approx$ **7,850 sq mi**

14. $V = LWH =$ (15 in.)(15 in.)(15 in.) = **3,375 cu in.**

15.
Entire cube: $V = LWH =$ (25 ft)(15 ft)(20 ft) =	7,500 ft^3
Missing portion: $V = LWH =$ (10 ft)(15 ft)(10 ft) =	-1,500 ft^3
Net volume	**6,000 cu ft**

16. $V = \pi r^2 h \approx 3.14(5 \text{ in.})(5 \text{ in.})(10 \text{ in.}) \approx$ **785 cu in.**

17. $V = LWH =$ (90 ft)(40 ft)(18 ft) = 64,800 cu ft 64,800 ÷ 250 = 259.20 = **259 tickets**

18. $V = \pi r^2 h \approx 3.14(14 \text{ ft})(14 \text{ ft})(15 \text{ ft}) \approx$ **9,231.60 cu ft**

19. $V = LWH =$ (18 yd)(18 yd)(18 yd) = **5,832 cu yd**

Unit 25.2 Unit costs and converting measurements (U.S. to U.S.)

20. 68-oz: Cost per ounce = $\frac{\text{Cost}}{\text{Number of ounces}} = \frac{\$1.19}{68 \text{ oz}} = \$0.0175$ per oz = **1.75¢ per oz** **(This one is cheaper)**

Six-pack: Cost per ounce = $\frac{\text{Cost}}{\text{Number of ounces}} = \frac{\$1.49}{72 \text{ oz}} \approx \$0.0207$ per oz ≈ 2.07¢ per oz

21. $P = 2(L + W) = 2(40 \text{ ft} + 30 \text{ ft}) = 2(70 \text{ ft}) = 140$ ft Cost = 140 × \$4.75 = **\$665**

22.
Area of rectangle: $A = LW =$ (70 ft)(40 ft) =	2,800
Area of circle: $A = \pi r^2 \approx 3.14$(20 ft)(20 ft) ≈	+1,256
Total area	4,056 × \$6.50 = **\$26,364**

23. $A = LW =$ (74 ft)(62 ft) = 4,588 sq ft Cost: (4,588 × \$0.22) + \$35 = \$1,009.36 + \$35 = **\$1,044.36**

24. 1,875 sq ft × \$120 per sq ft = **\$225,000**

25. Weight of each can, with beans: 12 oz + 1 oz = 13 oz
Number of cans = ×24
Total weight of cans, filled = 312 oz
Weight of carton = +10 oz
Total weight of carton, filled = 322 oz = (322 ÷ 16) lb ≈ **20.13 pounds**

26. $A = LW$ = (24 ft)(15 ft) = 360 sq ft = (360 ÷ 9) sq yd = 40 sq yd Cost = 40 sq yd × $21.50 per sq yd = **$860**

27. $A = LW$ = (2,640 ft)(100 ft) = 264,000 sq ft = (264,000 ÷ 43,560) acres ≈ 6.06060606 acres
6.06060606 acres × $22,000 per acre = **$133,333.33**

28. 65 ft × 150 times = 9,750 ft = (9,750 ÷ 5,280) mi ≈ **1.85 mi**

29. 100 yds = (100 × 36) in. = 3,600 in. 3,600 in. ÷ 30 in. per day = **120 days**

Challenge problems

30. $C = 2\pi r \approx 2(3.14)(15 \text{ in.}) \approx 94.20$ in. *(The car travels 94.20 inches for each revolution of the tires.)*
3,403 mi = (3,403 × 5,280) ft = 17,967,840 ft = (17,967,840 × 12) in. = 215,614,080 in.
(The car travels 215,614,080 in.)
Tire revolutions: 215,614,080 in. ÷ 94.20 in. per revolution ≈ **2,288,897 revolutions**

31. Diameter of earth: $d = \frac{c}{\pi} \approx \frac{25{,}000 \text{ mi}}{3.14} \approx 7{,}961.783439$ mi

Diameter of satellite orbit: 7,961.783439 mi + 400 mi = 8,361.783439 mi
Circumference of orbit: $C = \pi d \approx 3.14(8{,}361.783439 \text{ mi}) \approx$ **26,256 mi**

32. Area of ceiling: 14 ft × 18 ft = 252 sq ft
Gallons required: 252 sq ft ÷ 200 sq ft per gallon ≈ 1.26 gal ≈ 2 gal *(Can't buy part of a gallon)*

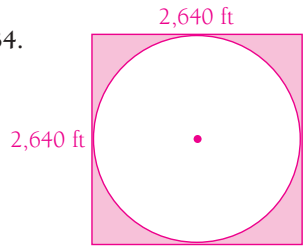
Area of walls:
2 walls 14 ft wide: 2(14 ft × 9 ft) = 2(126 sq ft) = 252 sq ft
2 walls 18 ft wide: 2(18 ft × 9 ft) = 2(162 sq ft) = + 324 sq ft
Less windows: 3(3 ft × 4 ft) = 3(12 sq ft) = - 36 sq ft
Less door: 3 ft × 7 ft = - 21 sq ft
Net area = 519 sq ft

Gallons required: 519 sq ft ÷ 200 sq ft per gallon ≈ 2.60 gal ≈ 3 gal *(Can't buy part of a gallon)*

Cost: 5 gal × $32.95 = **$164.75**

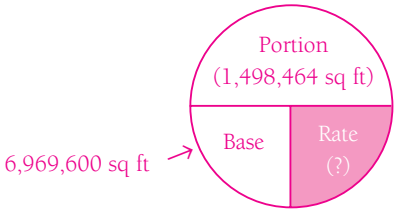
33. 27 in. = $(\frac{27}{12})$ ft = 2.25 ft
$V = LWH$ = (115 ft)(280 ft)(2.25 ft) = 72,450 cu ft = $(\frac{72{,}450}{27})$ cu yd ≈ **2,683.33 cu yd**

34.



Total sq ft of land: $A = LW$ = (2,640 ft)(2,640 ft) = 6,969,600 sq ft
Sq ft in circular part: $A = \pi r^2 \approx$ (3.14)(1,320 ft)(1,320 ft) = -5,471,136 sq ft
Area not farmed = **1,498,464 sq ft**

35.

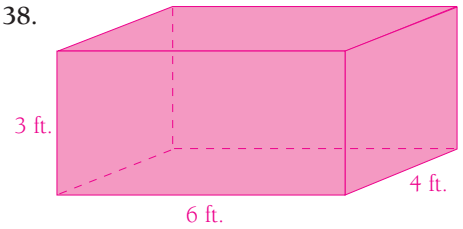


Rate = $\frac{\text{Portion}}{\text{Base}} = \frac{1{,}498{,}464 \text{ sq ft}}{6{,}969{,}600 \text{ sq ft}} = 0.2150 =$ **21.50%**

36. 7,122 yd + 125 yd (to first hole) + (17 × 50 yd) + 125 yd (back to clubhouse) = 8,222 yd = $(\frac{8{,}222}{1{,}760})$ mi ≈ **4.67 mi**

37. $V = LWH$ = (27 ft 6 in.)(18 ft)(4 in.) ≈ (27.5 ft)(18 ft)($\frac{1}{3}$ ft) = 165 cu ft = ($\frac{165}{27}$) cu yd ≈ 6.111111111 cu yd
6.111111111 cu yd × $85 per cu yd = **$519.44**

38.



Top and bottom: 2(6 ft × 4 ft)	48	sq ft
Front and back: 2(6 ft × 3 ft)	36	sq ft
Two ends: 2(4 ft × 3 ft)	+24	sq ft
Total	**108**	**sq ft**

39. 100 yds = (100 ÷ 1,760) mi ≈ .05681818 mi
10.5 sec = (10.5 ÷ 60) min = .175 min = (.175 ÷ 60) hr ≈ .00291667 hr
miles per hour means miles ÷ number of hours, so: .05681818 mi ÷ .00291667 hr ≈ **19.5 mph**

40.

A	=	LW	*Formula for area of rectangle*
452	=	L(24)	*Substitute: W = 24 in.*
$\frac{452}{24}$	=	L	*Divide both sides by 24*
18.83	≈	L	

Check answer: 18.83 in. × 24 in. ≈ 452 sq in.

Practice Test

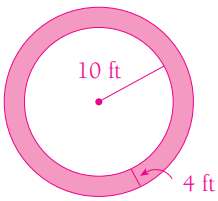
1. $P = 2(L + W)$ = 2(1,200 ft + 600 ft) = 2(1,800 ft) = **3,600 ft**

2. $d = \frac{c}{\pi} \approx \frac{31.5 \text{ in.}}{3.14} \approx$ **10.03 in.**

3.

Rectangle: $A = LW$ = (150 ft)(120 ft) =	18,000	sq ft
Triangle: $A = \frac{1}{2}bh = \frac{1}{2}$(80 ft)(150 ft) =	+ 6,000	sq ft
Total area	**24,000**	**sq ft**

4.



Entire circle: $A = \pi r^2 \approx$ 3.14(14 ft)(14 ft) ≈	615.44	sq ft
Inner circle: $A = \pi r^2 \approx$ 3.14(10 ft)(10 ft) ≈	- 314.00	sq ft
Net area	**301.44**	**sq ft**

5. $V = LWH$ = (1,000 ft)(270 ft)(12 ft) = 3,240,000 cu ft = ($\frac{3,240,000}{27}$) cu yd = **120,000 cu yd**

6. $V = \pi r^2 h \approx$ 3.14(12 ft)(12 ft)(45 ft) ≈ **20,347.20 cu ft**

7. Cost per sq ft = $\frac{\text{Cost}}{\text{Number of sq ft}} = \frac{\$242,000}{2,320 \text{ sq ft}}$ = **$104.31 per sq ft (Yes, it is within range.)**

8. $A = LW$ = (1,320 ft)(660 ft) = 871,200 sq ft = ($\frac{871,200}{43,560}$) acres = **20 acres**

Chapter 26 International Business: Exchange Rates and Metrics

Unit 26.1 Monetary exchange rates: Significance in international business

1. **False;** a worldwide currency has never existed.
2. $2,300 = (2,300 × .70348) euros = **1,618 euros**
3. $2,300 = (2,300 × .55882) pounds = **1,285.29 pounds**
4. $2,300 = (2,300 × 104.710) yen = **240,833 yen**

5. 21,300 Canadian dollars = $\frac{21,300}{1.07880}$ U.S. dollars = **$19,744.16**

6. 975,000 British pounds = $\frac{975,000}{.55882}$ U.S. dollars = **$1,744,747.86**

7. 65 Swiss francs = $\frac{65}{1.12080}$ U.S. dollars = **$57.99**

8. $128,000 = (128,000 × 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	$4,746,698.89
Purchased for	-5,042,816.37
Loss	**($ 296,117.48)**

Unit 26.2 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. **65ℓ**; a liter is a bit more than a quart

21. **112 km**

Abbreviation for prefix (kilo) | *Abbreviation for base unit (meter)*

22. **25 mg**

Abbreviation for prefix (milli) | *Abbreviation for base unit (gram)*

23. **82 ℓ**

There is no prefix | *Abbreviation for base unit (liter)*

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 26-3. Move to centi (1 place to the left). Move the decimal point 1 place to the left: 850 mm = 85.0 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 × 2.2046) lb ≈ **52.91 lb**

31. We will convert from m to yd (see left side of the Distance section): 100 m ≈ (100 × 1.09361) yd ≈ **109.36 yd**

32. We will convert from ℓ to gal (see left side of the Volume section): 62 ℓ ≈ (62 × .26417762) gal ≈ **16.38 gal**

33. We will convert from in. to cm (see right side of Distance section): 17.5 in. ≈ (17.5 × 2.54) cm ≈ **44.45 cm**

34. We will convert from yd^3 to m^3 (see right side of Volume section): 38 $yd^3 \approx (38 \times .76456)\ m^3 \approx$ **29.05 m^3**

35. We will convert from oz to g (see right side of Weight section): 14.2 oz ≈ (14.2 × 28.3495) g ≈ **402.56 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 in. ≈ (8.5 × 2.54) cm ≈ **21.59 cm** 11 in. ≈ (11 × 2.54) cm ≈ **27.94 cm**

37. 60 oz ≈ (60 × 28.3495) g ≈ **1,701 g**

38. To compare the temperatures, we must state both using the same scale. Let's convert the Fahrenheit temperature (95°) to a Celsius (C) temperature

$$C = \frac{5}{9}(F - 32) = \frac{5}{9}(95 - 32) = \frac{5}{9}(63) = 35°C$$

The temperature in Rome (38°C) was higher than that of Chicago (35°C).

39. $C = \frac{5}{9}(F - 32) = \frac{5}{9}(98.6 - 32) = \frac{5}{9}(66.6) =$ **37°C**

40. $C = \frac{5}{9}(F - 32) = \frac{5}{9}(-60 - 32) = \frac{5}{9}(-92) \approx$ **-51.1°C**

Challenge problems

41. 15 T ≈ (15 × .9072) t ≈ **13.608 t**

42. 975 British pounds = $\left(\frac{975}{62570}\right)$ U.S. dollars = **$1,558.25**

43. 13.608 (t) × $1,558.25 (per t) = **$21,204.67**

44. 83 cm = .83 m 1.6 m + 2.5 m + .83 m + 4.7 m = **9.63 m**

45. 483 km ≈ (483 × .62137) mi ≈ 300 mi 300 mi ÷ 50 mph = **6 hr**

46. Cost in U.S. dollars for one liter: 1.40 Canadian dollars = $\left(\frac{1.40}{1.05}\right)$ U.S. dollars ≈ $1.33333333

1 liter ≈ (1 × .26417762) gal ≈ .26417762 gal

Price per gallon means price ÷ gallons: $\frac{\$1.33333333}{.26417762\ \text{gal}}$ ≈ **$5.05 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

$\frac{100\ \text{m}}{10.94\ \text{sec.}}$ ≈ 9.14 m per sec. For each second, the runner traveled 9.14 m.

Lincoln High School

100 yd ≈ (100 × .9144) m ≈ 91.44 m

$\frac{91.44\ \text{m}}{10.03\ \text{sec.}}$ ≈ 9.12 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 × 10.2350) pesos = **388,930 pesos**

2.

Sold for: 7,500,000 British pounds = $\left(\frac{7,500,000}{.71450}\right)$ U.S. dollars =	$10,496,850.94
Purchased for: 6,800,000 British pounds = $\left(\frac{6,800,000}{.65320}\right)$ US dollars =	-10,410,287.81
Profit	**$ 86,563.13**

3. **25 km** 4. 1.05 mg = 001.05 mg = **.00105 g**

5. 12.5 oz ≈ (12.5 × 28.3495) g ≈ **354 g** 6. $F = \frac{9}{5}C + 32 = \frac{9}{5}(30) + 32 = 54 + 32 =$ **86°F**

Chapter 27 Statistics: An Introduction

Unit 27.1 The three Ms: Mean, median, and mode

1. $\frac{79 + 87 + 94 + 67 + 92 + 94 + 82}{7} = \frac{595}{7} = \mathbf{85}$

2. Values, high to low: 94, 94, 92, **87**, 82, 79, 67

$$\text{Midpoint} = \frac{\text{Number of values} + 1}{2} = \frac{7 + 1}{2} = \frac{8}{2} = 4$$

3. The value "**94**" occurs the most often (twice), so it is the mode.

4. $\frac{\$125{,}000 + \$115{,}000 + \$195{,}000 + \$88{,}000 + \$150{,}000 + \$135{,}000 + \$245{,}000 + \$110{,}000 + \$165{,}000 + \$88{,}000 + \$665{,}000 + \$145{,}000}{12} = \frac{\$2{,}226{,}000}{12} = \mathbf{\$185{,}500}$

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

$$\text{Midpoint} = \frac{\text{Number of values} + 1}{2} = \frac{12 + 1}{2} = \frac{13}{2} = 6.5 \qquad (\$145{,}000 + \$135{,}000) \div 2 = \mathbf{\$140{,}000}$$

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. $\frac{\$4{,}700 + \$5{,}900 + \$6{,}800 + \$8{,}700}{4} = \frac{\$26{,}100}{4} = \mathbf{\$6{,}525}$

9.

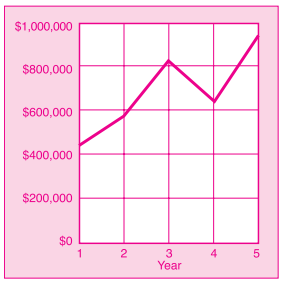
\$4,700 ×	8	\$ 37,600
\$5,900 ×	13	76,700
\$6,800 ×	11	74,800
\$8,700 ×	5	43,500
	37	\$232,600 ÷ 37 = **\$6,286.49**

10.

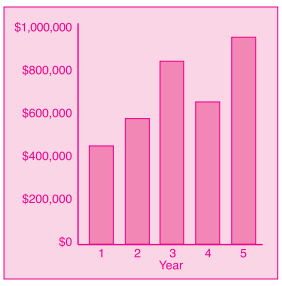
Course	Grade	Hours	Grade-point units	
Accounting	B+	5	3.3 × 5 =	16.50
Computer Science	B-	3	2.7 × 3 =	8.10
Golf	A	1	4.0 × 1 =	4.00
Management	A-	3	3.7 × 3 =	11.10
		12		39.70 ÷ 12 = **3.31** (about a B+ average)

Unit 27.2 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 entends farther to the right than the bars for the other rivers.

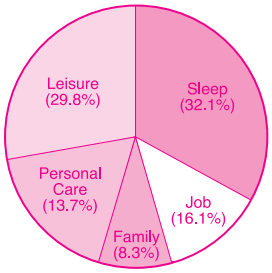
14. **About 3,900 mi.**

15. 4,150 mi (Nile) - 3,850 (Mississippi-Missouri) = **about 300 mi**

16.

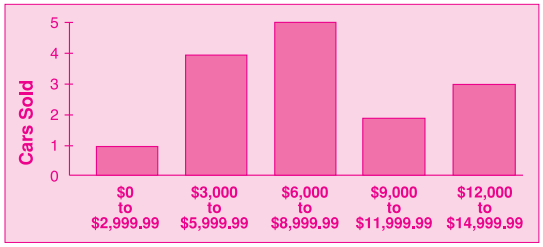
Department	Percent of total	Degrees
Sleep	54 ÷ 168 ≈ .321 ≈ 32.1%	× 360° ≈ **115.7°**
Job	27 ÷ 168 ≈ .161 ≈ 16.1%	× 360° ≈ **57.9°**
Family care	14 ÷ 168 ≈ .083 ≈ 8.3%	× 360° = **30.0°**
Personal care	23 ÷ 168 ≈ .137 ≈ 13.7%	× 360° ≈ **49.3°**
Leisure	50 ÷ 168 ≈ .298 ≈ 29.8%	× 360° ≈ **107.1°**
	168 100.0%	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**

Challenge problems

23. Your savings account balance at the end of May was $400. You made a $225 deposit on June 5 and withdrew $150 on June 28. Calculate your average (mean) daily balance for June.

4 days × $400	$ 1,600
23 days × $625	14,375
3 days × $475	+ 1,425
30	$17,400 ÷ 30 = **$580**

24. Your test scores so far are 84, 93, 87, 94, and 88. What score do you need on your last test to end up with an average (mean) score of 90?

Total points required to have an average of 90: 6 tests × 90	540
Points so far: 84 + 93 + 87 + 94 + 88	-446
Points needed on last test	**94**

25.

Prior cumulative grade-point units: 2.92 × 42 hrs	122.64
Grade-point units for this semester (see Problem 10)	+ 39.70
Cumulative grade-point units for all 54 hrs	162.34 ÷ 54 = **3.01**

Practice Test

1. $\frac{\$120{,}000 + \$140{,}000 + \$210{,}000 + \$178{,}000 + \$2{,}400{,}000 + \$120{,}000}{6} = \frac{\$3{,}168{,}000}{6} = \mathbf{\$528{,}000}$

2. Values, high to low: \$2,400,000, \$210,000, \$178,000, \$140,000, \$120,000, \$120,000

   Midpoint = $\frac{\text{Number of values} + 1}{2} = \frac{6+1}{2} = \frac{7}{2} = 3.5$ (\$178,000 + \$140,000) ÷ 2 = **\$159,000**

3. **\$120,000** occurs the most often (twice)

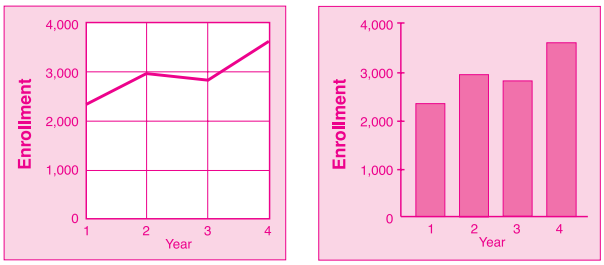
4. **The median.** The mean (\$528,000) is distorted by the \$2,400,000 sale. The mode (\$120,000) happens to be the lowest value.

5.

Model	Price	Number sold
Workmaster	\$550	52
Auto-Feed	\$850	18
Deluxe	\$2,300	6

Value		Frequency		Product
\$550	×	52	=	\$28,600
\$850	×	18	=	15,300
\$2,300	×	6	=	13,800
		76		\$57,700 ÷ 76 = **\$759.21**

6.



7.

Model	Number sold
4 × 7	252
5 × 8	144
10 × 12	211
12 × 15	128

Total number sold: 252 + 144 + 211 + 128 = 735
211 ÷ 735 ≈ .287; .287 × 360° ≈ **103.3°**