Percents

Solutions Key

ARE YOU READY?

1. proportion

2. decimal

3. ratio

4. simplest form

5. $\frac{8}{10} = 8 \div 10 = 0.8$

6. $\frac{53}{100} = 53 \div 100 = 0.53$

7. $\frac{739}{1{,}000} = 739 \div 1{,}000 = 0.739$

8. $\frac{7}{100} = 7 \div 100 = 0.07$

9. $\frac{2}{5} = 2 \div 5 = 0.4$

10. $\frac{5}{8} = 5 \div 8 = 0.625$

11. $\frac{7}{12} = 7 \div 12 = 0.58\overline{3}$

12. $\frac{13}{20} = 13 \div 20 = 0.65$

13. $0.05 = \frac{5}{100} = \frac{1}{20}$

14. $0.92 = \frac{92}{100} = \frac{23}{25}$

15. $0.013 = \frac{13}{1{,}000}$

16. $0.8 = \frac{8}{10} = \frac{4}{5}$

17. $0.006 = \frac{6}{1{,}000} = \frac{3}{500}$

18. $0.305 = \frac{305}{1{,}000} = \frac{61}{200}$

19. $0.0007 = \frac{7}{10{,}000}$

20. $1.04 = \frac{104}{100} = \frac{26}{25} = 1\frac{1}{25}$

21. $100n = 300$
$n = 3$

22. $38 = 0.4x$
$95 = x$

23. $16p = 1{,}200$
$p = 75$

24. $9 = 27y$
$\frac{1}{8} = y$

25. $0.07m = 56$
$m = 800$

26. $25 = 100t$
$\frac{1}{4} = t$

27. $\frac{2}{3} = \frac{x}{12}$
$24 = 3x$
$8 = x$

28. $\frac{x}{20} = \frac{3}{4}$
$4x = 60$
$x = 15$

29. $\frac{8}{15} = \frac{x}{45}$
$360 = 15x$
$24 = x$

30. $\frac{16}{28} = \frac{4}{n}$
$16n = 112$
$n = 7$

31. $\frac{p}{100} = \frac{12}{36}$
$36p = 1{,}200$
$p = 33\frac{1}{3}$

32. $\frac{42}{12} = \frac{14}{n}$
$42n = 168$
$n = 4$

33. $\frac{8}{y} = \frac{10}{5}$
$40 = 10y$
$4 = y$

34. $\frac{6}{9} = \frac{d}{24}$
$9d = 144$
$d = 16$

35. $\frac{21}{a} = \frac{7}{5}$
$7a = 105$
$a = 15$

LESSON 1

Think and Discuss

1. Possible answer: Divide 3 by 4 and write the decimal as a percent. Write an equivalent fraction with a denominator of 100 and then write the equivalent percent.

2. $\frac{25}{100} = \frac{1}{4}$; 0.25, 25%

Exercises

1. $0.6 = \frac{6}{10} = \frac{60}{100} = 60\%$

2. $0.32 = \frac{32}{100} = 32\%$

3. $0.544 = \frac{544}{1{,}000} = \frac{54.4}{100} = 54.4\%$

4. $0.06 = \frac{6}{100} = 6\%$

5. $0.087 = \frac{87}{1{,}000} = \frac{8.7}{100} = 8.7\%$

6. $\frac{1}{4} = 1 \div 4 = 0.25 = 25\%$

7. $\frac{3}{25} = 3 \div 25 = 0.12 = 12\%$

8. $\frac{11}{20} = 11 \div 20 = 0.55 = 55\%$

9. $\frac{7}{40} = 7 \div 40 = 0.175 = 17.5\%$

10. $\frac{5}{8} = 5 \div 8 = 0.625 = 62.5\%$

11. $0.\overline{5} \approx 0.555$, $50\% = 0.500$, $\frac{11}{20} = 0.550$
$0.500 < 0.550 < 0.555$, so $50\% < \frac{11}{20} < 0.\overline{5}$
$50\%, \frac{11}{20}, 0.\overline{5}$

12. $\frac{7}{8} = 0.875$, $-0.9 = -0.900$, $90\% = 0.900$
$-0.900 < 0.875 < 0.900$, so $-0.9 < \frac{7}{8} < 90\%$
$-0.9, \frac{7}{8}, 90\%$

13. $10\% = 0.100$, $1\% = 0.010$, $-\frac{1}{10} = -0.100$
$-0.100 < 0.010 < 0.100$, so $-\frac{1}{10} < 1\% < 10\%$
$-\frac{1}{10}, 1\%, 10\%$

14. $-0.8 = -0.800$, $\frac{4}{5} = 0.800$, $8\% = 0.080$
$-0.800 < 0.080 < 0.800$, so $-0.8 < 8\% < \frac{4}{5}$
$-0.8, 8\%, \frac{4}{5}$

15. $72\% = 0.720$, $\frac{35}{54} \approx 0.648$, $0.\overline{6} \approx 0.666$
$0.648 < 0.666 < 0.720$, so $\frac{35}{54} < 0.\overline{6} < 72\%$
$\frac{35}{54}, 0.\overline{6}, 72\%$

16. $-\frac{1}{2} = -0.500$, $5\% = 0.050$, $-0.05 = -0.050$
$-0.500 < -0.050 < 0.050$, so $-\frac{1}{2} < -0.05 < 5\%$
$-\frac{1}{2}$, -0.05, 5%

17. Use mental math. 50 multiplied by 2 is 100 so 20 multiplied by 2 is 40. 40%.

18. $0.15 = \frac{15}{100} = 15\%$

19. $0.83 = \frac{83}{100} = 83\%$

20. $0.325 = \frac{325}{1{,}000} = \frac{32.5}{100} = 32.5\%$

21. $0.081 = \frac{81}{1{,}000} = \frac{8.1}{100} = 8.1\%$

22. $0.42 = \frac{42}{100} = 42\%$

23. $\frac{3}{4} = 3 \div 4 = 0.75 = 75\%$

24. $\frac{2}{5} = 2 \div 5 = 0.4 = 40\%$

25. $\frac{3}{8} = 3 \div 8 = 0.375 = 37.5\%$

26. $\frac{3}{16} = 3 \div 16 = 0.1875 = 18.75\%$

27. $\frac{7}{25} = 7 \div 25 = 0.28 = 28\%$

28. $0.\overline{6} \approx 0.666$, $6\% = 0.060$, $\frac{3}{5} = 0.600$
$0.060 < 0.600 < 0.666$, so $6\% < \frac{3}{5} < 0.\overline{6}$
6%, $\frac{3}{5}$, $0.\overline{6}$

29. $-\frac{2}{3} \approx -0.667$, $-0.7 = -0.700$, $7\% = 0.070$
$-0.700 < -0.667 < 0.070$, so $-0.7 < -\frac{2}{3} < 0.\overline{6}$
-0.7, $-\frac{2}{3}$, $0.\overline{6}$

30. $\frac{8}{3} \approx 2.667$, $30\% = 0.300$, 3
$0.300 < 2.667 < 3$, so $30\% < \frac{8}{3} < 3$
30%, $\frac{8}{3}$, 3

31. $-0.1 = -0.100$, $1\% = 0.010$, $-\frac{1}{9} \approx -0.111$
$-0.111 < -0.100 < 0.010$, so $-\frac{1}{9} < -0.1 < 1\%$
$-\frac{1}{9}$, -0.1, 1%

32. $2\% = 0.020$, $\frac{5}{4} = 1.250$, $1.\overline{1} \approx 1.111$
$0.020 < 1.111 < 1.250$, so $2\% < 1.\overline{1} < \frac{5}{4}$
2%, $1.\overline{1}$, $\frac{5}{4}$

33. $-\frac{1}{6} \approx -0.167$, $-0.01 = -0.010$, $2\% = 0.020$
$-0.167 < -0.010 < 0.020$, so $-\frac{1}{6} < -0.01 < 2\%$
$-\frac{1}{6}$, -0.01, 2%

34. The denominator is not a factor of 100, so mental math is not a good choice. Using a calculator is the best method. $30 \div 75 = 0.4 = 40\%$

35. Pencil and paper, 20%

36. $9\% \blacksquare 0.9$
$\frac{9}{100} \blacksquare 0.9$
$0.09 < 0.9$
$9\% < 0.9$

37. $45\% \blacksquare \frac{2}{5}$
$\frac{45}{100} > \frac{40}{100}$
$45\% > \frac{2}{5}$

38. $0.037 \blacksquare 37\%$
$3.7\% < 37\%$
$0.037 < 37\%$

39. $\frac{7}{12} \blacksquare 60\%$
$0.583 < 0.60$
$\frac{7}{12} < 60\%$

40. $\frac{90{,}000}{250{,}000} = \frac{9}{25} = \frac{36}{100} = 36\%$
36% of the plant species are found in the rain forests.

41. $\frac{1}{2} \cdot 900 = 450$
$\frac{1}{10} \cdot 450 = 45$
$\frac{1}{5} \cdot 45 = 9$
$\frac{9}{900} = 0.01 = 1\%$
1% of the students are boys who play trumpet in the band.

42. 60%

43. North Mecklenburg, Dudley, Wallace-Rose Hill, Cummings, Wakefield

44. Cummings

45. $100\% - 66.\overline{6}\% = 33.\overline{3}\%$
Wallace-Rose Hill lost about 33.3% of their games.

46. After writing the fraction as 0.4, the student didn't move the decimal two places to the right to get 40%.

47. Possible answer: Use division to write the fraction as a decimal and write the decimal as a percent, or write an equivalent fraction with a denominator of 100 and write the new numerator with a percent sign.

48. $\frac{15}{12} = 15 \div 12 = 1.25 = 125\%$

49. D; $0.045 = 4.5\%$

50. Possible answer: Find the area of Melanie's floor, then write a ratio of the portion that the rug covers to the whole floor and convert this fraction to a percent.

LESSON 2

Think and Discuss

1. Possible answer: Find $\frac{1}{2}$ of 88, or find 10% of 88 and multiply by 5.

2. Possible answer: 15% is about $\frac{1}{7}$ because $\frac{15}{100} = \frac{3}{20}$ is close to $\frac{1}{7}$ and because $100 \div 15$ rounds to 7.

3. Possible answer: When you want to estimate the item's sale price or the sales tax on an item; when a store needs to collect sales tax on an item.

Exercises

1. Possible answer:

$30\% \text{ of } 86 \approx \frac{1}{3} \cdot 86$

$\approx \frac{1}{3} \cdot 90$

≈ 30

30% of 86 is about 30.

2. Possible answer:

$52\% \text{ of } 83 \approx \frac{1}{2} \cdot 83$

$\approx \frac{1}{2} \cdot 80$

≈ 40

52% of 83 is about 40.

3. Possible answer:

$10\% \text{ of } 48 \approx \frac{1}{10} \cdot 48$

$\approx \frac{1}{10} \cdot 50$

≈ 5

10% of 48 is about 5.

4. Possible answer:

$27\% \text{ of } 63 \approx \frac{1}{4} \cdot 63$

$\approx \frac{1}{4} \cdot 60$

≈ 15

27% of 63 is about 15.

5. Yes; 35% of \$43.99 is close to $\frac{1}{3}$ of \$45, which is \$15. Since \$45 − \$15 = \$30, Darden will have enough money.

6. Possible answer:
5% of 82
82 is about 80, so find 5% of 80.
$1\% \text{ of } 80 = .\underbrace{80}$
$5\% \text{ of } 80 = 5 \cdot 0.80 = 4.0$
5% of 82 is about 4.

7. Possible answer:
39% of 19
39% is about 40% and 19 is about 20, so find 40% of 20.
$10\% \text{ of } 20 = 2.\underbrace{0}$
$40\% \text{ of } 20 = 4 \cdot 2.0 = 8.0$
39% of 19 is about 8.

8. Possible answer:
21% of 68
21% is about 20% and 68 is about 70, so find 20% of 70.
$10\% \text{ of } 70 = 7.\underbrace{0}$
$20\% \text{ of } 70 = 2 \cdot 7.0 = 14.0$
21% of 68 is about 14.

9. Possible answer:
7% of 109
109 is about 110, so find 7% of 110.
$1\% \text{ of } 110 = 1.\underbrace{10}$
$7\% \text{ of } 110 = 7 \cdot 1.10 = 7.70$
7% of 109 is about 7.7.

10. Possible answer:
Find 15% of \$23.
15% = 10% + 5%
10% of \$23 = \$2.30
5% of \$23 = \$2.30 ÷ 2 = \$1.15
\$2.30 + \$1.15 = \$3.45
Mrs. Coronado should leave about \$3.45 for a 15% tip.

11. Possible answer:

$8\% \text{ of } 261 \approx \frac{1}{10} \cdot 261$

$\approx \frac{1}{10} \cdot 260$

≈ 26

8% of 261 is about 26.

12. Possible answer:

$34\% \text{ of } 93 \approx \frac{1}{3} \cdot 93$

≈ 31

≈ 34% of 93 is about 31.

13. Possible answer:

$53\% \text{ of } 142 \approx \frac{1}{2} \cdot 142$

$\approx \frac{1}{2} \cdot 140$

≈ 70

53% of 142 is about 70.

14. Possible answer:

$23\% \text{ of } 98 \approx \frac{1}{4} \cdot 98$

$\approx \frac{1}{4} \cdot 100$

≈ 25

23% of 98 is about 25.

15. Possible answer:

$51\% \text{ of } 432 \approx \frac{1}{2} \cdot 432$

≈ 216

51% of 432 is about 216.

16. Possible answer:

$18\% \text{ of } 42 \approx \frac{1}{5} \cdot 42$

$\approx \frac{1}{5} \cdot 40$

≈ 8

18% of 42 is about 8.

17. Possible answer:

$11\% \text{ of } 132 \approx \frac{1}{10} \cdot 132$

$\approx \frac{1}{10} \cdot 130$

≈ 13

11% of 132 is about 13.

18. Possible answer:

$54\% \text{ of } 39 \approx \frac{1}{2} \cdot 39$

$\approx \frac{1}{2} \cdot 40$

≈ 20

54% of 39 is about 20.

19. 25% of \$23.99

$\frac{1}{4} \cdot \$24.00 = \$6.00$

\$24.00 − \$6.00 = \$18.00

Fancy Feet has the better price of \$18.00.

20. Possible answer:
41% of 16
41% is about 40%, so find 40% of 16.
10% of 16 = 1.6
40% of 16 = 4 · 1.6 = 6.4
41% of 16 is about 6.4.

21. Possible answer:
8% of 310
310 is about 300, so find 8% of 300.
1% of 300 = 3
8% of 300 = 8 · 3 = 24
8% of 310 is about 24.

22. Possible answer:
83% of 70
83% is about 80%, so find 80% of 70.
10% of 70 = 7
80% of 70 = 8 · 7 = 56
83% of 70 is about 56.

23. Possible answer:
2% of 634
634 is about 600, so find 2% of 600.
1% of 600 = 6

2% of 600 = 2 · 6 = 12
2% of 634 is about 12.

24. Possible answer:
58% of 81
58% is about 60% and 81 is about 80, so find 60% of 80.
10% of 80 = 8
60% of 80 = 6 · 8 = 48
58% of 81 is about 48.

25. Possible answer:
24% of 49
24% is about 25% and 49 is about 50, so find 25% of 50.
10% of 50 = 5
25% of 50 = 2.5 · 5 = 12.5
24% of 49 is about 12.5 or 12.

26. Possible answer:
11% of 99
11% is about 10% and 99 is about 100, so find 10% of 100.
10% of 100 = 10
11% of 99 is about 10.

27. Possible answer:
63% of 39
63% is about 60% and 39 is about 40, so find 60% of 40.
10% of 4 = 4
60% of 40 = 6 · 4 = 24
63% of 39 is about 24.

28. Since \$8.92 is about \$9, find 15% of \$9.
15% = 10% + 5%
10% of \$9 = \$0.90
5% of \$9 = \$0.90 ÷ 2 = \$0.45
\$0.90 + \$0.45 = \$1.35
Marc should leave about \$1.35 for a 15% tip.

29. Possible answer:
31% of 180
Find 30% of 200.
10% of 200 = 20
3 · 20 = 60
31% of 180 is about 60.

30. Possible answer:
18% of 150
Find 20% of 150.
10% of 150 = 15
2 · 15 = 30
18% of 150 is about 30.

31. Possible answer:
3% of 96
Find 3% of 100.
1% of 100 = 1
3% of 100 = 3 · 1 = 3
3% of 96 is about 3.

32. Possible answer:
2% of 198
Find 2% of 200.
1% of 200 = 2
2% of 200 = 2 · 2 = 4
2% of 198 is about 4.

33. Possible answer:
78% of 90
Find 80% of 90.
10% of 90 = 9
8 · 9 = 72
78% of 90 is about 72.

34. Possible answer:
52% of 234
Find 50% of 230.
10% of 230 = 23
5 · 23 = 115
52% of 234 is about 115.

35. Possible answer:
19% of 75
Find 20% of 75.
10% of 75 = 7.5
2 · 7.5 = 15
19% of 75 is about 15.

36. Possible answer:
4% of 311
Find 4% of 300.
1% of 300 = 3
4% of 300 = 4 · 3 = 12
4% of 311 is about 12.

37. Estimate the amount of increase.
20% of 22
20% of 20
10% of 20 = 2
20% of 20 = 4
Add the amount of increase to the original amount.
32 + 4 = 26
There are about 26 ounces in the new package.

38. Estimate the sales tax.
7% of \$60.85
7% of \$60
1% of \$60 = \$0.60
7% of \$60 = \$4.20
Add the sales tax to the cost of the frame.
\$60 = \$4.20 = \$64.20
It will cost about \$64.20 to get a painting framed.

39. Estimate the 15% tip.
15% of \$11.67
15% of \$12.00
10% of \$12 = \$1.20
5% of \$12 = \$1.20 ÷ 2 = \$0.60
\$1.20 + \$0.60 = \$1.80
\$2.00 − \$1.80 = \$0.20
0.20 ÷ 12 = 0.0166 = 1.66%
Camden left about 2% more.

40. 19.3% of 82
20% of 80
10% of 80 = 8
20% of 80 = 16
Ali had about 16 hits.

41. a. Possible answer:
78% of 391
75% of 400
10% of 400 = 40
75% of 400 = 300
About 300 people are willing to give out their e-mail address on the Internet.

b. Possible answer:
67% of 391
65% of 400
10% of 400 = 40
65% of 400 = 260
About 260 people are not willing to give out their credit card number on the Internet.

42. a. Possible answer:
27% of \$43,000
25% of \$40,000
10% of \$40,000 = \$4,000
25% of \$40,000 = \$10,000
Sandi plans to spend about \$10,000 on rent this year.

b. Possible answer:
\$10,000 ÷ 12
\$10,000 ÷ 10 = \$1,000
Sandi plans to spend about \$1,000 on rent each month.

43. Possible answer: If 3,000 people are surveyed, about how many people will give out their street address?

44. Possible answer: When determining whether you have enough money to buy an item, it is important to know if your estimate is too high or too low.

45. Possible answer:

First Way	Second Way
Work phone number:	53% − 11% = 42%
53% of 391	42% of 391
50% of 400 = 200	40% of 400 = 160

Social Security number:
11% of 391
10% of 400 = 40
200 − 40 = 160
About 160 more people are willing to give out their work phone number than their Social Security number over the Internet.

46. C; 65% of 66
65% of 70
10% of 70 = 7
65% of 70 = 45.5
45%

47. Possible answer: Find 10% by moving the decimal point left one, and then divide by two to find 5%. Add together to find 15%.

LESSON 3

Think and Discuss

1. Possible answer: the Multiplication Property of Equality is used to help write equivalent equations because it states that by multiplying both sides of an equation by the same number, the statement will still be true.

Exercises

1. Method 1:
$14.25(8) + 11.75(8)$
$= 114 + 94$
$= 208$
Method 2:
$8(14.25 + 11.75)$
$= 8(26)$
$= 208$
They earn $208 together.

2. Method 1:
$12(12) - 12(6)$
$= 144 - 72$
$= 72$
Method 2:
$12(12 - 6)$
$= 12(6)$
$= 72$
Andy assembles 72 more circuit boards than Kimber.

3. $8x - 108 = 9$; $x = 14\frac{5}{8}$

$$\frac{2}{3}x - 9 = \frac{3}{4}$$
$$12\left(\frac{2}{3}x - 9\right) = 12\left(\frac{3}{4}\right)$$
$$8x - 108 = 9$$
$$8x - 108 + 108 = 9 + 108$$
$$8x = 117$$
$$\frac{8x}{8} = \frac{117}{8}$$
$$x = 14\frac{5}{8}$$

4. $4x + 160 = 15$; $x = -36\frac{1}{4}$

$$\frac{1}{5}x + 8 = \frac{3}{4}$$
$$20\left(\frac{1}{5}x + 8\right) = 20\left(\frac{3}{4}\right)$$
$$4x + 160 = 15$$
$$4x + 160 - 160 = 15 - 160$$
$$4x = -145$$
$$\frac{4x}{4} = \frac{-145}{4}$$
$$x = -36\frac{1}{4}$$

5. $24x + 168 = 7$; $x = -6\frac{17}{24}$

$$\frac{3}{7}x + 3 = \frac{1}{8}$$
$$56\left(\frac{3}{7}x + 3\right) = 56\left(\frac{1}{8}\right)$$
$$24x + 168 = 7$$
$$24x + 168 - 168 = 7 - 168$$
$$24x = -161$$
$$\frac{24x}{24} = \frac{-161}{24}$$
$$x = -6\frac{17}{24}$$

6. $3x - 72 = 4$; $x = 25\frac{1}{3}$

$$\frac{1}{6}x - 4 = \frac{2}{9}$$
$$18\left(\frac{1}{6}x - 4\right) = 18\left(\frac{2}{9}\right)$$
$$3x - 72 = 4$$
$$3x - 72 + 72 = 4 + 72$$
$$3x = 76$$
$$\frac{3x}{3} = \frac{76}{3}$$
$$x = 25\frac{1}{3}$$

7. $5x - 80 = 6$; $x = 17\frac{1}{5}$

$$\frac{5}{8}x - 10 = \frac{3}{4}$$
$$8\left(\frac{5}{8}x - 10\right) = 8\left(\frac{3}{4}\right)$$
$$5x - 80 = 6$$
$$5x - 80 + 80 = 6 + 80$$
$$5x = 86$$
$$\frac{5x}{5} = \frac{86}{5}$$
$$x = 17\frac{1}{5}$$

8. $16x - 240 = 15$; $x = 15\frac{15}{16}$

$$\frac{4}{5}x - 12 = \frac{3}{4}$$
$$20\left(\frac{4}{5}x - 12\right) = 20\left(\frac{3}{4}\right)$$
$$16x - 240 = 15$$
$$16x - 240 + 240 = 15 + 240$$
$$16x = 255$$
$$\frac{16x}{16} = \frac{255}{16}$$
$$x = 15\frac{15}{16}$$

9. $6425 + 715x = 12{,}145$; $x = 8$; 8 weeks
$64.25 + 7.15x = 121.45$
$100(64.25 + 7.15x) = 100(121.45)$

$$6425 + 715x = 12{,}145$$
$$6425 - 6425 + 715x = 12{,}145 - 6425$$
$$715x = 5720$$
$$\frac{715x}{715} = \frac{5720}{715}$$
$$x = 8$$

10. Method 1:
$1.39(11) + 0.79(11)$
$= 15.29 + 8.69$
$= 23.98$
Method 2:
$11(1.39 + 0.79)$
$= 11(2.18)$
$= 23.98$
Clare spent \$23.98.

11. Method 1:
$4(1.5) + 3(1.5)$
$= 6 + 4.5$
$= 10.5$
Method 2:
$1.5(4 + 3)$
$= 1.5(7)$
$= 10.5$
Mr. Cramer exercises 10.5 hours per week.

12. $4x + 120 = 15$; $x = -26\frac{1}{4}$
$$\frac{1}{5}x + 6 = \frac{3}{4}$$
$$20\left(\frac{1}{5}x + 6\right) = 20\left(\frac{3}{4}\right)$$
$$4x + 120 = 15$$
$$4x + 120 - 120 = 15 - 120$$
$$4x = -105$$
$$\frac{4x}{4} = \frac{-105}{4}$$
$$x = -26\frac{1}{4}$$

13. $4x - 42 = 3$; $x = 11\frac{1}{4}$
$$\frac{2}{3}x - 7 = \frac{1}{2}$$
$$6\left(\frac{2}{3}x - 7\right) = 6\left(\frac{1}{2}\right)$$
$$4x - 42 = 3$$
$$4x - 42 + 42 = 3 + 42$$
$$4x = 45$$
$$\frac{4x}{4} = \frac{45}{4}$$
$$x = 11\frac{1}{4}$$

14. $5x + 315 = 21$; $x = -58\frac{4}{5}$
$$\frac{1}{7}x + 9 = \frac{3}{5}$$
$$35\left(\frac{1}{7}x + 9\right) = 35\left(\frac{3}{5}\right)$$
$$5x + 315 = 21$$
$$5x + 315 - 315 = 21 - 315$$
$$5x = -294$$
$$\frac{5x}{5} = \frac{-294}{5}$$
$$x = -58\frac{4}{5}$$

15. $5x - 24 = 6$; $x = 6$
$$\frac{5}{8}x - 3 = \frac{3}{4}$$
$$8\left(\frac{5}{8}x - 3\right) = 8\left(\frac{3}{4}\right)$$
$$5x - 24 = 6$$
$$5x - 24 + 24 = 6 + 24$$
$$\frac{5x}{5} = \frac{30}{5}$$
$$x = 6$$

16. $8x + 120 = 3$; $x = -14\frac{5}{8}$
$$\frac{4}{5}x + 12 = \frac{3}{10}$$
$$10\left(\frac{4}{5}x + 12\right) = 10\left(\frac{3}{10}\right)$$
$$8x + 120 = 3$$
$$8x + 120 - 120 = 3 - 120$$
$$8x = -117$$
$$\frac{8x}{8} = \frac{-117}{8}$$
$$x = -14\frac{5}{8}$$

17. $4x + 48 = 5$; $x = -10\frac{3}{4}$
$$\frac{2}{3}x + 8 = \frac{5}{6}$$
$$6\left(\frac{2}{3}x + 8\right) = 6\left(\frac{5}{6}\right)$$
$$4x + 48 = 5$$
$$4x + 48 - 48 = 5 - 48$$
$$4x = -43$$
$$\frac{4x}{4} = \frac{-43}{4}$$
$$x = -10\frac{3}{4}$$

18. $12x - 30 = 10$; $x = 3\frac{1}{3}$
$$\frac{4}{5}x - 2 = \frac{2}{3}$$
$$15\left(\frac{4}{5}x - 2\right) = 15\left(\frac{2}{3}\right)$$
$$12x - 30 = 10$$
$$12x - 30 + 30 = 10 + 30$$
$$12x = 40$$
$$\frac{12x}{12} = \frac{40}{12}$$
$$x = 3\frac{1}{3}$$

19. $6x + 210 = 7$; $x = 33\frac{5}{6}$
$$\frac{2}{7}x + 10 = \frac{1}{3}$$
$$21\left(\frac{2}{7}x + 10\right) = 21\left(\frac{1}{3}\right)$$
$$6x + 210 = 7$$
$$6x + 210 - 210 = 7 - 210$$
$$6x = -203$$
$$\frac{6x}{6} = \frac{-203}{6}$$
$$x = -33\frac{5}{6}$$

20. $10x - 84 = 9$; $x = 9\frac{3}{10}$
$$\frac{5}{6}x - 7 = \frac{3}{4}$$
$$12\left(\frac{5}{6}x - 7\right) = 12\left(\frac{3}{4}\right)$$
$$10x - 84 = 9$$
$$10x - 84 + 84 = 9 + 84$$
$$10x = 93$$
$$\frac{10x}{10} = \frac{93}{10}$$
$$x = 9\frac{3}{10}$$

21. $5035 = 380x + 1995$; $x = 8$; 8 markers
$$100(50.35) = 100(3.80x + 19.95)$$
$$5035 = 380x + 1995$$

$$5035 - 1995 = 380x + 1995 - 1995$$
$$3040 = 380x$$
$$\frac{3040}{380} = \frac{380x}{380}$$
$$8 = x$$

22. Method 1:
$34(6) - 21(6)$
$= 204 - 126$
$= 78$
Method 2:
$6(34 - 21)$
$= 6(13)$
$= 78$
The watercolor painting class submitted 78 more art pieces.

23. Method 1:
$3(89) - 2(89)$
$= 267 - 178$
$= 89$
Method 2:
$89(3 - 2)$
$= 89(1)$
$= 89$
Karl drives 89 more miles than Jack.

24. Let x = the number of days the hair grows. The hair is 12 mm long and grows 0.3 mm/day. Solve $0.3x + 12 = 16.5$.
$$0.3x + 12 = 16.5$$
$$10(0.3x + 12) = 10(16.5)$$
$$3x + 120 = 165$$
$$3x + 120 - 120 = 165 - 120$$
$$3x = 45$$
$$x = 15$$
It will take 15 days.

25. $2x + 24 = 3$; $x = -10\frac{1}{2}$
$$\frac{1}{2}x + 6 = \frac{3}{4}$$
$$4\left(\frac{1}{2}x + 6\right) = 4\left(\frac{3}{4}\right)$$
$$2x + 24 = 3$$
$$2x + 24 - 24 = 3 - 24$$
$$2x = -21$$
$$x = -10\frac{1}{2}$$

26. $5x - 42 = 2$; $x = 8\frac{4}{5}$
$$\frac{5}{6}x - 7 = \frac{1}{3}$$
$$6\left(\frac{5}{6}x - 7\right) = 6\left(\frac{1}{3}\right)$$
$$5x - 42 = 2$$
$$5x - 42 + 42 = 2 + 42$$
$$5x = 44$$
$$x = 8\frac{4}{5}$$

27. $10x - 105 = 6$; $x = 11\frac{1}{10}$
$$\frac{2}{3}x - 7 = \frac{2}{5}$$
$$15\left(\frac{2}{3}x - 7\right) = 15\left(\frac{2}{5}\right)$$
$$10x - 105 = 6$$
$$10x - 105 + 105 = 6 + 105$$
$$10x = 111$$
$$x = 11\frac{1}{10}$$

28. $25x - 400 = 50$; $x = 18$
$$0.25x - 4 = 0.5$$
$$100(0.25x - 4) = 100(0.5)$$
$$25x - 400 = 50$$
$$25x - 400 + 400 = 50 + 400$$
$$25x = 450$$
$$x = 18$$

29. $5x - 68 = 124$; $x = 38.4$
$$0.5x - 6.8 = 12.4$$
$$10(0.5x - 6.8) = 10(12.4)$$
$$5x - 68 = 124$$
$$5x - 68 + 68 = 124 + 68$$
$$5x = 192$$
$$x = 38.4$$

30. $250x - 250 = 125$; $x = 1.5$
$$0.25x - 0.25 = 0.125$$
$$1000(0.25x - 0.25) = 1000(0.125)$$
$$250x - 250 = 125$$
$$250x - 250 + 250 = 125 + 250$$
$$250x = 375$$
$$\frac{250x}{250} = \frac{375}{250}$$
$$x = 1.5$$

31. The student did not multiply 8 by 12; $x = -10\frac{2}{9}$.

32. Possible answer: Find the GCF of the numbers in the denominators of the fractions. Then multiply each side of the equation by the GCF. This will give you an equivalent equation without fractions.

33. $12x + 10 = 15$; $x = \frac{5}{12}$
$$\frac{3}{5}x + \frac{1}{2} = \frac{3}{4}$$
$$20\left(\frac{3}{5}x + \frac{1}{2}\right) = 20\left(\frac{3}{4}\right)$$
$$12x + 10 = 15$$
$$12x + 10 - 10 = 15 - 10$$
$$12x = 5$$
$$x = \frac{5}{12}$$

34. B
$$\frac{1}{8}x + 3 = \frac{3}{4}$$
$$\frac{1}{8}(-18) + 3 \stackrel{?}{=} \frac{3}{4}$$
$$8\left(\frac{1}{8}(-18) + 3\right) \stackrel{?}{=} 8\left(\frac{3}{4}\right)$$
$$-18 + 24 \stackrel{?}{=} 6$$
$$6 = 6$$

35. $25x + 90 = 265$; $x = 7$
$$2.5x + 9 = 26.5$$
$$10(2.5x + 9) = 10(26.5)$$
$$25x + 90 = 265$$
$$25x + 90 - 90 = 265 - 90$$
$$25x = 175$$
$$x = 7$$

READY TO GO ON?

1. $0.85 = 85\%$
2. $0.026 = 2.6\%$
3. $0.1111 = 11.11\%$
4. $0.56 = 56\%$
5. $\frac{14}{81} = 14 \div 81 \approx 0.173 = 17.3\%$

6. $\frac{25}{52} = 25 \div 52 \approx 0.481 = 48.1\%$

7. $\frac{55}{78} = 55 \div 78 \approx 0.705 = 70.5\%$

8. $\frac{13}{32} = 13 \div 32 \approx 0.406 = 40.6\%$

9. Possible answer:

$49\% \text{ of } 46 \approx \frac{1}{2} \cdot 46 \approx 23$

49% of 46 is about 23.

10. Possible answer:

$9\% \text{ of } 25 \approx \frac{1}{10} \cdot 25 \approx 2.5$

9% of 25 is about 2.5.

11. Possible answer:

$36\% \text{ of } 150 \approx \frac{1}{3} \cdot 150 \approx 50$

36% of 150 is about 50.

12. Possible answer:

5% of 60

1% of 60 = 0.6

5% of 60 = 5 · 0.6 = 3

5% of 60 is 3.

13. Possible answer:

$18\% \text{ of } 80 \approx \frac{1}{5} \cdot 80 \approx 16$

18% of 80 is about 16.

14. Possible answer:

$26\% \text{ of } 115 \approx \frac{1}{4} \cdot 120 \approx 30$

26% of 155 is about 30.

15. Possible answer:

91% of 300 ≈ 90% of 300

10% of 300 = 30

90% of 300 = 9 · 30 = 270

91% of 300 is about 270.

16. Possible answer:

42% of 197 ≈ 40% of 200

10% of 200 = 20

40% of 200 = 4 · 20 = 80

42% of 197 is about 80.

17. Possible answer:

15% of \$21.85 ≈ 15% of \$22

10% of \$22 = \$2.20

5% of \$22 = \$2.20 ÷ 2 = \$1.10

\$2.20 + \$1.10 = \$3.30

15% of \$21.85 is about \$3.30.

18. $3x - 28 = 2$; $x = 10$

$\frac{3}{4}x - 7 = \frac{1}{2}$

$4\left(\frac{3}{4}x - 7\right) = 4\left(\frac{1}{2}\right)$

$3x - 28 = 2$

$3x - 28 + 28 = 2 + 28$

$3x = 30$

$\frac{3x}{3} = \frac{30}{3}$

$x = 10$

19. $10x + 45 = 9$; $x = -3\frac{3}{5}$

$\frac{2}{3}x + 3 = \frac{3}{5}$

$15\left(\frac{2}{3}x + 7\right) = 15\left(\frac{3}{5}\right)$

$10x + 45 = 9$

$10x + 45 - 45 = 9 - 45$

$10x = -36$

$\frac{10x}{10} = \frac{-36}{10}$

$x = -3\frac{6}{10} = -3\frac{3}{5}$

20. $6x - 10 = 5$; $x = 2\frac{1}{2}$

$\frac{3}{5}x - 1 = \frac{1}{2}$

$10\left(\frac{3}{5}x - 1\right) = 10\left(\frac{1}{2}\right)$

$6x - 10 = 5$

$6x - 10 + 10 = 5 + 10$

$6x = 15$

$\frac{6x}{6} = \frac{15}{6}$

$x = -2\frac{3}{6} = 2\frac{1}{2}$

21. $225x + 295 = 970$; $x = 3$ pounds

$2.25x + 2.95 = 9.70$

$100(2.25x + 2.95 = 100(9.70)$

$225x + 295 = 970$

$225x + 295 - 295 = 970 - 295$

$225x = 675$

$\frac{225x}{225} = \frac{615}{225}$

$x = 3$

Armando bought 3 pounds of tomatoes.

LESSON 4

Think and Discuss

1. Possible answer: A 100% decrease is a decrease equal to the original amount. The difference between the original amount and a 100% decrease is zero.

2. Possible answer: 10 increased to 25 is a 150% increase of 10. The percent of increase must be greater than 100% for the amount of increase to exceed the original amount.

Exercises

1. 25 is decreased to 18.

$25 - 18 = 7$

$\text{percent of change} = \frac{7}{25}$

$= 0.28$

$= 28\%$

The percent of decrease is 28%.

2. 36 is increased to 84.

$84 - 36 = 48$

$\text{percent of change} = \frac{48}{36}$

≈ 1.333333

$\approx 133.3\%$

The percent of increase is about 133.3%

3. 62 is decreased to 52.

$62 - 52 = 10$

$\text{percent of change} = \frac{10}{62}$

≈ 0.161290323

$\approx 16.1\%$

The percent of decrease is about 16.1%.

4. 28 is increased to 96.

$$96 - 28 = 68$$

$$\text{percent change} = \frac{68}{28}$$

$$\approx 2.428571429$$

$$\approx 242.9\%$$

The percent of increase is about 242.9%.

5. $20\% \cdot 42.99 = d$

$0.20 \cdot 42.99 = d$

$8.598 = d$

$\$8.60 \approx d$

The discount on the sweater is \$8.60.

$\$42.99 - \$\ 8.60 = \$34.39$

The sale price is \$34.39.

6. First find the actual amount on increase.

Think: 98% of \$12.50 is what number?

$98\% \cdot 12.50 = n$

$0.98 \cdot 12.50 = n$

$12.25 = n$

The amount of increase is \$12.25. Now find the retail price.

Think: retail price = wholesale price + amount of increase

$r = \$12.50 + \$12.25$

$r = \$24.75$

The retail price of the pair of shoes is \$24.75.

7. 72 is decreased to 45.

$$72 - 45 = 27$$

$$\text{percent of change} = \frac{27}{72}$$

$$= 0.375$$

$$= 37.5\%$$

The percent of decrease is 37.5%.

8. 55 is increased to 90.

$$90 - 55 = 35$$

$$\text{percent of change} = \frac{35}{55}$$

$$\approx 0.636363$$

$$\approx 63.6\%$$

The percent increase is about 63.6%.

9. 180 is decreased to 140.

$$180 - 140 = 40$$

$$\text{percent change} = \frac{40}{180}$$

$$\approx 0.22222222$$

$$\approx 22.2\%$$

The percent of decrease is about 22.2%.

10. 230 is increased to 250.

$$250 - 230 = 20$$

$$\text{percent of change} = \frac{20}{230}$$

$$\approx 0.086956522$$

$$\approx 8.7\%$$

The percent on increase is about 8.7%.

11. $15\% \cdot 65 = d$

$0.15 \cdot 65 = d$

$9.75 = d$

$\$9.75 = d$

The discount on the skateboard is \$9.75.

$\$65 - \$9.75 = \$55.25$

The sale price is \$55.25.

12. First find the actual amount of increase.

Think: 135% of \$85 is what number?

$135\% \cdot 85 = n$

$1.35 \cdot 85 = n$

$114.75 = n$

The amount of increase is \$114.75. Now find the retail price.

Think: retail price = wholesale price + amount of increase

$r = \$85 + \$114.75$

$r = \$199.75$

The retail price of the ring is \$199.75.

13. \$8.80 is increased to \$17.60.

$17.60 - 8.80 = 8.80$

$\frac{8.80}{8.80} = 1.00 = 100\%$

The percent of change is 100%.

14. 6.2 is decreased to 5.9.

$6.2 - 5.9 = 0.3$

$\frac{0.3}{6.2} \approx 0.048 \approx 4.8\%$

The percent of change is 4.8%.

15. 39.2 is increased to 56.3.

$56.3 - 39.2 = 17.1$

$\frac{17.1}{39.2} \approx 0.436 \approx 43.6\%$

The percent of change is 43.6%.

16. \$325 is decreased to \$100.

$325 - 100 = 225$

$\frac{225}{325} \approx 0.692 \approx 69.2\%$

The percent of change is 69.2%.

17. 75 is decreased by 40%.

$40\% \cdot 75 = n$

$0.40 \cdot 75 = n$

$30 = n$

The amount of decrease is 30.

18. 28 is increases by 150%.

$150\% \cdot 28 = n$

$1.5 \cdot 28 = n$

$42 = n$

The amount of increase is 42.

19. First find the actual amount of increase.

Think: 25% of 45 gal is what number?

$25\% \cdot 45 = n$

$0.25 \cdot 45 = n$

$11.25 = n$

The amount of increase is 11.25 gallons. Now find the capacity of the new water tank.

Think: capacity of new tank = capacity of original tank + amount increase

$c = 45 \text{ gal} + 11.25 \text{ gal}$

$c = 56.25 \text{ gal}$

The capacity of the new water tank is 56.25.

20. First find the actual amount of increase. Think: 28% of \$7 is what number?

$28\% \cdot 7 = n$

$0.28 \cdot 7 = n$

$1.96 = n$

The amount of increase is \$1.96. Now find the retail price.
Think: retail price = wholesale price + amount of increase
$r = \$7 + \$1.96$
$r = \$8.96$
The retail price of the purses is \$8.96.

21. First find the discount rate for the sunglasses.
Think: what percent of \$44.95 is \$26.97?
$n \cdot 44.95 = 26.97$
$n = \frac{26.97}{44.95}$
$n = 0.6$
$n = 60\%$
The discount rate for the store is 60%.
Use the discount rate to find the original price of the bathing suit.
Think: 60% of what number is 28.95?
$0.6 \cdot n = 28.95$
$n = \frac{28.95}{0.6}$
$n = 48.25$
The original price of the suit was \$48.25.

22. \$10 is $\frac{1}{2}$ of \$20 and $\frac{1}{2} = 50\%$ so \$20 to \$10 is a 50% decrease.
\$10 + \$10 = \$20 and \$10 is 100% of itself so \$10 to \$20 is a 100% markup.

23. a. 7% of what number was 2,905?
$0.07 \cdot n = 2{,}905$
$n = 41{,}500$
Their income for the year was \$41,500.

b. $41{,}500 \cdot 0.43 = 17{,}845$
\$17,845 was spent on household expenses.

c. 14,400 is what percent of 17,845?
$14{,}400 = n \cdot 17{,}845$
$0.807 \approx$ n
Their mortgage is about 80.7% of their household expenses.

24. $99.4 - 428.7 = 562.7$
$\frac{562.7}{428.7} \approx 1.313 \approx 131.3\%$
During this ten-year period, health expenses increased about 131.3%.

25. 1,990 Btu = 1,950 Btu + 165% of 1,950 Btu
Let n = 1,950 Btu
$1{,}990 \text{ Btu} = n + 165\%n$
$1{,}990 \text{ Btu} = 1n + 1.65n$
$1{,}990 \text{ Btu} = 2.65n$
$22{,}540 = 2.65n$
$8{,}506 \approx n$
About 8,506 trillion Btu were consumed in 1,950.

26. 75.8% of $21.5 = 0.758 \cdot 21.5 \approx 16.3$
$21.5\% - 16.3\% = 5.2\%$
In 1990, 5.2% did not have a telephone.
$100 - 5.2 = 94.8$
In 1990, 94.8% of U.S. households had a telephone.

27. A; \$0.85 is increases to \$1.25.
\$1.25 − \$0.85 = \$0.40
$\frac{0.40}{0.85} = 0.4705 = 47.1\%$
The percent increase is 47.1%.

28. No; a 50% increase over \$30 makes the new price \$45 and a sale of 50% off \$45 is \$22.50, not \$30.

LESSON 5

Think and Discuss

1. Both are based on percents of the price.

2. Yes. The price plus 6% is the same as 106% of the price.

3. Solve $x + 0.05x =$ total cost.

4. Usually the sales tax would be double. If the tax rate is 8%, the tax on \$10 would be \$0.80 and the tax on \$20 would be \$1.60. However, if the tax rate is 8.25%, the tax on \$10 would be \$0.83 after rounding to the nearest cent, and tax on \$20 would be \$1.65, not quite double because of rounding.

Exercises

1. $7\% \cdot 3{,}200 = c$
$0.07 \cdot 3{,}200 = c$
$224 = c$
$224 + 350 = 560$
\$224 + \$350 = \$574

2. Total price: $59.99 + 13.49 = 73.98$
Sales tax: $73.98 \cdot 7\% = 73.98(0.07) \approx 5.18$
The total sales tax is \$5.18.

3. $\frac{n}{100} = \frac{3{,}612.59}{31{,}025}$
$31{,}025n = (3{,}612.59)(100)$
$31{,}025n = 361{,}259$
$n = \frac{361{,}259}{31{,}025} \approx 11.6$
About 11.6% of Nadia's income went to food.

4. $20.93 = 0.07 \cdot s$
$\frac{20.93}{0.07} = s$
$299 = s$
The price of the camera was \$299.

5. $5.5\% \cdot 5{,}700 = c$
$0.055 \cdot 5{,}700 = c$
$313.50 = c$
$313.50 + 290 = 603.50$
Kayla's total pay was \$603.50.

6. Total price: $22.49 \cdot 3 + 829.99 = 67.47 + 829.99 = 897.46$
Sales tax: $897.46 \cdot 4.25\% = 897.46 \cdot 0.0425 \approx 38.14$
The total sales tax is \$38.14.

7. $\frac{n}{100} = \frac{47.20}{1{,}545}$
$1{,}545n = (47.20)(100)$
$1{,}545n = 4{,}720$
$n = \frac{4{,}720}{1{,}545} \approx 3.1$
About 3.1% of Jada's income went to electricity.

8. $375 = 0.05s$
$\frac{375}{0.05} = s$
$7{,}500 = s$
For Heather to earn \$375, her weekly sales have to be \$7,500.

9. $7.25\% \cdot 210.13 = t$
$0.0725 \cdot 210.13 = t$
$15.23 = t$
The sales tax is \$15.23.

10. $9\% \cdot 42.99 = t$
$0.09 \cdot 42.99 = t$
$3.87 = t$
The sales tax is \$3.87.

11. $4.25\ \% \cdot 895.75 = t$
$0.0425 \cdot 895.75 = t$
$38.07 = t$
The sales tax is \$38.07.

12 $63.06 = 0.05s$
$\frac{63.06}{0.05} = s$
$1{,}261.20 = s$
The total sales is \$1,261.20.

13. $2{,}842 = 0.035s$
$\frac{2{,}842}{0.035} = s$
$81{,}200 = s$
The total sales is \$81,200.

14. Rent: $30\% \cdot 1{,}600 = 0.30 \cdot 1{,}600 = 480$
Food: $20\% \cdot 1{,}600 = 0.20 \cdot 1{,}600 = 320$
Utilities: $10\% \cdot 1{,}600 = 0.10 \cdot 1{,}600 = 160$
Remainder: $1{,}600 - (480 + 320 + 160) = 1{,}600 - 960 = 640$
Entertainment, clothes, transportation, savings, and charity: $640 \div 5 = 128$
Rent: \$480; food: \$320; utilities: \$160; Entertainment, clothes, transportation, savings, and charity: \$128 each

15. $1{,}800 + 0.065(5{,}000) = 1{,}800 + 325 = 2{,}125$
$1{,}800 + 0.065(10{,}000) = 1{,}800 + 650 = 2{,}450$
$2{,}100 + 0.04(5{,}000) = 2{,}100 + 200 = 2{,}300$
$2{,}100 + 0.04(10{,}000) = 2{,}100 + 400 = 2{,}500$
Deborah has the potential to make more money if she chooses the \$2,100 plus 4% of sales option. She will make between \$2,300 and \$2,500 a month.

16. Hourly rate: $\frac{162.50}{24} \approx 6.77$; \$6.77/h
Federal income tax: $162.50(0.10) = 16.25$; \$16.25
Other federal taxes: $162.50\,(0.0765) \approx 12.43$; \$12.43
Net Pay: $162.50 - 16.25 - 12.43 = 133.82$; \$133.82

17. a. Taxable income: $71{,}458 - 7{,}250 = 64{,}208$
b. Tax: base tax + tax rate (amount over)
$= 4{,}090 + 0.25(64{,}208 - 29{,}700)$
$= 4{,}090 + 0.25(34{,}508)$
$= 4{,}090 + 8{,}627$
$= 12{,}717$
Anna owed \$12,717 in taxes.
c. $\frac{12{,}717}{71{,}458} \approx 0.178 = 17.8\%$
The tax represented 17.8% of Anna's total income.
d. $\frac{12{,}717}{64{,}208} \approx 0.198 = 19.8\%$
The tax represented 19.8% of Anna's taxable income.

18. Maximum tax in the 15% tax bracket: $730 + 29{,}700(0.15) = 5{,}185$
Maximum tax in the 25% tax bracket: $4{,}090 + 0.25(71{,}950 - 29{,}700) = 14{,}652.50$
Charlena falls in the 25% tax bracket. Let I be the taxable income.
$4{,}090 + 0.25(I - 29{,}700) = 10{,}050$
$0.25(I - 29{,}700) = 10{,}050 - 4{,}090$
$0.25(I - 29{,}700) = 5{,}960$
$0.25I - 7{,}425 = 5{,}960$
$0.25I = 13{,}385$
$I = 53{,}540$
Charlena's taxable income was \$53,540.

19. $8\% \cdot (6{,}250 - 500) = c$
$0.08 \cdot 5{,}750 = c$
$460 = c$
$235 + 460 = 695$
Gabrielle's weekly pay was \$695.

20. tax: $49.95 \cdot 6.5\% = 49.95(0.065) \approx 3.25$
Total cost: $49.95 + 3.25 = 53.20$
To the nearest dollar, Rafael's total cost was \$53.

LESSON 6

Think and Discuss

1. I (interest): simple interest earned, P (principal): amount of money invested or borrowed, r (rate): percent earned or charged, t (time): number of years the money is borrowed or invested.

2. Since t is always written in years, $t = 0.5$ or $\frac{1}{2}$.

3. I and P

4. The interest on \$500 at 8% for 1 year is $500 \cdot 0.08 \cdot 1 = \$40$. The interest on the same amount at 4% for 2 years is $500 \cdot 0.04 \cdot 2 = \$40$.

Exercises

1. $I = P \cdot r \cdot t$
$I = 7{,}150 \cdot 0.0625 \cdot 5$
$I \approx 2{,}234.38$
The interest due is \$2,234.38
$A = P + I$
$A = 7{,}150 + 2{,}234.38 = 9{,}384.38$
Nick will have to repay \$9,384.38.

2. $I = P \cdot r \cdot t$
$800 = 4{,}000 \cdot 0.04 \cdot t$
$800 = 160 \cdot t$
$\frac{800}{160} = t$
$5 = t$
5 years

3. $I = P \cdot r \cdot t$
$I = 1{,}277 \cdot 0.04 \cdot 3$
$I = 153.24$
$A = P + I$

$A = 1{,}277 + 153.24 = 1{,}430.24$
Paige will have $1,430.24.

4. Interest $= 46{,}375 - 35{,}000 = 11{,}375$

$$I = P \cdot r \cdot t$$
$$11{,}375 = 35{,}000 \cdot r \cdot 5$$
$$11{,}375 = 175{,}000 \cdot r$$
$$\frac{11{,}375}{175{,}000} = r$$
$$0.065 = r$$

The simple interest rate is 6.5 %

5. $I = P \cdot r \cdot t$
$I = 18{,}500 \cdot 0.07 \cdot 3.5$
$I = 4{,}532.50$
$A = P + I$
$A = 18{,}500 + 4{,}532.50 = 23{,}032.50$
Billy would owe $23,032.50.

6. $I = P \cdot r \cdot t$
$9{,}392.50 = 8{,}500 \cdot 0.065 \cdot t$
$9{,}392.50 = 552.50 \cdot t$
$\frac{9{,}392.50}{552.50} = t$
$17 = t$
The money must be in the fund 17 years.

7. $I = P \cdot r \cdot t$
$I = 1{,}200 \cdot 0.0285 \cdot 8$
$I = 273.60$
$A = P + I$
$A = 1{,}200 + 273.60 = 1{,}473.60$
Mr. Allen will return $1,473.60 to Jessika.

8. Interest $= 350{,}625 - 275{,}000 = 75{,}625$

$$I = P \cdot r \cdot t$$
$$75{,}625 = 275{,}000 \cdot r \cdot 5$$
$$75{,}625 = 1{,}375{,}000 \cdot r$$
$$\frac{75{,}625}{1{,}375{,}000} = r$$
$$0.055 = r$$

The interest rate is 5.5%.

9. $I = P \cdot r \cdot t$
$I = 315 \cdot 0.06 \cdot 5$
$I = 94.50$
$A = P + I$
$A = 315 + 94.50 = 409.50$
Interest: $94.50
Total Amount: $409.50

10. $I = P \cdot r \cdot t$
$I = 800 \cdot 0.09 \cdot 1$
$I = 72$
$A = P + \mathrm{I}$
$A = 800 + 72 = 872$
Interest: $72
Total Amount: $872

11. $I = P \cdot r \cdot t$
$I = 4{,}250 \cdot 0.07 \cdot 1.5$
$I = 446.25$
$A = P + I$
$A = 4{,}250 + 446.25 = 4{,}696.25$
Interest: $446.25
Total Amount: $4,696.25

12. $I = P \cdot r \cdot t$
$I = 550 \cdot 0.055 \cdot 3$
$I = 90.75$
$A = P + I$
$A = 550 + 90.75 = 640.75$
Interest: $90.75
Total Amount: $640.75

13. $I = P \cdot r \cdot t$
$I = 617 \cdot 0.06 \cdot 0.25$
$I = 9.26$
$A = P + I$
$A = 617 + 9.26 = 626.26$
Interest: $9.26
Total Amount: $626.26

14. $I = P \cdot r \cdot t$
$I = 2{,}975 \cdot 0.06 \cdot 5$
$I = 892.50$
$A = P + I$
$A = 2{,}975 + 892.50 = 3{,}867.50$
Interest: $892.50
Total Amount: $3,867.50

15. $I = P \cdot r \cdot t$
$I = 900 \cdot 0.0725 \cdot 3$
$I = 195.75$
$A = P + I$
$A = 900 + 195.75 = 1{,}095.75$
Interest: $195.75
Total Amount: $1,095.75

16. $I = P \cdot r \cdot t$
$I = 200 \cdot 0.07 \cdot 0.75$
$I = 10.50$
$A = P + I$
$A = 200 + 10.50 = 210.50$
Interest: $10.50
Total Amount: $210.50

17. $I = P \cdot r \cdot t$
$I = 1{,}700 \cdot 0.16 \cdot 1.25$
$I = 340$
$A = P + I$
$A = 1{,}700 + 340 = 2{,}040$
Interest: $340
Total Amount: $2,040

18. $I = P \cdot r \cdot t$
$3{,}325 = 9{,}500 \cdot 0.07 \cdot t$
$3{,}325 = 665 \cdot t$
$\frac{3{,}325}{665} = t$
$5 = t$
She borrowed the money for 5 years.

19. The question cannot be answered without knowing how long each person had the money in their account.

20. a. Option A total amount: $A = P + I$
$35{,}500 + 14{,}643.75 = 50{,}143.75$
The Smiths would pay $50,143.75 under loan option A.
Option B total amount: $A = P + I$
$35{,}500 + 11{,}005.00 = 46{,}505.00$
The Smiths would pay $46,505.00.
The Smiths would pay $46,505 under loan option B.

b. Option A interest rate: $I = P \cdot r \cdot t$

$14{,}643.75 = 35{,}500 \cdot r \cdot 5$

$14{,}643.75 = 177{,}500 \cdot r$

$\frac{14{,}643.75}{177{,}500} = r$

$0.0825 = r$

The interest rate for loan option A would be 8.25%.

Option B interest rate: $I = P \cdot r \cdot t$

$11{,}005 = 35{,}500 \cdot r \cdot 4$

$11{,}005 = 142{,}000 \cdot r$

$\frac{11{,}005}{142{,}000} = r$

$0.0775 = r$

The interest rate for loan option B would be 7.75%.

c. Option A monthly payment:

5 yr = 60 mo

$\frac{50{,}143.75}{60} \approx 835.73$

The monthly payment under loan option A would be $835.73.

Option B monthly payment:

4 yr = 48 mo

$\frac{46{,}505}{48} \approx 968.85$

The monthly payment under loan option B would be $968.85.

d. $14{,}643.75 - 11{,}005 = 3{,}638.75$

The Smiths will save $3,638.75 by choosing loan option B.

21. Possible answer: How long did Alice keep her money in the savings account?

22. Possible answer: The 3-year loan would cost the borrower less ($675, compared with $720). The interest saved would be $45.

23. Possible answer: The payments are equal. For example, the interest on a $1,000 loan for 5 years at 3% is $1{,}000 \cdot 0.03 \cdot 5 = \$150$. The interest on the same loan with a monthly rate of 0.25% is $1{,}000 \cdot 0.0025 \cdot 60 = \$150$.

24. B; $I = P \cdot r \cdot t$

$I = 2{,}500 \cdot 0.025 \cdot 2$

$I = 125$

$125

25. G; $I = P \cdot r \cdot t$

$125 = 250 \cdot r \cdot 4$

$125 = 1{,}000 \cdot r$

$\frac{125}{1{,}000} = r$

$0.125 = r$

$12.5\% = r$

12.5%

READY TO GO ON?

1. 37 is decreased to 17.

$37 - 17 = 20$

percent of change $= \frac{20}{37}$

≈ 0.5405

$\approx 54.1\%$

The percent decrease is 54.1%.

2. 121 is increased to 321.

$321 - 121 = 200$

percent of change $= \frac{200}{121}$

≈ 01.6528

$\approx 165.3\%$

The percent increase is 165.3%.

3. 89 is decreased to 84.

$89 - 84 = 5$

percent of change $= \frac{5}{89}$

≈ 0.0561

$\approx 5.6\%$

The percent decrease is 5.6%.

4. 45 is increased to 60.

$60 - 45 = 15$

percent of change $= \frac{15}{45}$

≈ 0.3333

$\approx 33.3\%$

The percent increase is 33.3%.

5. 61 is decreased to 33.

$61 - 33 = 28$

percent of change $= \frac{28}{61}$

≈ 0.4590

$\approx 45.9\%$

The percent of decrease is 45.9%.

6. 86 is increased to 95.

$95 - 86 = 9$

percent of change $= \frac{9}{86}$

≈ 0.1046

$\approx 10.5\%$

The percent of increase is 10.5%.

7. Find 25% of 16

$0.25 \cdot 16 = 4$

$16 + 4 = 20$

The new capacity is 20 ounces.

8. $12{,}500 \cdot 3.25\% = 12{,}500 \cdot 0.0325 = \$406.25$

9. $14.23 \cdot 8.25\% = 14.23 \cdot 0.0825 = \$1.17$

10. $25{,}000 \cdot 2.75\% = 25{,}000 \cdot 0.0275 = \$687.50$

11. $251.50 \cdot 7.5\% = 251.50 \cdot 0.075 = \$18.86$

12. $10{,}500 \cdot 4\% = 10{,}500 \cdot 0.04 = \$420$

13. $75.99 \cdot 6.125\% = 75.99 \cdot 0.06125 = \$4.65$

14. $3{,}500 \cdot 0.06 = c$

$210 = c$

Total pay $= 300 + 210 = 510$

15. $I = P \cdot r \cdot t$

$I = 225 \cdot 0.05 \cdot 3$

$I = 33.75$

$A = P + I$

$A = 225 + 33.75 = 258.75$

Interest: $33.75

Total Amount: $258.75

16. $I = P \cdot r \cdot t$

$I = 775 \cdot 0.08 \cdot 1$

$I = 62$

$A = P + I$

$A = 775 + 62 = 837$
Interest: \$62
Total Amount: \$837

17. $I = P \cdot r \cdot t$
$I = 8{,}250 \cdot 0.0725 \cdot 3$
$I = 1{,}794.38$
$A = P + I$
$A = 8{,}250 + 1{,}794.38 = 10{,}044.38$
Interest: \$1,794.38
Total Amount: \$10,044.38

18. $I = P \cdot r \cdot t$
$I = 1{,}422 \cdot 0.03 \cdot 5$
$I = 213.30$
$A = P + I$
$A = 1{,}422 + 213.30 = 1{,}635.30$
\$1,635.30

19. $I = P \cdot r \cdot t$
$270 = 1{,}500 \cdot 0.12 \cdot t$
$270 = 180 \cdot t$
$\frac{270}{180} = t$
$1.5 = t$
1.5 years or 18 months

STUDY GUIDE: REVIEW

1. Interest, simple interest, principal; rate of interest

2. Percent of increase

3. Percent of decrease

4. Commission

5. $\frac{3}{5} = 3 \div 5 = 0.6 = 60\%$

6. $\frac{1}{6} = 1 \div 6 \approx 0.167 \approx 16.7\%$

7. $0.06 = \frac{6}{100} = 6\%$

8. $0.8 = \frac{80}{100} = 80\%$

9. $\frac{2}{3} = 2 \div 3 \approx 0.667 \approx 66.7\%$

10. $0.0056 = \frac{56}{10{,}000} = 0.56\%$

11. $0.\overline{33}\% \approx 0.333$, $-2.6 = -2.600$,
$2\frac{3}{5} = 2.600$, $30\% = 0.300$
$-2.600 < 0.300 < 0.333 < 2.600$, so
$-2.6 < 30\% < 0.\overline{33} < 2\frac{3}{5}$
-2.6, 30%, $0.\overline{33}$, $2\frac{3}{5}$

12. Possible answer:
22% of $44 \approx \frac{1}{5} \cdot 44 \approx 8$

13. Possible answer:
74% of $120 \approx \frac{3}{4} \cdot 120 \approx 90$

14. Possible answer:
43% of $64 \approx \frac{2}{5} \cdot 60 \approx 24$

15. Possible answer:
31% of $97 \approx \frac{1}{3} \cdot 96 \approx 32$

16. Possible answer:
49% of $82 \approx \frac{1}{2} \cdot 80 \approx 40$

17. Possible answer:
6% of $53 \approx \frac{1}{15} \cdot 45 \approx 3$

18. Possible answer:
15% of \$18.23 ≈ 10% of \$20 + 5% of \$20
≈ \$2 + \$1 ≈ \$3

19. Possible answer:
15% of \$9.85 ≈ 15% of \$10
≈ \$1.50
\$2.00 − \$1.50 = \$0.50
He tipped about 5% more than 15%.

20. $2x + 36 = 9$; $x = -13\frac{1}{2}$
$\frac{1}{6}x + 3 = \frac{3}{4}$
$12\left(\frac{1}{6}x + 3\right) = 12\left(\frac{3}{4}\right)$
$2x + 36 = 9$
$2x + 36 - 36 = 9 - 36$
$\frac{2x}{2} = \frac{-27}{2}$
$x = -13\frac{1}{2}$

21. $6x - 20 = 1$; $x = 3\frac{1}{2}$
$\frac{3}{5}x - 2 = \frac{1}{10}$
$10\left(\frac{3}{5}x - 2\right) = \left(\frac{1}{10}\right)$
$6x - 20 = 1$
$6x - 20 + 20 = 1 + 20$
$6x = 21$
$\frac{6x}{6} = \frac{21}{6}$
$x = 3\frac{3}{6} = 3\frac{1}{2}$

22. $6x - 20 = 15$; $x = 5\frac{5}{6}$
$\frac{3}{10}x - 1 = \frac{3}{4}$
$20\left(\frac{3}{10}x - 1\right) = 20\left(\frac{3}{4}\right)$
$6x - 20 = 15$
$6x - 20 + 20 = 15 + 20$
$6x = 35$
$\frac{6x}{6} = \frac{35}{6}$
$x = 5\frac{5}{6}$

23. $9x + 48 = 20$; $x = -3\frac{1}{9}$
$\frac{3}{8}x + 2 = \frac{5}{6}$
$24\left(\frac{3}{8}x + 2\right) = 24\left(\frac{5}{6}\right)$
$9x + 48 = 20$
$9x + 48 - 48 = 20 - 48$
$9x = -28$
$\frac{9x}{9} = \frac{-28}{9}$
$x = -3\frac{1}{9}$

24. $4x - 9 = 1$; $x = 2\frac{1}{2}$
$\frac{4}{9}x - 1 = \frac{1}{9}$
$9\left(\frac{4}{9}x - 1\right) = 9\left(\frac{1}{9}\right)$
$4x - 9 = 1$
$4x = 9 + 9 = 1 + 9$

$4x = 10$

$\frac{4x}{4} = \frac{10}{4}$

$x = 2\frac{2}{4} = 2\frac{1}{2}$

25. $5x - 48 = 10$; $x = 11\frac{3}{5}$

$\frac{5}{12}x - 4 = \frac{5}{6}$

$12\left(\frac{5}{12}x - 4\right) = 12\left(\frac{5}{6}\right)$

$5x - 48 = 10$

$5x - 48 + 48 = 10 + 48$

$5x = 58$

$\frac{5x}{5} = \frac{58}{5}$

$x = 11\frac{3}{5}$

26. 54 is increased to 81.

$81 - 54 = 27$

$\frac{27}{54} = 0.5$

The percent of increase is 50%.

27. 14 is decreased to 12.

$14 - 12 = 2$

$\frac{2}{14} \approx 0.143$

The percent of decrease is about 14.3%.

28. 110 is increases to 143.

$143 - 110 = 33$

$\frac{33}{110} = 0.3$

The percent of increase is 30%.

29. 90 is decreases to 15.2.

$90 - 15.2 = 74.8$

$\frac{74.8}{90} = 0.83\overline{1}$

The percent of decrease is about 83.1%.

30. 26 is increased to 32.

$32 - 26 = 6$

$\frac{6}{32} \approx 0.231$

The percent of increase is about 23.1%.

31. 84 is decreased to 21.

$84 - 21 = 63$

$\frac{63}{84} = 0.75$

The percent of increase is 75%.

32. $175{,}000 + 199{,}000 = 374{,}000$

$4\frac{1}{2}\% = 0.045$

$374{,}000 \cdot 0.045 = \$16{,}830$

Kensho's commission for the quarter is \$16,830.

33. $\$17.99 + \$24.99 = \$42.98$

$8\frac{1}{4}\% = 0.0825$

$\$42.98 \cdot 0.0825 \approx \$3.55$

Luisa paid \$3.55 in tax.

34. $I = P \cdot r \cdot t$

$I = 14{,}500 \cdot 0.0625 \cdot 3.5$

$I = \$3{,}171.88$

35. $I = P \cdot r \cdot t$

$32 = P \cdot 0.02 \cdot 4$

$32 = P \cdot 0.08$

$\frac{32}{0.08} = P$

$400 = P$

36. $I = P \cdot r \cdot t$

$367.50 = 1{,}500 \cdot r \cdot 3.5$

$367.50 = 5{,}250 \cdot r$

$\frac{367.50}{5{,}250} = r$

$0.07 = r$

$7\% = r$

37. $I = P \cdot r \cdot t$

$1{,}787.50 = 55{,}000 \cdot 0.065 \cdot t$

$1{,}787.50 = 3{,}575 \cdot t$

$\frac{1{,}787.50}{3{,}575} = t$

$0.5 \text{ yr} = t$

38. \$1,000 at 3% for 4 years: $I = 1{,}000 \cdot 0.03 \cdot 4 = \$120$

\$1,000 at 3.75% for 3 years: $I = 1{,}000 \cdot 0.0375 \cdot 3 = \$112.50$

The loan of \$1,000 at 3.75% for 3 years would cost the borrower \$7.50 less.

39. $I = P \cdot r \cdot t$

$I = 12{,}500 \cdot 0.045 \cdot 4$

$I = 2{,}250$

Total: $\$2{,}250 + \$12{,}500 = \$14{,}750$

Wade paid back a total of \$14,750.

CHAPTER TEST

1. $0.75 = 75\%$

2. $0.12 = 12\%$

3. $0.80 = 80\%$

4. $0.0039 = 0.39\%$

5. $\frac{3}{10} = 3 \div 10 = 0.3 = 30\%$

6. $\frac{9}{20} = 9 \div 20 = 0.45 = 45\%$

7. $\frac{5}{16} = 5 \div 16 = 0.3125 = 31.3\%$

8. $\frac{7}{21} = 7 \div 21 = 0.33\overline{3} = 33.3\overline{3}\% = 33.3\%$

9. Possible answer:

48% of $8 \approx \frac{1}{2} \cdot 8 \approx 4$

10. Possible answer:

3% of $199 \approx 3\% \cdot 120$

1% of $120 = 1.2$

3% of $120 = 3 \cdot 1.2 \cdot 3.6$

3% of $119 \approx 3.6$

11. Possible answer:

26% of $32 \approx \frac{1}{4} \cdot 32 \approx 8$

12. Possible answer:

76% of $280 \approx \frac{3}{4} \cdot 280 \approx 210$

13. $15\% = 10\% + 55$

10% of $\$47.89 \approx 10\%$ of $\$48 \approx \$4.80$

5% of $\$48 = \$4.80 \div 2 = \$2.40$

$\$4.80 + \$2.40 = \$7.20$.

The should leave about \$7.20 for a 15% tip.

14. $6x + 24 = 3$; $x = -3\frac{1}{2}$

$\frac{3}{4}x + 3 = \frac{3}{8}$

$8\left(\frac{3}{4}x + 3\right) = 8\left(\frac{3}{8}\right)$

$6x + 24 = 3$

$6x + 24 - 24 = 3 - 24$

$6x = -21$

$\frac{6x}{6} = \frac{-21}{6}$

$x = -3\frac{3}{6} = -3\frac{1}{2}$

15. $7x + 200 = 4$; $x = -28$

$\frac{7}{10}x + 20 = \frac{2}{5}$

$10\left(\frac{7}{10}x + 20\right) = 10\left(\frac{2}{5}\right)$

$7x + 200 = 4$

$7x + 200 - 200 = 4 - 200$

$7x = -196$

$7x = \frac{-196}{7}$

$x = -28$

16. $8x - 12 = 9$; $x = 2\frac{5}{8}$

$\frac{2}{3}x - 1 = \frac{3}{4}$

$12\left(\frac{2}{4}x - 1\right) 12\left(\frac{3}{4}\right)$

$8x - 12 = 9$

$8x - 12 + 12 = 9 + 12$

$8x = 21$

$\frac{8x}{8} = \frac{21}{8}$

$x = 2\frac{5}{8}$

17. $1300x + 250 = 1225$; $x = \$0.75$

$13x + 2.50 = 12.25$

$100(13x + 2.50) = 100(12.25)$

$1300x + 250 = 1225$

$1300x + 250 - 250 = 1225 - 250$

$1300x = 975$

$\frac{1300x}{1300} = \frac{975}{1300}$

$x = \frac{3}{4} = 0.75$

The cost of a singe softcover book is \$0.75.

18. 30 is increased to 45.

$45 - 30 = 15$

$\frac{15}{30} = 0.5$

The percent of increase is 50%.

19. 115 is decreased to 46.

$115 - 46 = 69$

$\frac{69}{115} = 0.6$

The percent of decrease is 60%.

20. 116 is increased to 145.

$145 - 116 = 29$

$\frac{29}{116} = 0.25$

The percent of increase is 25%.

21. 129 is decreased to 32

$129 - 32 = 97$

$\frac{97}{129} = 0.7519$

The percent of decrease is 75.2%.

22. 34% of $8{,}500 = 0.34 \cdot 8{,}500 = 2{,}890$

$8{,}500 + 2{,}890 = 11{,}390$

The theater sold 11,390 tickets during its tenth year.

23. $13{,}600 \cdot 0.0275 = c$

$374 = c$

commission: \$374

24. $135.50 \cdot 0.0825 = s$

$11.18 \approx s$

sales tax: \$11.18

25. $20{,}250 \cdot 0.039 = c$

$789.75 = c$

commission: \$789.75

26. $c = 0.08 \cdot 560 = 44.80$

total pay $= 350 + 44.80 = 394.80$

Ms. Tan's total pay for the week is \$394.80.

27. $c = 264{,}000 \cdot 0.03 = 7{,}920$

total pay $= 36{,}000 + 7{,}920 = 43{,}920$

George's total pay is \$43,920.

28. $I = P \cdot r \cdot t$

$2{,}025 = 7{,}500 \cdot 0.09 \cdot t$

$2{,}025 = 675 \cdot t$

$\frac{2{,}025}{675} = t$

$3 = t$

She borrowed the money for 3 years.

29. $I = P \cdot r \cdot t$

$486 = 675 \cdot r \cdot 12$

$486 = 8{,}100 \cdot r$

$\frac{486}{8{,}100} = r$

$0.06 = r$

The annual simple interest rate the bank offers is 6%.