INSTRUCTOR'S SOLUTIONS MANUAL

GEX PUBLISHING SERVICES

ELEMENTARY AND INTERMEDIATE ALBEGRA

FOURTH EDITION

Tom Carson
Franklin Classical School

Bill E. Jordan
Seminole State College of Florida

PEARSON

Boston Columbus Indianapolis New York San Francisco Upper Saddle River
Amsterdam Cape Town Dubai London Madrid Milan Munich Paris Montreal Toronto
Delhi Mexico City São Paulo Sydney Hong Kong Seoul Singapore Taipei Tokyo

Reproduced by Pearson from electronic files supplied by the author.

Publishing as Pearson, 75 Arlington Street, Boston, MA 02116.

ISBN-13: 978-0-321-92525-1
ISBN-10: 0-321-92525-4

www.pearsonhighered.com

PEARSON

CONTENTS

Chapter 1
Foundations of Algebra

Exercise Set 1.1

2. $\{q, r, s, t, u, v, w, x, y, z\}$

4. $\{\text{Alaska, Hawaii}\}$

6. $\{2, 4, 6, 8, \ldots\}$

8. $\{16, 18, 20, 22, \ldots\}$

10. $\{-2, -1, 0\}$

12. Rational because 1 and 4 are integers.

14. Rational because -12 is an integer and all integers are rational numbers.

16. Irrational because $\frac{\pi}{4}$ cannot be written as a ratio of integers.

18. Rational because -0.8 can be expressed as $-\frac{8}{10}$, the ratio of two integers.

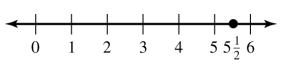
20. Rational because $0.\overline{13}$ can be expressed as the fraction $\frac{13}{99}$, the ratio of two integers.

22. False. There are real numbers that are not rational (irrational numbers).

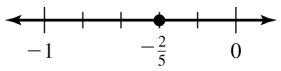
24. False. There are real numbers that are not natural numbers, such as 0, –2, $\frac{3}{4}$, $0.\overline{6}$, and π.

26. True

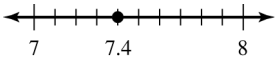
28. The number $5\frac{1}{2}$ is located $\frac{1}{2}$ of the way between 5 and 6, so we divide the space between 5 and 6 into 2 equal divisions and place a dot on the 1st mark to the right of 5.



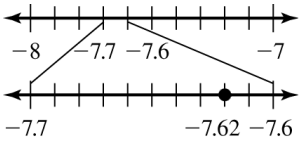
30. The number $-\frac{2}{5}$ is located $\frac{2}{5}$ of the way between 0 and -1, so we divide the space between 0 and -1 into 5 equal divisions and place a dot on the 2nd mark to the left of 0.



32. The number 7.4 is located $0.4 = \frac{4}{10}$ of the way between 7 and 8, so we divide the space between 7 and 8 into 10 equal divisions and place a dot on the 4th mark to the right of 7.



34. First divide the number line between -7 and -8 into tenths. The number -7.62 falls between -7.6 and -7.7 on the number line. Subdivide this section into hundredths and place a dot on the 2nd mark to the left of -7.6.



36. $|6| = 6$ because 6 is 6 units from 0 on a number line.

38. $|-8| = 8$ because -8 is 8 units from 0 on a number line.

40. $|-4.5| = 4.5$ because -4.5 is 4.5 units from 0 on a number line.

42. $\left|2\frac{3}{5}\right| = 2\frac{3}{5}$ because $2\frac{3}{5}$ is $2\frac{3}{5}$ units from 0 on a number line.

44. $|-67.8| = 67.8$ because -67.8 is 67.8 units from 0 on a number line.

46. $2 < 7$ because 2 is farther to the left on a number line than 7.

48. $-6 < 5$ because -6 is farther to the left on a number line than 5.

50. $-19 < -7$ because -19 is farther to the left on a number line than -7.

52. $0 > -5$ because 0 is farther to the right on a number line than -5.

54. $2.63 < 3.75$ because 2.63 is farther to the left on a number line than 3.75.

56. $-3.5 < -3.1$ because -3.5 is farther to the left on a number line than -3.1.

58. $3\frac{5}{6} > 3\frac{1}{4}$ because $3\frac{5}{6}$ is farther to the right on a number line than $3\frac{1}{4}$.

60. $|-4.1| = 4.1$ because the absolute value of -4.1 is equal to 4.1.

62. $|-10.4| > 3.2$ because the absolute value of -10.4 is equal to 10.4, which is farther to the right on a number line than 3.2.

64. $|-0.59| = |0.59|$ because the absolute value of -0.59 and the absolute value of 0.59 are both equal to 0.59.

66. $4\frac{2}{9} < \left|4\frac{5}{9}\right|$ because $4\frac{2}{9}$ is farther to the left on a number line than the absolute value of $4\frac{5}{9}$, which is equal to $4\frac{5}{9}$.

68. $|-10| > |-8|$ because the absolute value of -10 is 10, the absolute value of -8 is 8, and 10 is farther to the right on a number line than 8.

70. $|-5.36| < |5.76|$ because the absolute value of -5.36 is 5.36, the absolute value of 5.76 is 5.76, and 5.36 is farther to the left on a number line than 5.76.

72. $\left|-\frac{9}{11}\right| > \left|-\frac{7}{11}\right|$ because the absolute value of $-\frac{9}{11}$ is $\frac{9}{11}$, the absolute value of $-\frac{7}{11}$ is $\frac{7}{11}$, and $\frac{9}{11}$ is farther to the right on a number line than $\frac{7}{11}$.

74. $-12.6, -9.6, 1, |-1.3|, \left|-2\frac{3}{4}\right|, 2.9$

76. $-4\frac{1}{8}, -2\frac{1}{4}, -2, -0.13, |0.1|, 1.02, |-1.06|$

Exercise Set 1.2

2. $\frac{5}{8}$ 4. $\frac{7}{20}$ 6. $\frac{1}{4}$ 8. $\frac{5}{8}$ 10. $\frac{9}{16}$

12. $\frac{5}{8} = \frac{?}{16} \Rightarrow \frac{5\cdot 2}{8\cdot 2} = \frac{10}{16}$
The missing number is 10.

14. $\frac{2}{5} = \frac{6}{?} \Rightarrow \frac{2\cdot 3}{5\cdot 3} = \frac{6}{15}$
The missing number is 15.

16. $\frac{6}{8} = \frac{?}{4} \Rightarrow \frac{6\div 2}{8\div 2} = \frac{3}{4}$
The missing number is 3.

18. $\frac{27}{30} = \frac{9}{?} \Rightarrow \frac{27\div 3}{30\div 3} = \frac{9}{10}$
The missing number is 10.

20. The LCD of 7 and 11 is 77.
$\frac{5\cdot 11}{7\cdot 11} = \frac{55}{77}$ and $\frac{3\cdot 7}{11\cdot 7} = \frac{21}{77}$

22. The LCD of 8 and 12 is 24.
$\frac{5\cdot 3}{8\cdot 3} = \frac{15}{24}$ and $\frac{7\cdot 2}{12\cdot 2} = \frac{14}{24}$

24. The LCD of 20 and 15 is 60.
$-\frac{9\cdot 3}{20\cdot 3} = -\frac{27}{60}$ and $-\frac{7\cdot 4}{15\cdot 4} = -\frac{28}{60}$

26. The LCD of 21 and 14 is 42.
$-\frac{13\cdot 2}{21\cdot 2} = -\frac{26}{42}$ and $-\frac{9\cdot 3}{14\cdot 3} = -\frac{27}{42}$

28. $33 = 3\cdot 11$

30. $42 = 2\cdot 21 = 2\cdot 3\cdot 7$

32. $48 = 2\cdot 24$
$= 2\cdot 8\cdot 3$
$= 2\cdot 2\cdot 4\cdot 3$
$= 2\cdot 2\cdot 2\cdot 2\cdot 3$

34. $810 = 2\cdot 405$
$= 2\cdot 81\cdot 5$
$= 2\cdot 9\cdot 9\cdot 5$
$= 2\cdot 3\cdot 3\cdot 3\cdot 3\cdot 5$

36. $\frac{48}{84} = \frac{2\cdot 2\cdot \cancel{2}\cdot \cancel{2}\cdot \cancel{3}}{\cancel{2}\cdot \cancel{2}\cdot \cancel{3}\cdot 7} = \frac{4}{7}$

38. $\frac{42}{91} = \frac{2\cdot 3\cdot \cancel{7}}{\cancel{7}\cdot 13} = \frac{6}{13}$

40. $-\frac{30}{54} = -\frac{\cancel{2}\cdot\cancel{3}\cdot 5}{\cancel{2}\cdot\cancel{3}\cdot 3\cdot 3} = -\frac{5}{9}$

42. $-\frac{24}{162} = -\frac{\cancel{2}\cdot 2\cdot 2\cdot\cancel{3}}{\cancel{2}\cdot 3\cdot 3\cdot 3\cdot\cancel{3}} = -\frac{4}{27}$

44. Incorrect. 2 is not a factor of the numerator.

46. Incorrect. The prime factorization of 108 should be $2\cdot 2\cdot 3\cdot 3\cdot 3$.

48. If 130 of the 250 calories come from fat, the fraction of calories in a serving that comes from fat is $\frac{130}{250}$.
$\frac{130}{250} = \frac{\cancel{2}\cdot\cancel{5}\cdot 13}{\cancel{2}\cdot 5\cdot\cancel{5}\cdot 5} = \frac{13}{25}$

50. If 120 square feet of the 1830 square feet are used as a home office, the fraction of her home that is used as an office is $\frac{120}{1830}$.
$\frac{120}{1830} = \frac{\cancel{2}\cdot 2\cdot 2\cdot\cancel{3}\cdot\cancel{5}}{\cancel{2}\cdot\cancel{3}\cdot\cancel{5}\cdot 61} = \frac{4}{61}$

52. There are $7\cdot 24 = 168$ hours in one week.
$\frac{50}{168} = \frac{\cancel{2}\cdot 5\cdot 5}{\cancel{2}\cdot 2\cdot 2\cdot 3\cdot 7} = \frac{25}{84}$
Carla spends $\frac{25}{84}$ of her week sleeping.

54. $50+40+18+4 = 112$ hours for the listed activities. The non-listed activities take $168-112 = 56$ hours.
$\frac{56}{168} = \frac{\cancel{2}\cdot\cancel{2}\cdot\cancel{2}\cdot\cancel{7}}{\cancel{2}\cdot\cancel{2}\cdot\cancel{2}\cdot 3\cdot\cancel{7}} = \frac{1}{3}$
Carla spends $\frac{1}{3}$ of her week away from all of the listed activities.

56. $\frac{310}{1000} = \frac{\cancel{2}\cdot\cancel{5}\cdot 31}{\cancel{2}\cdot 2\cdot 2\cdot\cancel{5}\cdot 5\cdot 5} = \frac{31}{100}$

58. $1000-310 = 690$ non-victims;
$\frac{690}{1000} = \frac{69}{100}$

60. a) 2008
b) $\frac{26}{1000} = \frac{\cancel{2}\cdot 13}{\cancel{2}\cdot 2\cdot 2\cdot 5\cdot 5\cdot 5} = \frac{13}{500}$

62. $\frac{9}{159} = \frac{\cancel{3}\cdot 3}{\cancel{3}\cdot 53} = \frac{3}{53}$

64. $\frac{8}{60} = \frac{\cancel{2}\cdot\cancel{2}\cdot 2}{\cancel{2}\cdot\cancel{2}\cdot 3\cdot 5} = \frac{2}{15}$

66. $\frac{4}{12} = \frac{\cancel{2}\cdot\cancel{2}}{\cancel{2}\cdot\cancel{2}\cdot 3} = \frac{1}{3}$

68. 47 Republicans + 2 Independents = 49 Not Democrats; $\frac{49}{100}$ of the Senate was not Democrat.

70. $6+12+6 = 24$ atoms total
$12+6 = 18$ not-carbon atoms
$\frac{18}{24} = \frac{\cancel{2}\cdot\cancel{3}\cdot 3}{\cancel{2}\cdot 2\cdot 2\cdot\cancel{3}} = \frac{3}{4}$

Exercise Set 1.3

2. Commutative Property of Addition because the order of the addends is changed.

4. Additive identity because the sum of a number and 0 is that number.

6. Additive inverse because the sum of these opposites is 0.

8. Associative Property of Addition because the grouping is changed.

10. Commutative Property of Addition because the order of the addends is changed.

12. Additive inverse because the sum of the opposites -4.6 and 4.6 is 0.

14. $15+7 = 22$

16. $-5+(-7) = -12$

18. $-5+16 = 11$

20. $-17+8 = -9$

22. $29+(-7) = 22$

24. $-16+13 = -3$

26. $\frac{9}{16}+\frac{5}{16} = \frac{9+5}{16}$
$= \frac{14}{16}$
$= \frac{\cancel{2}\cdot 7}{\cancel{2}\cdot 2\cdot 2\cdot 2}$
$= \frac{7}{8}$

28. $-\frac{3}{5}+\left(-\frac{1}{5}\right)=\frac{-3+(-1)}{5}$
$=-\frac{4}{5}$

30. $-\frac{9}{14}+\frac{3}{14}=\frac{-9+3}{14}$
$=-\frac{6}{14}$
$=-\frac{\cancel{2}\cdot 3}{\cancel{2}\cdot 7}$
$=-\frac{3}{7}$

32. The LCD of 4 and 8 is 8.
$\frac{1}{4}+\frac{7}{8}=\frac{1(2)}{4(2)}+\frac{7}{8}$
$=\frac{2}{8}+\frac{7}{8}$
$=\frac{2+7}{8}$
$=\frac{9}{8}$

34. The LCD of 5 and 20 is 20.
$-\frac{2}{5}+\left(-\frac{3}{20}\right)=-\frac{2(4)}{5(4)}+\left(-\frac{3}{20}\right)$
$=-\frac{8}{20}+\left(-\frac{3}{20}\right)$
$=-\frac{11}{20}$

36. The LCD of 16 and 12 is 48.
$-\frac{5}{16}+\frac{3}{12}=-\frac{5(3)}{16(3)}+\frac{3(4)}{12(4)}$
$=-\frac{15}{48}+\frac{12}{48}$
$=\frac{-15+12}{48}$
$=-\frac{3}{48}$
$=-\frac{\cancel{3}}{\cancel{3}\cdot 16}$
$=-\frac{1}{16}$

38. $0.06+0.17=0.23$

40. $-15.81+4.28=-11.53$

42. $-7.8+(-9.16)=-16.96$

44. $-31+|-54|=-31+54=23$

46. $|-0.6|+|-9.1|=0.6+9.1=9.7$

48. The LCD of 5 and 4 is 20.
$\left|-\frac{4}{5}\right|+\left|\frac{3}{4}\right|=\frac{4}{5}+\frac{3}{4}$
$=\frac{4(4)}{5(4)}+\frac{3(5)}{4(5)}$
$=\frac{16}{20}+\frac{15}{20}$
$=\frac{31}{20}$

50. -7 because $7+(-7)=0$

52. 6 because $-6+6=0$

54. 9 because $-9+9=0$

56. $\frac{6}{17}$ because $-\frac{6}{17}+\frac{6}{17}=0$

58. –2.8 because $2.8+(-2.8)=0$

60. $-b$ because $b+(-b)=0$

62. $\frac{a}{b}$ because $-\frac{a}{b}+\frac{a}{b}=0$

64. $-(-15)=15$

66. $-(-(-1))=-(1)=-1$

68. $-|10|=-10$

70. $-|-5|=-(5)=-5$

72. $8-20=8+(-20)=-12$

74. $-7-15=-7+(-15)=-22$

76. $6-(-7)=6+7=13$

78. $-13-(-6)=-13+6=-7$

80. $-\frac{3}{4}-\left(-\frac{3}{4}\right)=-\frac{3}{4}+\frac{3}{4}$
$=0$

82. The LCD of 6 and 8 is 24.

$$\frac{3}{8}-\left(-\frac{5}{6}\right)=\frac{3}{8}+\frac{5}{6}$$
$$=\frac{3(3)}{8(3)}+\frac{5(4)}{6(4)}$$
$$=\frac{9}{24}+\frac{20}{24}$$
$$=\frac{29}{24}$$

84. The LCD of 2 and 3 is 6.

$$-\frac{1}{2}-\left(-\frac{1}{3}\right)=-\frac{1}{2}+\frac{1}{3}$$
$$=-\frac{1(3)}{2(3)}+\frac{1(2)}{3(2)}$$
$$=-\frac{3}{6}+\frac{2}{6}$$
$$=-\frac{1}{6}$$

86. $8.1-4.76=3.34$

88. $0.107-5.802=0.107+(-5.802)$
$=-5.695$

90. $-7.1-(-2.3)=-7.1+2.3$
$=-4.8$

92. $-|-9|-|-12|=-(9)-(12)$
$=-9+(-12)$
$=-21$

94. $|4.6|-|-7.3|=4.6-7.3$
$=4.6+(-7.3)$
$=-2.7$

96. $24,572.88+1284.56+(-1545.75)+(-2700)$
$+(-865.45)+(-21,580.50)=-\$834.26,$ which indicates a loss

98. $31,672.88+32,284.56+124.75+2400$
$+(-6545.75)+(-1200)+(-165.45)$
$+(-10,800)=\$47,770.99$

100. $29.15-28.83=29.15+(-28.83)$
$=\$0.32$

102. $2887.98-(-14.35)=2887.98+14.35$
$=\$2902.33$

104. $-256.5-(-273.15)$;
$-256.5-(-273.15)=-256.5+273.15$
$=16.65$

106. a) $21.0-18.8$

b) $21.0-18.8=2.2$

c) The positive difference indicates that the mean composite score in 2010 was greater than the score in 1986.

108. \$94,207 – \$67,790 = \$26,417

110. Masters;
\$111,149 – \$94,207 = \$16,942

Puzzle Problem

2	9	4
7	5	3
6	1	8

Exercise Set 1.4

2. Distributive Property of Multiplication over addition.

4. Multiplicative Identity because the product of a number and 1 is the number.

6. Multiplicative Property of 0 because the product of a number and 0 is 0.

8. Commutative Property of Multiplication because the order of the factors is different.

10. Associative Property of Multiplication because the grouping of factors is different.

12. Commutative Property of Multiplication because the order of the factors is different.

14. $4(-7)=-28$

16. $(-8)(5)=-40$

18. $(12)(-4)=-48$

20. $(-4)(-3)=12$

22. $(-8)(-12)=96$

24. $-\frac{4}{5}\cdot\left(\frac{20}{3}\right)=-\frac{2\cdot 2}{\cancel{5}}\cdot\frac{2\cdot 2\cdot\cancel{5}}{3}=-\frac{16}{3}$

26. $\left(-\frac{5}{6}\right)\left(-\frac{6}{5}\right)=\frac{\cancel{5}\cdot\cancel{6}}{\cancel{6}\cdot\cancel{5}}=1$

28. $\left(\frac{2}{9}\right)\left(-\frac{21}{26}\right)=\frac{\cancel{2}}{\cancel{3}\cdot 3}\cdot\left(-\frac{\cancel{3}\cdot 7}{\cancel{2}\cdot 13}\right)=-\frac{7}{39}$

30. $8(-2.5)=-20$

32. $-7.1(-0.5)=3.55$

34. $8.1(-2.75)=-22.275$

36. $-4(5)(-3)=-20(-3)=60$

38. $3(7)(-8)=21(-8)=-168$

40. $(-5)(-3)(-2)=(15)(-2)=-30$

42. $-5(3)(-4)(-2)=-15(-4)(-2)$
$=60(-2)$
$=-120$

44. $(-2)(-4)(-30)(-1)=(8)(-30)(-1)$
$=(-240)(-1)$
$=240$

46. $(-1)(-1)(4)(-5)(-3)=(1)(4)(-5)(-3)$
$=4(-5)(-3)$
$=-20(-3)$
$=60$

48. $\frac{3}{20}$ is the multiplicative inverse of $\frac{20}{3}$ because $\frac{20}{3}\cdot\frac{3}{20}=1$.

50. $-\frac{7}{6}$ is the multiplicative inverse of $-\frac{6}{7}$ because $-\frac{6}{7}\cdot\left(-\frac{7}{6}\right)=1$.

52. $\frac{1}{17}$ is the multiplicative inverse of 17 because $17\cdot\frac{1}{17}=1$.

54. –1 is the multiplicative inverse of -1 because $-1\cdot(-1)=1$.

56. $42\div(-7)=-6$

58. $-12\div(-4)=3$

60. $\frac{75}{-3}=-25$

62. $\frac{-48}{-6}=8$

64. $\frac{0}{5}=0$

66. $-21\div 0$ is undefined.

68. $0\div 0$ is indeterminate.

70. $-8\div\frac{3}{4}=\frac{-8}{1}\cdot\frac{4}{3}$
$=-\frac{32}{3}$

72. $-\frac{4}{5}\div\frac{4}{5}=-\frac{\cancel{4}}{\cancel{5}}\cdot\frac{\cancel{5}}{\cancel{4}}$
$=-1$

74. $-\frac{1}{3}\div\left(-\frac{3}{2}\right)=-\frac{1}{3}\cdot\left(-\frac{2}{3}\right)$
$=\frac{2}{9}$

76. $\frac{7}{15}\div\left(-\frac{35}{24}\right)=\frac{7}{15}\cdot\left(-\frac{24}{35}\right)$
$=\frac{\cancel{7}}{\cancel{3}\cdot 5}\cdot\left(-\frac{2\cdot 2\cdot 2\cdot\cancel{3}}{5\cdot\cancel{7}}\right)$
$=-\frac{8}{25}$

78. $8.1\div 0.6=13.5$

80. $-10.65\div(-7.1)=1.5$

82. $19\div(-0.06)=-316.\overline{6}$

84. $25\frac{1}{2}\div 2=\frac{51}{2}\cdot\frac{1}{2}$
$=\frac{51}{4}$
$=12\frac{3}{4}$

The 12th fret should be placed $12\frac{3}{4}$ in. from the saddle or nut.

86. $(-858)\frac{2}{3}=-\$572$

88. $4\left(-\frac{3}{8}\right)=-\$1\frac{1}{2}$

90. $70.4(-9.8)=-689.92$ N

92. $\dfrac{-2080}{-32.2} \approx 64.6$ slugs

94. $-15 \div (-8) = 1.875\ \Omega$

96. $400 = (-6.5)^2 r$

$\dfrac{400}{(-6.5)^2} = r$

$9.47\Omega \approx r$

Exercise Set 1.5

2. Base: 9; Exponent: 4; "nine to the fourth power"

4. Base: –8; Exponent: 2; "negative eight squared"

6. Base: 3; Exponent: 8; "additive inverse of three to the eighth power"

8. $2^5 = 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 = 32$

10. $(-2)^4 = (-2)(-2)(-2)(-2) = 16$

12. $-2^4 = -2 \cdot 2 \cdot 2 \cdot 2 = -16$

14. $(-3)^5 = (-3)(-3)(-3)(-3)(-3) = -243$

16. $-3^5 = -3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 = -243$

18. $-(-3)^3 = -(-3)(-3)(-3)$
$= -(-27)$
$= 27$

20. $-(-1)^4 = -(-1)(-1)(-1)(-1)$
$= -(1)$
$= -1$

22. $\left(-\dfrac{2}{7}\right)^2 = \left(-\dfrac{2}{7}\right)\left(-\dfrac{2}{7}\right) = \dfrac{4}{49}$

24. $\left(-\dfrac{1}{3}\right)^5 = \left(-\dfrac{1}{3}\right)\left(-\dfrac{1}{3}\right)\left(-\dfrac{1}{3}\right)\left(-\dfrac{1}{3}\right)\left(-\dfrac{1}{3}\right)$
$= -\dfrac{1}{243}$

26. $(0.3)^4 = (0.3)(0.3)(0.3)(0.3)$
$= 0.0081$

28. $(-0.2)^4 = (-0.2)(-0.2)(-0.2)(-0.2)$
$= 0.0016$

30. ± 7

32. No real-number square root exists.

34. ± 13

36. ± 15

38. $\sqrt{36} = 6$

40. $\sqrt{289} = 17$

42. $\sqrt{0.01} = 0.1$

44. $\sqrt{-25}$ is not a real number.

46. $\sqrt{\dfrac{9}{100}} = \dfrac{\sqrt{9}}{\sqrt{100}}$
$= \dfrac{3}{10}$

48. $\sqrt{\dfrac{48}{3}} = \sqrt{16} = 4$

50. $4 \cdot 6 - 5 = 24 - 5$
$= 19$

52. $18 \div 2 + 3 = 9 + 3$
$= 12$

54. $9 + 6 \div 3 = 9 + 2$
$= 11$

56. $-3 \cdot 4 - 2 \cdot 7 = -12 - 14$
$= -26$

58. $8 - 3^2 = 8 - 9$
$= -1$

60. $16 - 5(-2)^2 = 16 - 5(4)$
$= 16 - 20$
$= -4$

62. $3^2 - 18 \div 3(6 - 3) = 3^2 - 18 \div 3 \cdot 3$
$= 9 - 18 \div 3 \cdot 3$
$= 9 - 6 \cdot 3$
$= 9 - 18$
$= -9$

64. $12 - 2(-2)^3 - 64 \div 4 \cdot 2 = 12 - 2(-8) - 64 \div 4 \cdot 2$
$= 12 - (-16) - 16 \cdot 2$
$= 12 + 16 - 32$
$= 28 - 32$
$= -4$

66. $(-3)^3 - 16 - 5(7-2) = (-3)^3 - 16 - 5(5)$
$= -27 - 16 - 5(5)$
$= -27 - 16 - 25$
$= -43 - 25$
$= -68$

68. $18 \div (-6+3)(4+1) = 18 \div (-3)(5)$
$= -6(5)$
$= -30$

70. $-15.54 \div 3.7 + (-2)^4 + \sqrt{49}$
$= -15.54 \div 3.7 + 16 + 7$
$= -4.2 + 16 + 7$
$= 11.8 + 7$
$= 18.8$

72. $16.3 + 2.8\left[(8+7) \div 5 - 4^2\right]$
$= 16.3 + 2.8\left(15 \div 5 - 4^2\right)$
$= 16.3 + 2.8(15 \div 5 - 16)$
$= 16.3 + 2.8(3 - 16)$
$= 16.3 + 2.8(-13)$
$= 16.3 + (-36.4)$
$= -20.1$

74. $-2|9-15| + 5^2 - 3^2 = -2|-6| + 5^2 - 3^2$
$= -2(6) + 5^2 - 3^2$
$= -2(6) + 25 - 9$
$= -12 + 25 - 9$
$= 4$

76. $\frac{5}{6} \div \left(-\frac{2}{3}\right) + \left(-\frac{2}{7}\right)(5)(-14)$
$= \frac{5}{2 \cdot \cancel{3}} \cdot \left(-\frac{\cancel{3}}{2}\right) + \left(-\frac{2}{\cancel{7}}\right)\left(\frac{5}{1}\right)\left(-\frac{2 \cdot \cancel{7}}{1}\right)$
$= -\frac{5}{4} + \frac{20}{1}$
$= -\frac{5}{4} + \frac{80}{4}$
$= \frac{75}{4}$
$= 18\frac{3}{4}$

78. $\sqrt{100-64} + 18 \div (-3)(-2)$
$= \sqrt{36} + 18 \div (-3)(-2)$
$= 6 + 18 \div (-3)(-2)$
$= 6 + (-6)(-2)$
$= 6 + 12$
$= 18$

80. $4 - 8\left[3 - (9+3)\right] + \sqrt{64}$
$= 4 - 8(3-12) + \sqrt{64}$
$= 4 - 8(-9) + \sqrt{64}$
$= 4 - 8(-9) + 8$
$= 4 + 72 + 8$
$= 84$

82. $\sqrt{83-58} - 2^2\left[9 - (3-8)\right] + 3^4$
$= \sqrt{25} - 2^2\left[9 - (-5)\right] + 3^4$
$= \sqrt{25} - 2^2(9+5) + 3^4$
$= \sqrt{25} - 2^2(14) + 3^4$
$= 5 - 4(14) + 81$
$= 5 - 56 + 81$
$= -51 + 81$
$= 30$

84. $\left(\frac{3}{4} - \frac{2}{3}\right) \div \sqrt{\frac{9}{81}} - \left(\frac{16}{27}\right) \div \left(\frac{4}{9}\right)$
$= \left(\frac{9}{12} - \frac{8}{12}\right) \div \sqrt{\frac{9}{81}} - \left(\frac{16}{27}\right) \div \left(\frac{4}{9}\right)$
$= \left(\frac{1}{12}\right) \div \frac{\sqrt{9}}{\sqrt{81}} - \left(\frac{16}{27}\right) \div \left(\frac{4}{9}\right)$
$= \left(\frac{1}{12}\right) \div \frac{3}{9} - \left(\frac{16}{27}\right) \div \left(\frac{4}{9}\right)$
$= \frac{1}{12} \div \frac{1}{3} - \frac{16}{27} \div \frac{4}{9}$
$= \frac{1}{12} \cdot \frac{3}{1} - \frac{{}^{4}\cancel{16}}{{}_{3}\cancel{27}} \cdot \frac{\cancel{9}^{1}}{\cancel{4}_{1}}$
$= \frac{3}{12} - \frac{4}{3}$
$= \frac{3}{12} - \frac{16}{12}$
$= -\frac{13}{12}$

86. $\frac{5}{6}(-18)\div\left(\frac{3}{2}\right)-\sqrt{9+16}$

$=\frac{5}{6}(-18)\div\left(\frac{3}{2}\right)-\sqrt{25}$

$=\frac{5}{6}(-18)\div\left(\frac{3}{2}\right)-5$

$=-15\div\left(\frac{3}{2}\right)-5$

$=-\frac{\overset{5}{\cancel{15}}}{1}\cdot\frac{2}{\underset{1}{\cancel{3}}}-5$

$=-10-5$

$=-15$

88. $18\cdot\left(-\frac{5}{6}\right)\div(-3)+2\left|4+2(7-3)\right|$

$=18\cdot\left(-\frac{5}{6}\right)\div(-3)+2\left|4+2(4)\right|$

$=18\cdot\left(-\frac{5}{6}\right)\div(-3)+2\left|4+8\right|$

$=18\cdot\left(-\frac{5}{6}\right)\div(-3)+2\left|12\right|$

$=\overset{3}{\cancel{18}}\cdot\left(-\frac{5}{\underset{1}{\cancel{6}}}\right)\div(-3)+2(12)$

$=-15\div(-3)+2(12)$

$=5+2(12)$

$=5+24$

$=29$

90. $\frac{\left|6(-3)+7\right|-11}{5^3-2(6-12)}=\frac{\left|-18+7\right|-11}{5^3-2(-6)}$

$=\frac{\left|-11\right|-11}{125-2(-6)}$

$=\frac{11-11}{125+12}$

$=\frac{0}{137}$

$=0$

92. $\frac{3\left[24-4(6-2)\right]}{-3^3+4^2+3}=\frac{3\left[24-4(4)\right]}{-27+16+3}$

$=\frac{3(24-16)}{-11+3}$

$=\frac{3(8)}{-8}$

$=\frac{24}{-8}$

$=-3$

94. $\frac{6^2-3\left(4+2^5\right)}{4+20-(2+4)^2}=\frac{6^2-3(4+32)}{4+20-6^2}$

$=\frac{6^2-3(36)}{4+20-36}$

$=\frac{36-3(36)}{24-36}$

$=\frac{36-108}{-12}$

$=\frac{-72}{-12}$

$=6$

96. $\frac{5(4-9)+1}{2^3-\sqrt{100-36}}=\frac{5(-5)+1}{2^3-\sqrt{64}}$

$=\frac{-25+1}{8-8}$

$=\frac{-24}{0}$

Because the divisor is 0, the answer is undefined.

98. Distributive Property. The parentheses were not simplified first.

100. Commutative Property of Addition. The addition was not performed from left to right.

102. Mistake: Subtracted before multiplying.

Correct: $19-6(10-8)=19-6\cdot 2$

$=19-12$

$=7$

104. Mistake: Treated -3^4 as $(-3)^4$.

Correct:

$-3^4+20\div 5-(16-24)=-3^4+20\div 5-(-8)$

$=-81+20\div 5-(-8)$

$=-81+4+8$

$=-69$

106. Since the instructor drops one quiz, the 4, there is a total of 8 quizzes. Add the quiz scores and divide by 8.

$$\frac{9+8+8+7+7+6+9+8}{8}=\frac{62}{8}=7.75$$

108. Assume that Lisa will not make lower than 68 and that score will be dropped. Add the test scores (268) and subtract from the lowest possible points for an A (4 tests multiplied by a score of 90 = 360 points). 360 – 268 = 92.

110. Add the unemployment figures for each month and divide by 12, the number of months in a year.

$$\frac{\left(\begin{array}{l}14,937+14,542+14,060+13,237\\+13,421+14,409+14,428+14,008\\+13,520+13,102+12,613+12,692\end{array}\right)}{12}$$

$$=\frac{164,969}{12}$$

$$\approx 13,747 \text{ thousand people}$$

$$=13,747,000 \text{ people}$$

112. Add the ending averages and divide by 5, the number of days.

$$\frac{\left(\begin{array}{l}13,075.35+13,071.72+13,007.47\\+12,969.70+12,885.82\end{array}\right)}{5}$$

$$=\frac{65,010.06}{5}$$

$$\approx 13,002.01$$

Exercise Set 1.6

2. $4n$

4. $5+y$

6. $T-6$

8. $\dfrac{7}{m^2}$

10. $2y-13$

12. $r\div 6$ or $\dfrac{r}{6}$

14. b^3+7

16. $4x+\dfrac{2}{3}$

18. $3(n+4)$

20. $(2-l)^3$

22. $3a+5$

24. $x\div y+7$ or $\dfrac{x}{y}+7$

26. $-8-(m-n)$

28. $0.81+8(x+0.3)$

30. $(c-d)-(a+b)$

32. $ab-\sqrt{x}$

34. $5n-(n+2)$

36. Mistake: Order is incorrect.
Correct: m^2-4

38. Mistake: Wrote 19 as a dividend instead of a divisor.
Correct: $\dfrac{hk}{19}$ or $hk\div 19$

40. $l-4$

42. $\dfrac{1}{4}l$

44. $2r$

46. $60-n$

48. $t+\dfrac{1}{3}$

50. πr^2

52. $\dfrac{4}{3}\pi r^3$

54. $\dfrac{v^2}{r}$

56. $\sqrt{1-\dfrac{v^2}{c^2}}$

58. Mistake: Could be translated as $2(a-7)$.
Correct: Seven less than two times a.

60. Mistake: Could be translated as $4y+6$.
Correct: Four times the sum of y and six.

62. Mistake: Could be translated as $(m-3)(m+2)$.
Correct: m minus the product of three and the sum of m and two.

64. The product of one-half the height and the sum of a and b.

66. The product of π, the radius squared, and the height.

68. Twice the product of π, the radius, and the sum of the radius and the height.

70. The product of a and x squared added to the product of b and x added to c.

Puzzle Problem

a) $n+1, n+2$
b) $n+2, n+4$
c) $n+2, n+4$

Exercise Set 1.7

2. Let $m = 5, n = 3$.

$$\begin{aligned} 8n - 2(m+1) &= 8(3) - 2(5+1) \\ &= 8(3) - 2(6) \\ &= 24 - 12 \\ &= 12 \end{aligned}$$

4. Let $y = 5$.

$$\begin{aligned} 6 - 0.4(y-2) &= 6 - 0.4(5-2) \\ &= 6 - 0.4(3) \\ &= 6 - 1.2 \\ &= 4.8 \end{aligned}$$

6. Let $n = -1$.

$$\begin{aligned} n^2 - 8n + 1 &= (-1)^2 - 8(-1) + 1 \\ &= 1 - 8(-1) + 1 \\ &= 1 + 8 + 1 \\ &= 10 \end{aligned}$$

8. Let $r = -\frac{1}{3}$.

$$\begin{aligned} 3r^2 - 9r + 6 &= 3\left(-\frac{1}{3}\right)^2 - 9\left(-\frac{1}{3}\right) + 6 \\ &= 3\left(\frac{1}{9}\right) - 9\left(-\frac{1}{3}\right) + 6 \\ &= \frac{1}{3} + 3 + 6 \\ &= 9\frac{1}{3} = \frac{28}{3} \end{aligned}$$

10. Let $l = -0.4$.

$$\begin{aligned} -6 - 2(l-5) &= -6 - 2(-0.4 - 5) \\ &= -6 - 2(-5.4) \\ &= -6 + 10.8 \\ &= 4.8 \end{aligned}$$

12. Let $m = 3$, $n = -2$.

$$\begin{aligned} -\left|2m^2\right| - |4n| &= -\left|2(3)^2\right| - |4(-2)| \\ &= -|2(9)| - |-8| \\ &= -|18| - 8 \\ &= -18 - 8 \\ &= -26 \end{aligned}$$

14. Let $m = -4$, $n = -5$.

$$\begin{aligned} \left|2m^2 + 2n\right| &= \left|2(-4)^2 + 2(-5)\right| \\ &= |2(16) + 2(-5)| \\ &= |32 + (-10)| \\ &= |22| \\ &= 22 \end{aligned}$$

16. Let $x = -2$, $y = -3$, $z = 4$.

$$\begin{aligned} -2x^3 y + \sqrt{z} &= -2(-2)^3(-3) + \sqrt{4} \\ &= -2(-8)(-3) + 2 \\ &= -48 + 2 \\ &= -46 \end{aligned}$$

18. Let $h = 16$, $k = 9$.

$$\begin{aligned} -3\sqrt{h} + 3\sqrt{k} &= -3\sqrt{16} + 3\sqrt{9} \\ &= -3(4) + 3(3) \\ &= -12 + 9 \\ &= -3 \end{aligned}$$

20. Let $m = 2, n = 4$.

$$\begin{aligned} \frac{4m^2}{n+4} &= \frac{4(2)^2}{4+4} \\ &= \frac{4(4)}{8} \\ &= \frac{16}{8} \\ &= 2 \end{aligned}$$

22. Let $a = 1, x = 64, y = 36$.

$$\begin{aligned} \frac{5 - a^2}{3\sqrt{x+y}} &= \frac{5 - 1^2}{3\sqrt{64+36}} \\ &= \frac{5-1}{3\sqrt{100}} \\ &= \frac{4}{3 \cdot 10} \\ &= \frac{4}{30} \\ &= \frac{2}{15} \end{aligned}$$

24. a) Let $a=1, b=0.5, c=-4, d=6$.

$$\begin{aligned} ad-bc &= 1(6)-0.5(-4) \\ &= 6+2 \\ &= 8 \end{aligned}$$

b) Let $a=-3, b=\frac{4}{5}, c=2, d=\frac{1}{2}$.

$$\begin{aligned} ad-bc &= -3\left(\frac{1}{2}\right)-\frac{4}{5}(2) \\ &= -\frac{3}{2}-\frac{8}{5} \\ &= -\frac{3(5)}{2(5)}-\frac{8(2)}{5(2)} \\ &= -\frac{15}{10}-\frac{16}{10} \\ &= -\frac{31}{10} \end{aligned}$$

26. a) Let $x_1=2, y_1=1, x_2=5, y_2=7$.

$$\begin{aligned} \sqrt{(x_2-x_1)^2+(y_2-y_1)^2} &= \sqrt{(5-2)^2+(7-1)^2} \\ &= \sqrt{3^2+6^2} \\ &= \sqrt{9+36} \\ &= \sqrt{45} \\ &\approx 6.7 \end{aligned}$$

b) Let $x_1=-1, y_1=2, x_2=-7, y_2=-2$

$$\begin{aligned} &\sqrt{(x_2-x_1)^2+(y_2-y_1)^2} \\ &= \sqrt{\left(-7-(-1)\right)^2+(-2-2)^2} \\ &= \sqrt{(-6)^2+(-4)^2} \\ &= \sqrt{36+16} \\ &= \sqrt{52} \\ &\approx 7.2 \end{aligned}$$

28. If $x=-3$, we have $\frac{8}{-3+3}=\frac{8}{0}$, which is undefined because the denominator is 0.

30. If $a=4$, we have $\frac{-5(4)}{(4-4)(4-2)}=\frac{-20}{(0)(2)}=\frac{-20}{0}$, which is undefined. If $a=2$, we have $\frac{-5(2)}{(2-4)(2-2)}=\frac{-10}{(-2)(0)}=\frac{-10}{0}$, which is undefined.

32. If $y=0$, we have $\frac{7-0}{0}=\frac{7}{0}$, which is undefined because the denominator is 0.

34. If $y=-\frac{1}{2}$, we have $\frac{3\left(-\frac{1}{2}\right)}{2\left(-\frac{1}{2}\right)+1}=\frac{-\frac{3}{2}}{-1+1}=\frac{-\frac{3}{2}}{0}$, which is undefined because the denominator is 0.

36. $$\begin{aligned} 4(b-5) &= 4\cdot b-4\cdot 5 \\ &= 4b-20 \end{aligned}$$

38. $$\begin{aligned} -7(3-2m) &= -7\cdot 3-(-7)\cdot 2m \\ &= -21-(-14m) \\ &= -21+14m \end{aligned}$$

40. $$\begin{aligned} \frac{4}{5}\left(-10h+\frac{2}{9}\right) &= \frac{4}{5}(-10h)+\frac{4}{5}\cdot\frac{2}{9} \\ &= -8h+\frac{8}{45} \end{aligned}$$

42. $$\begin{aligned} -1.5(6x+7) &= -1.5\cdot 6x+(-1.5)\cdot 7 \\ &= -9x-10.5 \end{aligned}$$

44. -14 46. 1 48. -1

50. $\frac{5}{8}$ 52. $-\frac{1}{3}$

54. $6m+7m=13m$

56. $5b-13b=-8b$

58. $-5y+12y=7y$

60. $-7m-6m=-13m$

62. $-5.1x^4+3.4x^4=-1.7x^4$

64. $$\begin{aligned} \frac{3}{4}z-\frac{7}{5}z &= \frac{3(5)}{4(5)}z-\frac{7(4)}{5(4)}z \\ &= \frac{15}{20}z-\frac{28}{20}z \\ &= -\frac{13}{20}z \end{aligned}$$

66. $$\begin{aligned} -15w-6w-11w &= -21w-11w \\ &= -32w \end{aligned}$$

68. $$\begin{aligned} 5y^2+6+3y^2-8 &= 5y^2+3y^2+6-8 \\ &= 8y^2-2 \end{aligned}$$

70. $-4a+9b-a+5+2b-8$
$=-4a-a+9b+2b+5-8$
$=-5a+11b-3$

72. $-3h+7k-5-8h-7k+19+x$
$=-3h-8h+7k-7k+x-5+19$
$=-11h+x+14$

74. $0.4t^2+t-2.8-t^2+0.9t-4$
$=0.4t^2-t^2+t+0.9t-2.8-4$
$=-0.6t^2+1.9t-6.8$

76. $\frac{5}{8}y+4-\frac{3}{4}x+\frac{2}{3}-\frac{1}{4}y$
$=-\frac{3}{4}x+\frac{5}{8}y-\frac{1}{4}y+4+\frac{2}{3}$
$=-\frac{3}{4}x+\frac{5}{8}y-\frac{1(2)}{4(2)}y+\frac{4(3)}{1(3)}+\frac{2}{3}$
$=-\frac{3}{4}x+\frac{5}{8}y-\frac{2}{8}y+\frac{12}{3}+\frac{2}{3}$
$=-\frac{3}{4}x+\frac{3}{8}y+\frac{14}{3}$

78. $\frac{1}{2}m-3n+14-\frac{3}{8}m-\frac{9}{10}n-5$
$=\frac{1}{2}m-\frac{3}{8}m-3n-\frac{9}{10}n+14-5$
$=\frac{1(4)}{2(4)}m-\frac{3}{8}m-\frac{3(10)}{1(10)}n-\frac{9}{10}n+14-5$
$=\frac{4}{8}m-\frac{3}{8}m-\frac{30}{10}n-\frac{9}{10}n+14-5$
$=\frac{1}{8}m-\frac{39}{10}n+9$

80. a) $-5n+(8-2n)$
b) $8-7n$
c) Let $n=0.2$
$8-7n=8-7(0.2)$
$=8-1.4$
$=6.6$

Puzzle Problem

F = 2, O = 9, R = 7, T = 8, Y = 6, E = 5, N = 0,
S = 3, I = 1, X = 4

$$\begin{array}{r} 29786 \\ 850 \\ +\ 850 \\ \hline 31486 \end{array}$$

Chapter 2

Solving Linear Equations and Inequalities

Exercise Set 2.1

2. For $4a+7=51$, let $a=11$.

$$\begin{aligned} 4\cdot 11+7 &\stackrel{?}{=} 51 \\ 44+7 &\stackrel{?}{=} 51 \\ 51 &= 51 \end{aligned}$$

Yes, $a=11$ is a solution.

4. For $-8t-3=2t-15$, let $t=-\frac{6}{5}$.

$$\begin{aligned} -8\left(-\frac{6}{5}\right)-3 &\stackrel{?}{=} 2\left(-\frac{6}{5}\right)-15 \\ \frac{48}{5}-\frac{15}{5} &\stackrel{?}{=} \frac{-12}{5}-\frac{75}{5} \\ \frac{33}{5} &\neq -\frac{87}{5} \end{aligned}$$

No, $t=-\frac{6}{5}$ is not a solution.

6. For $2(3m+2)-2=5m-1$, let $m=-3$.

$$\begin{aligned} 2(3(-3)+2)-2 &\stackrel{?}{=} 5(-3)-1 \\ 2(-9+2)-2 &\stackrel{?}{=} -15-1 \\ 2(-7)-2 &\stackrel{?}{=} -16 \\ -14-2 &\stackrel{?}{=} -16 \\ -16 &= -16 \end{aligned}$$

Yes, $m=-3$ is a solution.

8. For $\frac{1}{2}p-\frac{1}{2}=\frac{2}{5}p+\frac{3}{2}$, let $p=20$.

$$\begin{aligned} \frac{1}{2}(20)-\frac{1}{2} &\stackrel{?}{=} \frac{2}{5}(20)+\frac{3}{2} \\ 10-\frac{1}{2} &\stackrel{?}{=} 8+\frac{3}{2} \\ 9\frac{1}{2} &= 9\frac{1}{2} \end{aligned}$$

Yes, $p=20$ is a solution.

10. For $12.7a+12.6=a+5.4a$, let $a=-2$.

$$\begin{aligned} 12.7(-2)+12.6 &\stackrel{?}{=} -2+5.4(-2) \\ -25.4+12.6 &\stackrel{?}{=} -2-10.8 \\ -12.8 &= -12.8 \end{aligned}$$

Yes, $a=-2$ is a solution.

12. For $-x^3+9=2x^2-6x$, let $x=-3$.

$$\begin{aligned} -(-3)^3+9 &\stackrel{?}{=} 2(-3)^2-6(-3) \\ -(-27)+9 &\stackrel{?}{=} 2(9)+18 \\ 27+9 &\stackrel{?}{=} 18+18 \\ 36 &= 36 \end{aligned}$$

Yes, $x=-3$ is a solution.

14. For $-|2u-3|=-3u+8$, let $u=5$.

$$\begin{aligned} -|2(5)-3| &\stackrel{?}{=} -3(5)+8 \\ -|10-3| &\stackrel{?}{=} -15+8 \\ -|7| &\stackrel{?}{=} -7 \\ -7 &= -7 \end{aligned}$$

Yes, $u=5$ is a solution.

16. For $\frac{-y}{10+y}=\frac{\sqrt{4-y}}{3}$, let $y=-5$.

$$\begin{aligned} \frac{-(-5)}{10+(-5)} &\stackrel{?}{=} \frac{\sqrt{4-(-5)}}{3} \\ \frac{5}{5} &\stackrel{?}{=} \frac{\sqrt{4+5}}{3} \\ 1 &\stackrel{?}{=} \frac{\sqrt{9}}{3} \\ 1 &\stackrel{?}{=} \frac{3}{3} \\ 1 &= 1 \end{aligned}$$

Yes, $y=-5$ is a solution.

18. a) We must find the perimeter of a rectangle. Let l = 22 ft. and w = 16.5 ft.
$P = 2l + 2w$
$P = 2(22) + 2(16.5)$
$P = 44 + 33$
$P = 77$ ft.
b) $77 \div 8 = 9.625$
Since you cannot buy part of a strip, he must purchase 10 strips.
c) $10 \cdot 9.99 = \$99.90$

20. We must use the formula for the circumference of a circle. Let d = 180 km.
$C = \pi d$
$C = \pi(180)$
$C \approx 565.49$ km

22. We must find the area of a rectangle. Let l = 273 m and w = 50 m.
$A = lw$
$A = (273)(50)$
$A = 13{,}650 \text{ m}^2$

24. Begin by finding the area (in square feet) of the room. Let l = 15 ft. and w = 14 ft.
$A = lw$
$A = (15)(14)$
$A = 210 \text{ ft.}^2$
Now multiply the area (in square feet) of the room by the cost per square foot.
$210(\$34.50) = \$7245$

26. a) We must find the area of a rectangle. Let l = 42 ft. and w = 36 ft.
$A = lw$
$A = (42)(36)$
$A = 1512 \text{ ft.}^2$
b) $1512 \div 9 = 168 \text{ yd.}^2$
c) $168(\$22.50) = \$3780$.
No, the contractor's quote is more than Juan's budget.

28. a) We must find the area of a triangle. Let b = 32 ft. and h = 24 ft.
$A = \frac{1}{2}bh$
$A = \frac{1}{2}(32)(24)$
$A = 16(24)$
$A = 384 \text{ ft.}^2$
b) Now multiply the area by the cost per square foot: $384(\$6.50) = \$2496$.

30. a) Begin by finding the area of the room in square feet if the island was not there and also find the area of the island in square feet.
Area of room: $A = lw$
$A = 16.5(15)$
$A = 247.5$ sq. ft.
Area of island: $A = lw$
$A = 3.5(2)$
$A = 7$ sq. ft.
Subtract the area of the island from the area of the room.
$247.5 - 7 = 240.5$ sq. ft.
b) Now divide the area you just found by the area of a single tile: $240.5 \div 0.25 = 962$ pieces of tile.
c) Multiply the number of tiles by the price per tile: $962(\$3.95) = \$3799.90$.
d) Multiply the area by \$8 per square foot: $240.5(\$8) = \$1924$.

32. Begin by finding the area of the CD including the center and the area of the center.

Find the radius of the CD: $5\frac{3}{4} \div 2 = \frac{23}{4} \cdot \frac{1}{2}$

$= \frac{23}{8}$

$= 2\frac{7}{8}$

Area of CD: $A = \pi r^2$

$A = \pi\left(2\frac{7}{8}\right)^2$

$A = \pi(8.265625)$

$A \approx 25.97 \text{ in.}^2$

Find the radius of the center of the CD:

$1\frac{3}{4} \div 2 = \frac{7}{4} \cdot \frac{1}{2}$

$= \frac{7}{8}$

Area of center: $A = \pi r^2$

$A = \pi\left(\frac{7}{8}\right)^2$

$A = \pi(0.765625)$

$A \approx 2.41 \text{ in.}^2$

Subtract the area of the center from the area of the CD: $25.97 - 2.41 = 23.56 \approx 23.6 \text{ in.}^2$

34. Begin by finding the area (in square feet) of the side of the house if the window was not there and area (in square feet) of the window.
To find the area of the side of the house, find the area of the composite figure of a rectangle and triangle.

Area of side: $A = lw + \frac{1}{2}bh$

$A = 10(44.5) + \frac{1}{2}(44.5)(9.5)$

$A = 445 + 211.375$

$A = 656.375 \text{ ft.}^2$

Area of window: $A = lw$

$A = 3(4.5)$

$A = 13.5 \text{ ft.}^2$

Subtract the area of the window from the area of the side.

$656.375 - 13.5 = 642.875 \text{ ft.}^2$

36. Use the formula for the volume of a box.

$V = lwh$

$V = (2)\left(1\frac{1}{2}\right)(4)$

$V = \left(\frac{2}{1}\right)\left(\frac{3}{2}\right)\left(\frac{4}{1}\right)$

$V = 12 \text{ ft.}^3$

38. Use the formula for the volume of a sphere.

$V = \frac{4}{3}\pi r^3$

$V = \frac{4}{3}\pi(6370)^3$

$V \approx 1.1 \times 10^{12} \text{ km}^3$

$= 1{,}100{,}000{,}000{,}000 \text{ km}^3$

40. Use the formula for the volume of a cone. First find the radius: $8.5 \div 2 = 4.25$ in.

$V = \frac{1}{3}\pi r^2 h$

$V = \frac{1}{3}\pi(4.25)^2(6)$

$V = \frac{1}{3}\pi(18.0625)(6)$

$V \approx 113.5 \text{ in.}^3$

42. Begin by finding the total drive time. Between 7:30A.M. and 6:00 P.M. is 10 hours and 30 minutes. Taking out the three 15-minute breaks and one hour for lunch leaves a total drive time of 8 hours and 45 minutes or 8.75 hours. Also find the total distance traveled by subtracting the beginning odometer reading from the final odometer reading: 45,785.2 – 45,362.6 = 422.6 miles. We are looking for an average driving rate, so use the formula $r = \frac{d}{t}$.

$r = \frac{d}{t}$

$r = \frac{422.6}{8.75}$

$r \approx 48.3 \text{ mph}$

44. Begin by converting 87 hours, 34 minutes and 47 seconds to hours.

$$87+\frac{34}{60}+\frac{47}{60}\cdot\frac{1}{60}=87+\frac{34}{60}+\frac{47}{3600}$$
$$=87+\frac{34\cdot 60}{60\cdot 60}+\frac{47}{3600}$$
$$=87+\frac{2040}{3600}+\frac{47}{3600}$$
$$=87+\frac{2087}{3600}$$
$$=87\frac{2087}{3600}\text{ hr.}$$

We are looking for an average rate, so use the formula $r=\frac{d}{t}$.

$$r=\frac{d}{t}$$
$$r=\frac{3606}{87\frac{2087}{3600}}$$
$$r=\frac{3606}{\frac{315287}{3600}}$$
$$r=\frac{3606}{1}\cdot\frac{3600}{315287}$$
$$r\approx 41.2$$

Lance's average rate was 41.2 kilometers per hour.

46. Since the flight begins in EST and ends in CST, you must add 1 hour to the difference between arrival and departure: 2 hours and 40 minutes + 1 hour = 3 hours, 40 minutes or $3\frac{2}{3}$ hr.

$$d=rt$$
$$d=368.2\left(3\frac{2}{3}\right)$$
$$d=1350.0\overline{6}\text{ miles}$$

48. $V=iR$

$$V=(4.2)(16)$$
$$V=67.2\text{ V}$$

50. $F=\frac{9}{5}(1535)+32$

$$F=2763+32$$
$$F=2795^\circ\text{ F}$$

52. $C=\frac{5}{9}(-360-32)$

$$C=\frac{5}{9}(-392)$$
$$C=-217.\overline{7}^\circ\text{ C}$$

54. $C=\frac{5}{9}(890-32)$

$$C=\frac{5}{9}(858)$$
$$C=476.\overline{6}^\circ\text{ C}$$

Puzzle Problem

To find the number of marbles that might fit inside the jar, calculate the volume of the jar.

Jar ($r=\frac{9}{2}=4.5$ in. and $h=12$ in.):

$$V=\pi r^2 h$$
$$=\pi(4.5)^2(12)$$
$$\approx 763.407$$

The volume of the jar is 763.407 cubic inches. Now, calculate the volume of a marble.

Marble ($r=\frac{0.5}{2}=0.25$ in.):

$$V=\frac{4}{3}\pi r^3$$
$$=\frac{4}{3}\pi(0.25)^3$$
$$\approx 0.06545$$

The volume of a marble is 0.06545 cubic inches. To find the number of marbles that would fit inside the jar, divide the volume of the jar in cubic inches by the volume of a marble.

$763.407\div 0.06545\approx 11,664$ marbles.

Exercise Set 2.2

2. Yes, because the variable terms contain a single variable and have an exponent of 1.

4. No, because one variable term has an exponent of 2.

6. No, because there are variable terms with exponents greater than 1.

8. Yes, because the variable terms contain a single variable and have an exponent of 1.

10. Yes, because the variable terms contain a single variable and have an exponent of 1.

12. No, because the variable terms have exponents greater than 1.

14. Yes, because the variable term contains a single variable and has an exponent of 1.

16. Yes, because the variable terms contain a single variable and have an exponent of 1.

18. Solve the equation for a.

$$\begin{aligned} a-8 &= 30 \\ \underline{+8} \quad & \underline{+8} \\ a+0 &= 38 \\ a &= 38 \end{aligned}$$

Check: $38-8 \stackrel{?}{=} 30$

$30 = 30$

20. Solve the equation for n.

$$\begin{aligned} n-6 &= -2 \\ \underline{+6} \quad & \underline{+6} \\ n+0 &= 4 \\ n &= 4 \end{aligned}$$

Check: $4-6 \stackrel{?}{=} -2$

$-2 = -2$

22. Solve the equation for a.

$$\begin{aligned} a-3 &= -11 \\ \underline{+3} \quad & \underline{+3} \\ a+0 &= -8 \\ a &= -8 \end{aligned}$$

Check: $-8-3 \stackrel{?}{=} -11$

$-11 = -11$

24. Solve the equation for x.

$$\begin{aligned} x+2 &= 8 \\ \underline{-2} \quad & \underline{-2} \\ x+0 &= 6 \\ x &= 6 \end{aligned}$$

Check: $6+2 \stackrel{?}{=} 8$

$8 = 8$

26. Solve the equation for y.

$$\begin{aligned} y+15 &= 8 \\ \underline{-15} \quad & \underline{-15} \\ y+0 &= -7 \\ y &= -7 \end{aligned}$$

Check: $-7+15 \stackrel{?}{=} 8$

$8 = 8$

28. Solve the equation for n.

$$\begin{aligned} -24 &= n+11 \\ \underline{-11} \quad & \underline{-11} \\ -35 &= n+0 \\ -35 &= n \end{aligned}$$

Check: $-24 \stackrel{?}{=} -35+11$

$-24 = -24$

30. Solve the equation for k.

$$\begin{aligned} k+\frac{5}{9} &= -\frac{1}{3} \\ k+\frac{5}{9}-\frac{5}{9} &= -\frac{1}{3}-\frac{5}{9} \\ k+0 &= -\frac{3}{9}-\frac{5}{9} \\ k &= -\frac{8}{9} \end{aligned}$$

Check: $-\frac{8}{9}+\frac{5}{9} \stackrel{?}{=} -\frac{1}{3}$

$-\frac{3}{9} \stackrel{?}{=} -\frac{1}{3}$

$-\frac{1}{3} = -\frac{1}{3}$

32. Solve the equation for c.

$$\begin{aligned} \frac{3}{4} &= c-\frac{2}{3} \\ \frac{3}{4}+\frac{2}{3} &= c-\frac{2}{3}+\frac{2}{3} \\ \frac{9}{12}+\frac{8}{12} &= c+0 \\ \frac{17}{12} &= c \end{aligned}$$

Check: $\frac{3}{4} \stackrel{?}{=} \frac{17}{12}-\frac{2}{3}$

$\frac{3}{4} \stackrel{?}{=} \frac{17}{12}-\frac{8}{12}$

$\frac{3}{4} \stackrel{?}{=} \frac{9}{12}$

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

34. Solve the equation for b.

$$\begin{aligned} b+8.8 &= 5.4 \\ \underline{-8.8} \quad & \underline{-8.8} \\ b+0 &= -3.4 \\ b &= -3.4 \end{aligned}$$

Check: $-3.4+8.8 \stackrel{?}{=} 5.4$

$5.4 = 5.4$

36. Solve the equation for x.

$$\begin{aligned} x+0.4-1.6 &= -12.5 \\ x-1.2 &= -12.5 \\ \underline{+1.2} \quad & \underline{+1.2} \\ x+0 &= -11.3 \\ x &= -11.3 \end{aligned}$$

Check: $-11.3+0.4-1.6 \stackrel{?}{=} -12.5$

$-12.5 = -12.5$

38. Solve the equation for z.

$$\begin{aligned} 2z+6-z &= 5-9 \\ z+6 &= -4 \\ \underline{-6} \quad & \underline{-6} \\ z+0 &= -10 \\ z &= -10 \end{aligned}$$

Check: $2(-10)+6-(-10) \stackrel{?}{=} 5-9$

$$\begin{aligned} -20+6+10 &\stackrel{?}{=} -4 \\ -4 &= -4 \end{aligned}$$

40. Solve the equation for y.

$$\begin{aligned} 7y &= 6y-8 \\ \underline{-6y} \quad & \underline{-6y} \\ 1y &= 0-8 \\ y &= -8 \end{aligned}$$

Check: $7(-8) \stackrel{?}{=} 6(-8)-8$

$$\begin{aligned} -56 &\stackrel{?}{=} -48-8 \\ -56 &= -56 \end{aligned}$$

42. Solve the equation for y.

$$\begin{aligned} 12y+22 &= 11y-3 \\ \underline{-11y} \quad & \underline{-11y} \\ y+22 &= 0-3 \\ y+22 &= -3 \\ \underline{-22} \quad & \underline{-22} \\ y+0 &= -25 \\ y &= -25 \end{aligned}$$

Check: $12(-25)+22 \stackrel{?}{=} 11(-25)-3$

$$\begin{aligned} -300+22 &\stackrel{?}{=} -275-3 \\ -278 &= -278 \end{aligned}$$

44. Solve the equation for t.

$$\begin{aligned} -4t+9 &= -5t+1 \\ \underline{+5t} \quad & \underline{+5t} \\ t+9 &= 0+1 \\ t+9 &= 1 \\ \underline{-9} \quad & \underline{-9} \\ t+0 &= -8 \\ t &= -8 \end{aligned}$$

Check: $-4(-8)+9 \stackrel{?}{=} -5(-8)+1$

$$\begin{aligned} 32+9 &\stackrel{?}{=} 40+1 \\ 41 &= 41 \end{aligned}$$

46. Solve the equation for t.

$$\begin{aligned} 3t+6+4t &= 9t-2-t \\ 7t+6 &= 8t-2 \\ \underline{-7t} \quad & \underline{-7t} \\ 0+6 &= t-2 \\ 6 &= t-2 \\ \underline{+2} \quad & \underline{+2} \\ 8 &= t+0 \\ 8 &= t \end{aligned}$$

Check: $3(8)+6+4(8) \stackrel{?}{=} 9(8)-2-8$

$$\begin{aligned} 24+6+32 &\stackrel{?}{=} 72-2-8 \\ 62 &= 62 \end{aligned}$$

48. Solve the equation for x.

$$\begin{aligned} -10x-9+8x &= -4x-5+3x \\ -2x-9 &= -x-5 \\ \underline{+2x} \quad & \underline{+2x} \\ 0-9 &= x-5 \\ -9 &= x-5 \\ \underline{+5} \quad & \underline{+5} \\ -4 &= x+0 \\ -4 &= x \end{aligned}$$

Check:

$$-10(-4)-9+8(-4) \stackrel{?}{=} -4(-4)-5+3(-4)$$

$$\begin{aligned} 40-9-32 &\stackrel{?}{=} 16-5-12 \\ -1 &= -1 \end{aligned}$$

50. Solve the equation for c.

$$\begin{aligned} 9c+4.8 &= 7.5+4.8+8c \\ 9c+4.8 &= 8c+12.3 \\ \underline{-8c} & \quad \underline{-8c} \\ c+4.8 &= 0+12.3 \\ c+4.8 &= 12.3 \\ \underline{-4.8} & \quad \underline{-4.8} \\ c+0 &= 7.5 \\ c &= 7.5 \end{aligned}$$

Check: $9(7.5)+4.8 \stackrel{?}{=} 7.5+4.8+8(7.5)$

$$67.5+4.8 \stackrel{?}{=} 7.5+4.8+60$$

$$72.3 = 72.3$$

52. Solve the equation for m.

$$19-3(m+4)+4m = 42-18$$

$$19-3m-12+4m = 24$$

$$m+7 = 24$$

$$\underline{-7} \quad \underline{-7}$$

$$m+0 = 17$$

$$m = 17$$

Check: $19-3(17+4)+4(17) \stackrel{?}{=} 42-18$

$$19-3(21)+4(17) \stackrel{?}{=} 24$$

$$19-63+68 \stackrel{?}{=} 24$$

$$24 = 24$$

54. Solve the equation for b.

$$6-\frac{2}{3}(6b-9) = -5b-21$$

$$6-4b+6 = -5b-21$$

$$12-4b = -5b-21$$

$$\underline{+5b} \quad \underline{+5b}$$

$$12+b = 0-21$$

$$12+b = -21$$

$$\underline{-12} \quad \underline{-12}$$

$$0+b = -33$$

$$b = -33$$

Check: $6-\frac{2}{3}(6(-33)-9) \stackrel{?}{=} -5(-33)-21$

$$6-\frac{2}{3}(-198-9) \stackrel{?}{=} 165-21$$

$$6-\frac{2}{3}(-207) \stackrel{?}{=} 144$$

$$6+138 \stackrel{?}{=} 144$$

$$144 = 144$$

56. Solve the equation for x.

$$-15-2x = 16-(3x-9)$$

$$-15-2x = 16-3x+9$$

$$-15-2x = 25-3x$$

$$\underline{+3x} \quad \underline{+3x}$$

$$-15+x = 25+0$$

$$x-15 = 25$$

$$\underline{+15} \quad \underline{+15}$$

$$x+0 = 40$$

$$x = 40$$

Check: $-15-2(40) \stackrel{?}{=} 16-(3(40)-9)$

$$-15-80 \stackrel{?}{=} 16-(120-9)$$

$$-95 \stackrel{?}{=} 16-111$$

$$-95 = -95$$

58. Solve the equation for x.

$$5(5x-3)-6(4x-2) = 12-15$$

$$25x-15-24x+12 = -3$$

$$x-3 = -3$$

$$\underline{+3} \quad \underline{+3}$$

$$x+0 = 0$$

$$x = 0$$

Check: $5(5(0)-3)-6(4(0)-2) \stackrel{?}{=} 12-15$

$$5(0-3)-6(0-2) \stackrel{?}{=} -3$$

$$5(-3)-6(-2) \stackrel{?}{=} -3$$

$$-15+12 \stackrel{?}{=} -3$$

$$-3 = -3$$

60. Solve the equation for x.

$$0.5(3.8x-6.2)-(0.9x-4)=2.9-4.7$$
$$1.9x-3.1-0.9x+4=-1.8$$
$$x+0.9=-1.8$$
$$\underline{-0.9 \quad -0.9}$$
$$x+0=-2.7$$
$$x=-2.7$$

Check:

$$0.5(3.8(-2.7)-6.2)-(0.9(-2.7)-4)\stackrel{?}{=}2.9-4.7$$
$$0.5(-10.26-6.2)-(-2.43-4)\stackrel{?}{=}-1.8$$
$$0.5(-16.46)-(-6.43)\stackrel{?}{=}-1.8$$
$$-8.23+6.43\stackrel{?}{=}-1.8$$
$$-1.8=-1.8$$

62. Solve the equation for v.

$$-9-4v-1+v=-2v+5-v-15$$
$$-3v-10=-3v-10$$

Because the linear equation is an identity, every real number is a solution.

64. Solve the equation for y.

$$2.5y-3.4-1.2y=6.7-9.1+1.3y$$
$$1.3y-3.4=1.3y-2.4$$

The expressions on each side of the equation have the same variable term but different constant terms, so the equation is a contradiction and has no solution.

66. Solve the equation for b.

$$6b-1.5(8+2b)+4=6b-\frac{1}{8}(24b+48)$$
$$6b-12-3b+4=6b-3b-6$$
$$3b-8=3b-6$$

The expressions on each side of the equation have the same variable term but different constant terms, so the equation is a contradiction and has no solution.

68. Solve the equation for x.

$$-3(2x+5)+8(x+2)-7=6(x-5)-4(x-6)$$
$$-6x-15+8x+16-7=6x-30-4x+24$$
$$2x-6=2x-6$$

Because the linear equation is an identity, every real number is a solution.

70. Let x be the payment Kent must make.

$$10{,}500+x=12{,}412$$
$$\underline{-10{,}500 \qquad -10{,}500}$$
$$0+x=1912$$
$$x=1912$$

Kent must make a payment of \$1912.

72. Let x be the value on the fifth die.

$$23+x=28$$
$$\underline{-23 \qquad -23}$$
$$0+x=5$$
$$x=5$$

The fifth die should have a value of 5.

74. Let x be amount of the third injection.

$$110+110+x=350$$
$$220+x=350$$
$$\underline{-220 \qquad -220}$$
$$0+x=130$$
$$x=130$$

The third injection should be 130 cc.

76. Let x be the missing side of the triangle. Remember that the perimeter is the sum of all of the sides.

$$a+b+c=P$$
$$x+23+35\frac{1}{4}=84\frac{1}{2}$$
$$x+58\frac{1}{4}=84\frac{1}{2}$$
$$x+58\frac{1}{4}-58\frac{1}{4}=84\frac{1}{2}-58\frac{1}{4}$$
$$x+0=84\frac{2}{4}-58\frac{1}{4}$$
$$x=26\frac{1}{4}$$

The missing length is $26\frac{1}{4}$ in.

78. Let x be the length of the missing side.

$$6+x+4=16$$
$$10+x=16$$
$$\underline{-10 \qquad -10}$$
$$0+x=6$$
$$x=6$$

The length of the missing side is 6 cm.

80. To find the total in sales, we must first multiply the quantity sold by the price per unit.

Blouses: $3(\$25) = \$75$

Slacks: $5(\$30) = \$150$

Shoes: $2(\$85) = \$170$

Let x be the amount that Tamika needs to sell to make her goal. Translate this situation into an equation.

$$\begin{aligned} x + 3\cdot 25 + 5\cdot 30 + 2\cdot 85 &= 600 \\ x + 75 + 150 + 170 &= 600 \\ x + 395 &= 600 \\ -395 \quad & \quad -395 \\ x + 0 &= 205 \\ x &= 205 \end{aligned}$$

Tamika needs to sell \$205 more. No, Tamika will probably not meet her goal because she still has over one-third of her goal to go but only one hour left to work.

82. Let x represent the fraction of the respondents who believed that the increase was due to men and women equally. Remember that the fractions are parts of a whole, so set the sum of the fractions equal to 1 whole.

$$\begin{aligned} x + \frac{19}{50} + \frac{9}{50} &= 1 \\ x + \frac{28}{50} &= 1 \\ x + \frac{28}{50} - \frac{28}{50} &= 1 - \frac{28}{50} \\ x + 0 &= \frac{50}{50} - \frac{28}{50} \\ x &= \frac{22}{50} \\ x &= \frac{11}{25} \end{aligned}$$

$\frac{11}{25}$ of the respondents believed that the increase was due to men and women equally.

Puzzle Problem

Let x represent the fraction of the group that received the medication but showed no discernible effect from it. We are told that the participants who showed improvement $\left(\frac{1}{3}\right)$ took the medication and that the participants who experienced side effects $\left(\frac{1}{8}\right)$ also took the medication. Altogether, $\frac{1}{2}$ of the participants took the medication.

We can translate this into an equation.

$$\begin{aligned} x + \frac{1}{3} + \frac{1}{8} &= \frac{1}{2} \\ x + \frac{8}{24} + \frac{3}{24} &= \frac{1}{2} \\ x + \frac{11}{24} &= \frac{1}{2} \\ x + \frac{11}{24} - \frac{11}{24} &= \frac{1}{2} - \frac{11}{24} \\ x &= \frac{12}{24} - \frac{11}{24} \\ x &= \frac{1}{24} \end{aligned}$$

$\frac{1}{24}$ of the group that received the medication showed no discernible effects from it.

Exercise Set 2.3

2. Solve the equation for x.

$$\begin{aligned} 8x &= -24 \\ \frac{8x}{8} &= \frac{-24}{8} \\ x &= -3 \end{aligned}$$

Check: $8(-3) \stackrel{?}{=} -24$

$-24 = -24$

4. Solve the equation for y.

$$\begin{aligned} -5y &= 20 \\ \frac{-5y}{-5} &= \frac{20}{-5} \\ y &= -4 \end{aligned}$$

Check: $-5(-4) \stackrel{?}{=} 20$

$20 = 20$

6. Solve the equation for t.

$$\frac{t}{3} = -4 \qquad \text{Check: } \frac{-12}{3} \stackrel{?}{=} -4$$

$$3\left(\frac{t}{3}\right) = 3(-4) \qquad -4 = -4$$

$$t = -12$$

8. Solve the equation for x.

$$\frac{5}{6}x = 20 \qquad \text{Check: } \frac{5}{6}(24) \stackrel{?}{=} 20$$

$$\frac{6}{5}\left(\frac{5}{6}x\right) = \frac{6}{5}(20) \qquad 20 = 20$$

$$x = 24$$

10. Solve the equation for a.

$$-\frac{3}{8}a = \frac{5}{6}$$

$$-\frac{8}{3}\left(-\frac{3}{8}a\right) = -\frac{\cancel{8}^{4}}{3}\left(\frac{5}{\cancel{6}_{3}}\right)$$

$$a = -\frac{20}{9}$$

$$\text{Check: } -\frac{\cancel{3}^{1}}{\cancel{8}_{2}}\left(-\frac{\cancel{20}^{5}}{\cancel{9}_{3}}\right) \stackrel{?}{=} \frac{5}{6}$$

$$\frac{5}{6} = \frac{5}{6}$$

12. Solve the equation for t.

$$-\frac{7}{9}t = -\frac{5}{12}$$

$$-\frac{9}{7}\left(-\frac{7}{9}t\right) = -\frac{\cancel{9}^{3}}{7}\left(-\frac{5}{\cancel{12}_{4}}\right)$$

$$t = \frac{15}{28}$$

$$\text{Check: } -\frac{\cancel{7}^{1}}{\cancel{9}_{3}}\left(\frac{\cancel{15}^{5}}{\cancel{28}_{4}}\right) \stackrel{?}{=} -\frac{5}{12}$$

$$-\frac{5}{12} = -\frac{5}{12}$$

14. Solve the equation for t.

$$7t - 3t = 20 \qquad \text{Check: } 7(5) - 3(5) \stackrel{?}{=} 20$$

$$4t = 20 \qquad 35 - 15 \stackrel{?}{=} 20$$

$$\frac{4t}{4} = \frac{20}{4} \qquad 20 = 20$$

$$t = 5$$

16. Solve the equation for x.

$$3x + 5 = 11$$

$$\underline{-5} \quad \underline{-5}$$

$$3x + 0 = 6$$

$$3x = 6$$

$$\frac{3x}{3} = \frac{6}{3}$$

$$x = 2$$

$$\text{Check: } 3(2) + 5 \stackrel{?}{=} 11$$

$$6 + 5 = 11$$

18. Solve the equation for x.

$$3x - 8 = 10$$

$$\underline{+8} \quad \underline{+8}$$

$$3x + 0 = 18$$

$$3x = 18$$

$$\frac{3x}{3} = \frac{18}{3}$$

$$x = 6$$

$$\text{Check: } 3(6) - 8 \stackrel{?}{=} 10$$

$$18 - 8 \stackrel{?}{=} 10$$

$$10 = 10$$

20. Solve the equation for x.

$$3x + 9 = -6$$

$$\underline{-9} \quad \underline{-9}$$

$$3x + 0 = -15$$

$$3x = -15$$

$$\frac{3x}{3} = -\frac{15}{3}$$

$$x = -5$$

$$\text{Check: } 3(-5) + 9 \stackrel{?}{=} -6$$

$$-15 + 9 \stackrel{?}{=} -6$$

$$-6 = -6$$

22. Solve the equation for y.

$$\begin{aligned} 1-7y &= -8 \\ \underline{-1} &\quad \underline{-1} \\ 0-7y &= -9 \\ -7y &= -9 \\ \frac{-7y}{-7} &= \frac{-9}{-7} \\ y &= \frac{9}{7} \end{aligned}$$

Check: $1-7\left(\frac{9}{7}\right) \stackrel{?}{=} -8$

$$\begin{aligned} 1-9 &\stackrel{?}{=} -8 \\ -8 &= -8 \end{aligned}$$

24. Solve the equation for x.

$$\begin{aligned} 7 &= \frac{3}{4}x+13 \\ \underline{-13} &\quad \underline{-13} \\ -6 &= \frac{3}{4}x \\ \frac{4}{3}(-6) &= \frac{4}{3}\left(\frac{3}{4}x\right) \\ \frac{-24}{3} &= x \\ -8 &= x \end{aligned}$$

Check: $7 \stackrel{?}{=} \frac{3}{4}(-8)+13$

$$\begin{aligned} 7 &\stackrel{?}{=} -6+13 \\ 7 &= 7 \end{aligned}$$

26. Solve the equation for x.

$$\begin{aligned} 4(5x+7) &= 28 \\ 20x+28 &= 28 \\ \underline{-28} &\quad \underline{-28} \\ 20x+0 &= 0 \\ 20x &= 0 \\ \frac{20x}{20} &= \frac{0}{20} \\ x &= 0 \end{aligned}$$

Check: $4(5(0)+7) \stackrel{?}{=} 28$

$$\begin{aligned} 4(0+7) &\stackrel{?}{=} 28 \\ 4(7) &\stackrel{?}{=} 28 \\ 28 &= 28 \end{aligned}$$

28. Solve the equation for n.

$$\begin{aligned} 4(n-3) &= -8 \\ 4n-12 &= -8 \\ \underline{+12} &\quad \underline{+12} \\ 4n+0 &= 4 \\ 4n &= 4 \\ \frac{4n}{4} &= \frac{4}{4} \\ n &= 1 \end{aligned}$$

Check: $4(1-3) \stackrel{?}{=} -8$

$$\begin{aligned} 4(-2) &\stackrel{?}{=} -8 \\ -8 &= -8 \end{aligned}$$

30. Solve the equation for c.

$$\begin{aligned} c+2c+3+4c &= 24 \\ 7c+3 &= 24 \\ \underline{-3} &\quad \underline{-3} \\ 7c+0 &= 21 \\ 7c &= 21 \\ \frac{7c}{7} &= \frac{21}{7} \\ c &= 3 \end{aligned}$$

Check: $3+2(3)+3+4(3) \stackrel{?}{=} 24$

$$\begin{aligned} 3+6+3+12 &\stackrel{?}{=} 24 \\ 24 &= 24 \end{aligned}$$

32. Solve the equation for x.

$$\begin{aligned} 2x-6(x+8) &= -12 \\ 2x-6x-48 &= -12 \\ -4x-48 &= -12 \\ \underline{+48} &\quad \underline{+48} \\ -4x+0 &= 36 \\ -4x &= 36 \\ \frac{-4x}{-4} &= \frac{36}{-4} \\ x &= -9 \end{aligned}$$

Check: $2(-9)-6(-9+8) \stackrel{?}{=} -12$

$$\begin{aligned} -18-6(-1) &\stackrel{?}{=} -12 \\ -18+6 &\stackrel{?}{=} -12 \\ -12 &= -12 \end{aligned}$$

34. Solve the equation for r.

$$\begin{aligned} 4(r-8)+2(r+3) &= -8 \\ 4r-32+2r+6 &= -8 \\ 6r-26 &= -8 \\ \underline{+26} \quad & \underline{+26} \\ 6r+0 &= 18 \\ 6r &= 18 \\ \frac{6r}{6} &= \frac{18}{6} \\ r &= 3 \end{aligned}$$

Check: $4(3-8)+2(3+3) \stackrel{?}{=} -8$

$$\begin{aligned} 4(-5)+2(6) &\stackrel{?}{=} -8 \\ -20+12 &\stackrel{?}{=} -8 \\ -8 &= -8 \end{aligned}$$

36. Solve the equation for t.

$$\begin{aligned} 10t+1 &= 6t+13 \\ \underline{-6t} \quad & \underline{-6t} \\ 4t+1 &= 0+13 \\ 4t+1 &= 13 \\ \underline{-1} \quad & \underline{-1} \\ 4t+0 &= 12 \\ 4t &= 12 \\ \frac{4t}{4} &= \frac{12}{4} \\ t &= 3 \end{aligned}$$

Check: $10(3)+1 \stackrel{?}{=} 6(3)+13$

$$\begin{aligned} 30+1 &\stackrel{?}{=} 18+13 \\ 31 &= 31 \end{aligned}$$

38. Solve the equation for m.

$$\begin{aligned} 9m+1 &= 3m-14 \\ \underline{-3m} \quad & \underline{-3m} \\ 6m+1 &= 0-14 \\ 6m+1 &= -14 \\ \underline{-1} \quad & \underline{-1} \\ 6m+0 &= -15 \\ 6m &= -15 \\ \frac{6m}{6} &= \frac{-15}{6} \\ m &= -\frac{15}{6} \\ m &= -\frac{5}{2} \end{aligned}$$

Check: $9\left(-\frac{5}{2}\right)+1 \stackrel{?}{=} 3\left(-\frac{5}{2}\right)-14$

$$\begin{aligned} -\frac{45}{2}+1 &\stackrel{?}{=} -\frac{15}{2}-14 \\ -\frac{45}{2}+\frac{2}{2} &\stackrel{?}{=} -\frac{15}{2}-\frac{28}{2} \\ -\frac{43}{2} &= -\frac{43}{2} \end{aligned}$$

40. Solve the equation for m.

$$\begin{aligned} 6-12m &= -20m+22 \\ \underline{+20m} \quad & \underline{+20m} \\ 6+8m &= 0+22 \\ 6+8m &= 22 \\ \underline{-6} \quad & \underline{-6} \\ 0+8m &= 16 \\ 8m &= 16 \\ \frac{8m}{8} &= \frac{16}{8} \\ m &= 2 \end{aligned}$$

Check: $6-12(2) \stackrel{?}{=} -20(2)+22$

$$\begin{aligned} 6-24 &\stackrel{?}{=} -40+22 \\ -18 &= -18 \end{aligned}$$

42. Solve the equation for b.

$$\begin{aligned}
-11b-5 &= -5b+23-10\\
-11b-5 &= -5b+13\\
\underline{+5b} &\quad \underline{+5b}\\
-6b-5 &= 0+13\\
-6b-5 &= 13\\
\underline{+5} &\quad \underline{+5}\\
-6b+0 &= 18\\
-6b &= 8\\
\frac{-6b}{-6} &= \frac{18}{-6}\\
b &= -3
\end{aligned}$$

Check:
$$\begin{aligned}
-11(-3)-5 &\overset{?}{=} -5(-3)+23-10\\
33-5 &\overset{?}{=} 15+13\\
28 &= 28
\end{aligned}$$

44. Solve the equation for b.

$$\begin{aligned}
17b-11b-17 &= -4b+13-5b\\
6b-17 &= -9b+13\\
\underline{+9b} &\quad \underline{+9b}\\
15b-17 &= 0+13\\
15b-17 &= 13\\
\underline{+17} &\quad \underline{+17}\\
15b+0 &= 30\\
15b &= 30\\
\frac{15b}{15} &= \frac{30}{15}\\
b &= 2
\end{aligned}$$

Check:
$$\begin{aligned}
17(2)-11(2)-17 &\overset{?}{=} -4(2)+13-5(2)\\
34-22-17 &\overset{?}{=} -8+13-10\\
12-17 &\overset{?}{=} 5-10\\
-5 &= -5
\end{aligned}$$

46. Solve the equation for r.

$$\begin{aligned}
12-6r-14 &= 9-4r-7-2r\\
-6r-2 &= -6r+2
\end{aligned}$$

The expressions on each side of the equation have the same variable term but different constant terms, so the equation is a contradiction and has no solution.

48. Solve the equation for x.

$$\begin{aligned}
2x+2(3x-4) &= -23+5x\\
2x+6x-8 &= -23+5x\\
8x-8 &= -23+5x\\
\underline{-5x} &\quad \underline{-5x}\\
3x-8 &= -23+0\\
3x-8 &= -23\\
\underline{+8} &\quad \underline{+8}\\
3x+0 &= -15\\
3x &= -15\\
\frac{3x}{3} &= \frac{-15}{3}\\
x &= -5
\end{aligned}$$

Check:
$$\begin{aligned}
2(-5)+2(3(-5)-4) &\overset{?}{=} -23+5(-5)\\
2(-5)+2(-15-4) &\overset{?}{=} -23-25\\
2(-5)+2(-19) &\overset{?}{=} -48\\
-10-38 &\overset{?}{=} -48\\
-48 &= -48
\end{aligned}$$

50. Solve the equation for m.

$$\begin{aligned} 2-(17-5m) &= 9m-(m+7) \\ 2-17+5m &= 9m-m-7 \\ -15+5m &= 8m-7 \\ \underline{-8m} & \quad \underline{-8m} \\ -15-3m &= 0-7 \\ -15-3m &= -7 \\ \underline{+15} & \quad \underline{+15} \\ 0-3m &= 8 \\ -3m &= 8 \\ \frac{-3m}{-3} &= \frac{8}{-3} \\ m &= -\frac{8}{3} \end{aligned}$$

Check:

$$\begin{aligned} 2-\left(17-5\left(-\frac{8}{3}\right)\right) &\stackrel{?}{=} 9\left(-\frac{8}{3}\right)-\left(-\frac{8}{3}+7\right) \\ 2-\left(17+\frac{40}{3}\right) &\stackrel{?}{=} -\frac{72}{3}-\left(-\frac{8}{3}+\frac{21}{3}\right) \\ 2-\left(\frac{51}{3}+\frac{40}{3}\right) &\stackrel{?}{=} -\frac{72}{3}-\frac{13}{3} \\ \frac{6}{3}-\left(\frac{91}{3}\right) &\stackrel{?}{=} -\frac{85}{3} \\ -\frac{85}{3} &= -\frac{85}{3} \end{aligned}$$

52. Solve the equation for z.

$$\begin{aligned} -6-(3z-2) &= 5z-4(2z+1) \\ -6-3z+2 &= 5z-8z-4 \\ -3z-4 &= -3z-4 \end{aligned}$$

Because the linear equation is an identity, every real number is a solution.

54. Solve the equation for k.

$$\begin{aligned} -4(k+4)+13(k-1) &= -3(k-2)+13 \\ -4k-16+13k-13 &= -3k+6+13 \\ 9k-29 &= -3k+19 \\ \underline{+3k} & \quad \underline{+3k} \\ 12k-29 &= 0+19 \\ 12k-29 &= 19 \\ \underline{+29} & \quad \underline{+29} \\ 12k+0 &= 48 \\ 12k &= 48 \\ \frac{12k}{12} &= \frac{48}{12} \\ k &= 4 \end{aligned}$$

Check:

$$\begin{aligned} -4(4+4)+13(4-1) &\stackrel{?}{=} -3(4-2)+13 \\ -4(8)+13(3) &\stackrel{?}{=} -3(2)+13 \\ -32+39 &\stackrel{?}{=} -6+13 \\ 7 &= 7 \end{aligned}$$

56. Solve the equation for x.

$$\begin{aligned} 4(2x-1)-3(x+5) &= 5(x-2)+7 \\ 8x-4-3x-15 &= 5x-10+7 \\ 5x-19 &= 5x-3 \end{aligned}$$

The expressions on each side of the equation have the same variable term but different constant terms, so the equation is a contradiction and has no solution.

58. Solve the equation for n.

$$\begin{aligned} \frac{2}{5}n-1 &= \frac{3}{2} \\ 10\left(\frac{2}{5}n-1\right) &= {}^{5}\cancel{10}\left(\frac{3}{\cancel{2}_{1}}\right) \\ {}^{2}\cancel{10}\cdot\frac{2}{\cancel{5}_{1}}n-10 &= 15 \\ 4n-10 &= 15 \\ \underline{+10} & \quad \underline{+10} \\ 4n+0 &= 25 \\ 4n &= 25 \\ \frac{4n}{4} &= \frac{25}{4} \\ n &= \frac{25}{4} \end{aligned}$$

Check:

$$\begin{aligned} \frac{2}{5}\left(\frac{25}{4}\right)-1 &\stackrel{?}{=} \frac{3}{2} \\ \frac{5}{2}-1 &\stackrel{?}{=} \frac{3}{2} \\ \frac{5}{2}-\frac{2}{2} &\stackrel{?}{=} \frac{3}{2} \\ \frac{3}{2} &= \frac{3}{2} \end{aligned}$$

60. Solve the equation for t.

$$-\frac{2}{5}t+1=\frac{3}{10}t-3$$

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

$$^{2}\cancel{10}\left(-\frac{2}{\cancel{5}_{1}}t\right)+10=\cancel{10}\cdot\frac{3}{\cancel{10}}t-30$$

$$-4t+10=3t-30$$

$$\underline{-3t}\qquad\underline{-3t}$$

$$-7t+10=0-30$$

$$-7t+10=-30$$

$$\underline{-10}\quad\underline{-10}$$

$$-7t+0=-40$$

$$-7t=-40$$

$$\frac{-7t}{-7}=\frac{-40}{-7}$$

$$t=\frac{40}{7}$$

Check: $-\frac{2}{\cancel{5}_{1}}\left(\frac{\cancel{40}^{8}}{7}\right)+1 \stackrel{?}{=} \frac{3}{\cancel{10}_{1}}\left(\frac{^{4}\cancel{40}}{7}\right)-3$

$$-\frac{16}{7}+1 \stackrel{?}{=} \frac{12}{7}-3$$

$$-\frac{16}{7}+\frac{7}{7} \stackrel{?}{=} \frac{12}{7}-\frac{21}{7}$$

$$-\frac{9}{7} = -\frac{9}{7}$$

62. Solve the equation for w.

$$\frac{7}{9}w-\frac{13}{6}=\frac{7}{2}w+\frac{5}{9}$$

$$18\left(\frac{7}{9}w-\frac{13}{6}\right)=18\left(\frac{7}{2}w+\frac{5}{9}\right)$$

$$^{2}\cancel{18}\cdot\frac{7}{\cancel{9}}w-{}^{3}\cancel{18}\cdot\frac{13}{\cancel{6}}={}^{9}\cancel{18}\cdot\frac{7}{\cancel{2}}w+{}^{2}\cancel{18}\cdot\frac{5}{\cancel{9}}$$

$$14w-39=63w+10$$

$$\underline{-63w}\qquad\underline{-63w}$$

$$-49w-39=0+10$$

$$-49w-39=10$$

$$\underline{+39}\quad\underline{+39}$$

$$-49w+0=49$$

$$-49w=49$$

$$\frac{-49w}{-49}=\frac{49}{-49}$$

$$w=-1$$

Check: $\frac{7}{9}(-1)-\frac{13}{6} \stackrel{?}{=} \frac{7}{2}(-1)+\frac{5}{9}$

$$-\frac{7}{9}-\frac{13}{6} \stackrel{?}{=} -\frac{7}{2}+\frac{5}{9}$$

$$-\frac{14}{18}-\frac{39}{18} \stackrel{?}{=} -\frac{63}{18}+\frac{10}{18}$$

$$-\frac{53}{18} = -\frac{53}{18}$$

64. Solve the equation for x.

$$\frac{2}{3}(x-4)=\frac{4}{3}+2x$$

$$3\left[\frac{2}{3}(x-4)\right]=3\left[\frac{4}{3}+2x\right]$$

$$\frac{\cancel{3}}{1}\cdot\frac{2}{\cancel{3}}(x-4)=\frac{\cancel{3}}{1}\cdot\frac{4}{\cancel{3}}+6x$$

$$2(x-4)=4+6x$$

$$2x-8=4+6x$$

$$\underline{-6x}\qquad\underline{-6x}$$

$$-4x-8=4+0$$

$$-4x-8=4$$

$$\underline{+8}\quad\underline{+8}$$

$$-4x+0=12$$

$$-4x=12$$

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

$$x=-3$$

Check: $\frac{2}{3}(-3-4) \stackrel{?}{=} \frac{4}{3}+2(-3)$

$$\frac{2}{3}(-7) \stackrel{?}{=} \frac{4}{3}-6$$

$$-\frac{14}{3} \stackrel{?}{=} \frac{4}{3}-\frac{18}{3}$$

$$-\frac{14}{3} = -\frac{14}{3}$$

66. Solve the equation for y.

$$\frac{1}{5}(y-3)=\frac{3}{10}(y+5)-\frac{2}{5}y$$
$$10\left[\frac{1}{5}(y-3)\right]=10\left[\frac{3}{10}(y+5)-\frac{2}{5}y\right]$$
$$\frac{\cancel{10}^{2}}{1}\cdot\frac{1}{\cancel{5}}(y-3)=\frac{\cancel{10}}{1}\cdot\frac{3}{\cancel{10}}(y+5)-\frac{\cancel{10}^{2}}{1}\cdot\frac{2}{\cancel{5}}y$$
$$2(y-3)=3(y+5)-4y$$
$$2y-6=3y+15-4y$$
$$2y-6=-y+15$$
$$\underline{+y}\qquad\underline{+y}$$
$$3y-6=0+15$$
$$3y-6=15$$
$$\underline{+6}\quad\underline{+6}$$
$$3y+0=21$$
$$3y=21$$
$$\frac{3y}{3}=\frac{21}{3}$$
$$y=7$$

Check: $\frac{1}{5}(7-3)\stackrel{?}{=}\frac{3}{10}(7+5)-\frac{2}{5}(7)$

$$\frac{1}{5}(4)\stackrel{?}{=}\frac{3}{10}(12)-\frac{14}{5}$$
$$\frac{4}{5}\stackrel{?}{=}\frac{18}{5}-\frac{14}{5}$$
$$\frac{4}{5}=\frac{4}{5}$$

68. Solve the equation for z.

$$-4.6z+2.2z=4.8$$
$$10(-4.6z+2.2z)=10(4.8)$$
$$-46z+22z=48$$
$$-24z=48$$
$$\frac{-24z}{-24}=\frac{48}{-24}$$
$$z=-2$$

Check: $-4.6(-2)+2.2(-2)\stackrel{?}{=}4.8$

$$9.2-4.4\stackrel{?}{=}4.8$$
$$4.8=4.8$$

70. Solve the equation for y.

$$4.2y-8.2+2.3y=0.9+6.5y-9.1$$
$$10(4.2y-8.2+2.3y)=10(0.9+6.5y-9.1)$$
$$42y-82+23y=9+65y-91$$
$$65y-82=65y-82$$

Because the linear equation is an identity, every real number is a solution.

72. Solve the equation for w.

$$0.6(w-12)=0.2w$$
$$0.6w-7.2=0.2w$$
$$10(0.6w-7.2)=10(0.2w)$$
$$6w-72=2w$$
$$\underline{-6w}\qquad\underline{-6a}$$
$$0-72=-4w$$
$$-72=-4w$$
$$\frac{-72}{-4}=\frac{-4w}{-4}$$
$$18=w$$

Check: $0.6(18-12)\stackrel{?}{=}0.2(18)$

$$0.6(6)\stackrel{?}{=}3.6$$
$$3.6=3.6$$

74. Solve the equation for x.

$$0.06(25)+0.27x=0.3(4+x)$$
$$100(.06(25)+0.27x)=100(0.3(4+x))$$
$$6(25)+27x=30(4+x)$$
$$150+27x=120+30x$$
$$\underline{-30x}\qquad\underline{-30x}$$
$$150-3x=120+0$$
$$150-3x=120$$
$$\underline{-150}\qquad\underline{-150}$$
$$0-3x=-30$$
$$-3x=-30$$
$$\frac{-3x}{-3}=\frac{-30}{-3}$$
$$x=10$$

Check: $0.06(25)+0.27(10)\stackrel{?}{=}0.3(4+10)$

$$1.5+2.7\stackrel{?}{=}0.3(14)$$
$$4.2=4.2$$

76. Solve the equation for t.

$$\begin{aligned}
0.5-(t-6) &= 10.4-0.4(1-t)\\
0.5-t+6 &= 10.4-0.4+0.4t\\
0.5-t+6 &= 10+0.4t\\
10(0.5-t+6) &= 10(10+0.4t)\\
5-10t+60 &= 100+4t\\
-10t+65 &= 100+4t\\
\underline{-4t} & \quad \underline{-4t}\\
-14t+65 &= 100+0\\
-14t+65 &= 100\\
\underline{-65} & \quad \underline{-65}\\
-14t+0 &= 35\\
-14t &= 35\\
\frac{-14t}{-14} &= \frac{35}{-14}\\
t &= -2.5
\end{aligned}$$

Check:

$$\begin{aligned}
0.5-(-2.5-6) &\stackrel{?}{=} 10.4-0.4(1-(-2.5))\\
0.5-(-8.5) &\stackrel{?}{=} 10.4-0.4(3.5)\\
0.5+8.5 &\stackrel{?}{=} 10.4-1.4\\
9 &= 9
\end{aligned}$$

78. Mistake: In the check, neglected to multiply 5 by 3 after dividing out 2.

Correct: $\frac{5}{2}$ is correct; the second to the last line of the check should be $15+1=-5+21$.

80. Mistake: Did not multiply 3 by 12.

$$\begin{aligned}
\frac{1}{2}n-3 &= \frac{2}{3}n+\frac{1}{4}\\
\frac{\overset{6}{\cancel{12}}}{1}\cdot\frac{1}{\cancel{2}}n-12\cdot 3 &= \frac{\overset{4}{\cancel{12}}}{1}\cdot\frac{2}{\cancel{3}}n+\frac{\overset{3}{\cancel{12}}}{1}\cdot\frac{1}{\cancel{4}}\\
6n-36 &= 8n+3\\
\underline{-6n} & \quad \underline{-6n}\\
0-36 &= 2n+3\\
\underline{-3} & \quad \underline{-3}\\
-39 &= 2n+0\\
\frac{-39}{2} &= \frac{2n}{2}\\
-\frac{39}{2} &= n
\end{aligned}$$

Correct: $-\frac{39}{2}$

82. Let h be the crate's height. Since there are two types of units, convert all the units to feet:

5 feet, 4 inches is $5\frac{4}{12}=5\frac{1}{3}$ ft.

$$\begin{aligned}
V &= lwh\\
128 &= \left(5\frac{1}{3}\right)(6)h\\
128 &= 32h\\
\frac{128}{32} &= \frac{32h}{32}\\
4 &= h
\end{aligned}$$

The height of the crate must be 4 feet.

84. Substitute 76.8 for V and 6.4 for A, then solve for h.

$$\begin{aligned}
V &= \frac{1}{3}Ah\\
76.8 &= \frac{1}{3}(6.4)h\\
3\cdot 76.8 &= 3\cdot\left(\frac{1}{3}(6.4)h\right)\\
230.4 &= 6.4h\\
10\cdot(230.4) &= 10\cdot(6.4h)\\
2304 &= 64h\\
\frac{2304}{64} &= \frac{64h}{64}\\
36 &= h
\end{aligned}$$

The height is 36 inches.

86. Let w be the width of the building and $w + 16$ be the length of the building.

$$\begin{aligned}
P &= 2l+2w\\
241 &= 2(w+16)+2w\\
241 &= 2w+32+2w\\
241 &= 4w+32\\
\underline{-32} & \quad \underline{-32}\\
209 &= 4w+0\\
209 &= 4w\\
\frac{209}{4} &= \frac{4w}{4}\\
52.25 &= w
\end{aligned}$$

The width of the building is 52.25 ft. and the length is 52.25 + 16 = 68.25 ft.

88. Substitute 1008 for A, 24 for h, and 48 for b. Solve for a.

$$A = \frac{1}{2}h(a+b)$$
$$1008 = \frac{1}{2}(24)(a+48)$$
$$1008 = 12(a+48)$$
$$1008 = 12a + 576$$
$$\underline{-576} \qquad \underline{-576}$$
$$432 = 12a + 0$$
$$432 = 12a$$
$$\frac{432}{12} = \frac{12a}{12}$$
$$36 = a$$

The length of side a is 36 inches.

90. Substitute 1992 for SA, 22 for l, and 18 for w. Then solve for h.

$$SA = 2lw + 2lh + 2wh$$
$$1992 = 2 \cdot 22 \cdot 18 + 2 \cdot 22 \cdot h + 2 \cdot 18 \cdot h$$
$$1992 = 792 + 44h + 36h$$
$$1992 = 792 + 80h$$
$$\underline{-792} \qquad \underline{-792}$$
$$1200 = 0 + 80h$$
$$1200 = 80h$$
$$\frac{1200}{80} = \frac{80h}{80}$$
$$15 = h$$

The height will be 15 in.

92. Substitute 26.4 for C. Then solve for d.

$$C = \pi d$$
$$26.4 = \pi d$$
$$\frac{26.4}{\pi} = \frac{\pi d}{\pi}$$
$$\frac{26.4}{\pi} = d$$
$$8.4 \approx d$$

The diameter is approximately 8.4 m.

94. Since we are given the diameter, we must first find the radius. Since the radius is half the diameter, the radius is 3 cm. Substitute 355 for V and 3 for r. Then solve for h.

$$V = \pi r^2 h$$
$$355 = \pi(3)^2 h$$
$$355 = 9\pi h$$
$$\frac{355}{9\pi} = \frac{9\pi h}{9\pi}$$
$$\frac{355}{9\pi} = h$$
$$12.6 \approx h$$

The height of the liquid inside the can is about 12.6 cm.

96. By looking at the figure, we can see that

$$a + 7 = 12$$
$$\underline{-7} \quad \underline{-7}$$
$$a + 0 = 5$$
$$a = 5$$

We can also see that

$$a + 8 + a = c$$
$$2a + 8 = c$$
$$2(5) + 8 = c$$
$$10 + 8 = c$$
$$18 = c$$

Also, because the area of the figure is 192 square inches, we have

$$A = 12c - 8b$$
$$192 = 12(18) - 8b$$
$$192 = 216 - 8b$$
$$\underline{-216} \quad \underline{-216}$$
$$-24 = 0 - 8b$$
$$-24 = -8b$$
$$\frac{-24}{-8} = \frac{-8b}{-8}$$
$$3 = b$$

Therefore, $a = 5$ inches, $b = 3$ inches, $c = 18$ inches, and $a + 7 = 12$ inches.

98. Substitute 15 for V and 2.5 for i. Then solve for R.

$$V = iR$$
$$15 = 2.5R$$
$$\frac{15}{2.5} = \frac{2.5R}{2.5}$$
$$6\ \Omega = R$$

100. Substitute -9.8 for a and -44.1 for F. Then solve for m.

$$F = ma$$
$$-44.1 = m(-9.8)$$
$$\frac{-44.1}{-9.8} = \frac{-9.8m}{-9.8}$$
$$4.5 \text{ kg} = m$$

102. Substitute -160 for F and -32.2 for a. Then solve for m.

$$F = ma$$
$$-160 = m(-32.2)$$
$$\frac{-160}{-32.2} = \frac{-32.2m}{-32.2}$$
$$4.97 \text{ slugs} \approx m$$

104. Substitute 4 for t and 9.8 for g. Solve for V.

$$t = \frac{V}{g}$$
$$4 = \frac{V}{9.8}$$
$$4 \cdot (9.8) = \frac{V}{9.8} \cdot (9.8)$$
$$39.2 = V$$

The velocity is 39.2 m/sec.

106. Since Laura has 100 free miles, we must subtract that amount from her total miles: $421 - 100 = 321$. She will be charged for 321 miles. Substitute 321 for m.

$$C = 0.27(321) + 200$$
$$C = 86.67 + 200$$
$$C = 286.67$$

The total cost is \$286.67

108. Substitute 82.4 for F and solve for C.

$$F = \frac{9}{5}C + 32$$
$$82.4 = \frac{9}{5}C + 32$$
$$5(82.4) = 5\left(\frac{9}{5}C + 32\right)$$
$$412 = 9C + 160$$
$$\underline{-160} \qquad \underline{-160}$$
$$252 = 9C + 0$$
$$252 = 9C$$
$$\frac{252}{9} = \frac{9C}{9}$$
$$28 = C$$

The temperature is $28°$ C.

Exercise Set 2.4

2. Solve for a.

$$x = a + 3y$$
$$\underline{-3y} \qquad \underline{-3y}$$
$$x - 3y = a + 0$$
$$x - 3y = a$$

4. Solve for n.

$$2n = a$$
$$\frac{2n}{2} = \frac{a}{2}$$
$$n = \frac{a}{2}$$

6. Solve for m.

$$3m + b = y$$
$$\underline{-b} \quad \underline{-b}$$
$$3m + 0 = y - b$$
$$3m = y - b$$
$$\frac{3m}{3} = \frac{y - b}{3}$$
$$m = \frac{y - b}{3}$$

8. Solve for b.

$$ab + c = d$$
$$\underline{-c} \quad \underline{-c}$$
$$ab + 0 = d - c$$
$$ab = d - c$$
$$\frac{ab}{a} = \frac{d - c}{a}$$
$$b = \frac{d - c}{a}$$

10. Solve for w.

$$19 = 2l + 2w$$
$$\underline{-2l} \quad \underline{-2l}$$
$$19 - 2l = 0 + 2w$$
$$19 - 2l = 2w$$
$$\frac{19 - 2l}{2} = \frac{2w}{2}$$
$$\frac{19 - 2l}{2} = w$$

12. Solve for p.

$$q = \frac{rs}{2} - p$$
$$\underline{-\frac{rs}{2} \quad -\frac{rs}{2}}$$
$$q - \frac{rs}{2} = 0 - p$$
$$q - \frac{rs}{2} = -p$$
$$-1\left(q - \frac{rs}{2}\right) = -1(-p)$$
$$-q + \frac{rs}{2} = p$$
$$\frac{rs}{2} - q = p$$

14. Solve for a.

$$5(2n + a) = bn - c$$
$$10n + 5a = bn - c$$
$$\underline{-10n \qquad -10n}$$
$$0 + 5a = bn - c - 10n$$
$$5a = bn - c - 10n$$
$$\frac{5a}{5} = \frac{bn - c - 10n}{5}$$
$$a = \frac{bn - c - 10n}{5}$$

16. Solve for a.

$$\frac{a}{4} + \frac{b}{6} = 3$$
$$12\left(\frac{a}{4} + \frac{b}{6}\right) = 12(3)$$
$$3a + 2b = 36$$
$$\underline{-2b \quad -2b}$$
$$3a + 0 = 36 - 2b$$
$$3a = 36 - 2b$$
$$\frac{3a}{3} = \frac{36 - 2b}{3}$$
$$a = \frac{36 - 2b}{3}$$

18. Solve for m.

$$\frac{x}{6} + 5y = \frac{m}{n}$$
$$n\left(\frac{x}{6} + 5y\right) = n \cdot \frac{m}{n}$$
$$n\left(\frac{x}{6} + 5y\right) = m$$

20. Solve for M.

$$S = \frac{C}{1 - M}$$
$$(1 - M)S = \frac{C}{(1 - M)}(1 - M)$$
$$S - SM = C$$
$$\underline{-S \qquad -S}$$
$$0 - SM = C - S$$
$$-SM = C - S$$
$$\frac{-SM}{-S} = \frac{C - S}{-S}$$
$$M = \frac{S - C}{S}$$

22. Solve for b.

$$a + b + c = 180$$
$$\underline{-a \qquad -a}$$
$$0 + b + c = 180 - a$$
$$b + c = 180 - a$$
$$\underline{-c \quad -c}$$
$$b + 0 = 180 - a - c$$
$$b = 180 - a - c$$

24. Solve for r.

$$C = 2\pi r$$
$$\frac{C}{2\pi} = \frac{2\pi r}{2\pi}$$
$$\frac{C}{2\pi} = r$$

26. Solve for b.

$$\frac{A}{b} = h$$
$$b \cdot \frac{A}{b} = b \cdot h$$
$$A = bh$$
$$\frac{A}{h} = \frac{bh}{h}$$
$$\frac{A}{h} = b$$

28. Solve for r^3.

$$V = \frac{4}{3}\pi r^3$$
$$3 \cdot V = 3 \cdot \frac{4}{3}\pi r^3$$
$$3V = 4\pi r^3$$
$$\frac{3V}{4\pi} = \frac{4\pi r^3}{4\pi}$$
$$\frac{3V}{4\pi} = r^3$$

30. Solve for t^2.

$$S = \frac{1}{2}gt^2$$
$$2 \cdot S = 2 \cdot \frac{1}{2}gt^2$$
$$2S = gt^2$$
$$\frac{2S}{g} = \frac{gt^2}{g}$$
$$\frac{2S}{g} = t^2$$

32. Solve for h.

$$S = 2\pi r^2 - 2\pi rh$$
$$\underline{-2\pi r^2} \quad \underline{-2\pi r^2}$$
$$S - 2\pi r^2 = 0 - 2\pi rh$$
$$S - 2\pi r^2 = -2\pi rh$$
$$\frac{S - 2\pi r^2}{-2\pi r} = \frac{-2\pi rh}{-2\pi r}$$
$$\frac{S - 2\pi r^2}{-2\pi r} = h$$

or $h = \dfrac{2\pi r^2 - S}{2\pi r}$

34. Solve for b.

$$A = \frac{h}{2}(a+b)$$
$$2 \cdot A = 2 \cdot \frac{h}{2}(a+b)$$
$$2A = h(a+b)$$
$$2A = ah + bh$$
$$\underline{-ah} \quad \underline{-ah}$$
$$2A - ah = 0 + bh$$
$$2A - ah = bh$$
$$\frac{2A - ah}{h} = \frac{bh}{h}$$
$$\frac{2A - ah}{h} = b$$

36. Solve for r^2.

$$V = h\left(\pi r^2 + lw\right)$$
$$V = \pi r^2 h + lwh$$
$$\underline{-lwh} \quad \underline{-lwh}$$
$$V - lwh = \pi r^2 h + 0$$
$$V - lwh = \pi r^2 h$$
$$\frac{V - lwh}{\pi h} = \frac{\pi r^2 h}{\pi h}$$
$$\frac{V - lwh}{\pi h} = r^2$$

38. Solve for R.

$$P = R - C$$
$$\underline{+C} = \quad \underline{+C}$$
$$P + C = R + 0$$
$$P + C = R$$

40. Solve for t.

$$I = Prt$$
$$\frac{I}{Pr} = \frac{Prt}{Pr}$$
$$\frac{I}{Pr} = t$$

42. Solve for n.

$$P = \frac{C}{n}$$
$$n \cdot P = n \cdot \frac{C}{n}$$
$$nP = C$$
$$\frac{nP}{P} = \frac{C}{P}$$
$$n = \frac{C}{P}$$

44. Solve for t.

$$A = P + Prt$$
$$\underline{-P} \quad \underline{-P}$$
$$A - P = 0 + Prt$$
$$A - P = Prt$$
$$\frac{A-P}{Pr} = \frac{Prt}{Pr}$$
$$\frac{A-P}{Pr} = t$$

46. Solve for m.

$$F = ma$$
$$\frac{F}{a} = \frac{ma}{a}$$
$$\frac{F}{a} = m$$

48. Solve for k.

$$V = kT$$
$$\frac{V}{T} = \frac{kT}{T}$$
$$\frac{V}{T} = k$$

50. Solve for V.

$$D = \frac{M}{V}$$
$$V \cdot D = V \cdot \frac{M}{V}$$
$$VD = M$$
$$\frac{VD}{D} = \frac{M}{D}$$
$$V = \frac{M}{D}$$

52. Solve for v.

$$x = x_0 + vt$$
$$\underline{-x_0} \quad \underline{-x_0}$$
$$x - x_0 = 0 + vt$$
$$x - x_0 = vt$$
$$\frac{x - x_0}{t} = \frac{vt}{t}$$
$$\frac{x - x_0}{t} = v$$

54. Solve for F.

$$C = \frac{5}{9}(F - 32)$$
$$\frac{9}{5} \cdot C = \frac{9}{5} \cdot \frac{5}{9}(F - 32)$$
$$\frac{9}{5}C = F - 32$$
$$\underline{+32} \qquad \underline{+32}$$
$$\frac{9}{5}C + 32 = F + 0$$
$$\frac{9}{5}C + 32 = F$$

56. Solve for k.

$$F = \frac{kMn}{d^2}$$
$$F \cdot d^2 = \frac{kMn}{d^2} \cdot d^2$$
$$Fd^2 = kMn$$
$$\frac{Fd^2}{Mn} = \frac{kMn}{Mn}$$
$$\frac{Fd^2}{Mn} = k$$

58. Mistake: Applied the multiplication principle incorrectly, multiplying the left side by $\frac{1}{k}$ (which is correct) but the right side by $\frac{k}{1}$ (which is a different amount).

Correct: $t = \frac{4r}{k}$

60. Mistake: Did not distribute 7 to multiply -5.

Correct: $y = \frac{xv + 35}{7}$

Exercise Set 2.5

2. Translate and solve.
$$\begin{aligned} p+6 &= -2 \\ \underline{-6} \quad & \underline{-6} \\ p+0 &= -8 \\ p &= -8 \end{aligned}$$

4. Let w be the number.
$$\begin{aligned} w-18 &= -3 \\ \underline{+18} \quad & \underline{+18} \\ w+0 &= 15 \\ w &= 15 \end{aligned}$$

6. Translate and solve.
$$\begin{aligned} -3z &= -18 \\ \frac{-3z}{-3} &= \frac{-18}{-3} \\ z &= 6 \end{aligned}$$

8. Let k be the number.
$$\begin{aligned} \frac{k}{-6.5} &= 4.2 \\ -6.5 \cdot \frac{k}{-6.5} &= -6.5 \cdot 4.2 \\ k &= -27.3 \end{aligned}$$

10. Let x be the number.
$$\begin{aligned} \frac{3}{7}x &= -\frac{9}{8} \\ \frac{\cancel{7}}{\cancel{3}}\left(\frac{\cancel{3}}{\cancel{7}}x\right) &= \frac{7}{1\cancel{3}}\left(-\frac{\cancel{9}^{3}}{8}\right) \\ x &= -\frac{21}{8} \end{aligned}$$

12. Let p be the number.
$$\begin{aligned} 19+3p &= 100 \\ \underline{-19} \quad & \underline{-19} \\ 0+3p &= 81 \\ 3p &= 81 \\ \frac{3p}{3} &= \frac{81}{3} \\ p &= 27 \end{aligned}$$

14. Let r be the number.
$$\begin{aligned} 4r-25 &= 11 \\ \underline{+25} \quad & \underline{+25} \\ 4r+0 &= 36 \\ 4r &= 36 \\ \frac{4r}{4} &= \frac{36}{4} \\ r &= 9 \end{aligned}$$

16. Let x be the number.
$$\begin{aligned} 4(x+3) &= 16 \\ 4x+12 &= 16 \\ \underline{-12} \quad & \underline{-12} \\ 4x+0 &= 4 \\ 4x &= 4 \\ \frac{4x}{4} &= \frac{4}{4} \\ x &= 1 \end{aligned}$$

18. Translate and solve.
$$\begin{aligned} 3(x-5) &= -15 \\ 3x-15 &= -15 \\ \underline{+15} \quad & \underline{+15} \\ 3x+0 &= 0 \\ 3x &= 0 \\ \frac{3x}{3} &= \frac{0}{3} \\ x &= 0 \end{aligned}$$

20. Let h be the number.
$$\begin{aligned} \frac{1}{2}(h-2) &= 4 \\ 2 \cdot \frac{1}{2}(h-2) &= 2 \cdot 4 \\ h-2 &= 8 \\ \underline{+2} \quad & \underline{+2} \\ h+0 &= 10 \\ h &= 10 \end{aligned}$$

22. Let x be the number.

$$\begin{aligned} 4x+5 &= x-7 \\ \underline{-x} &\quad \underline{-x} \\ 3x+5 &= 0-7 \\ 3x+5 &= -7 \\ \underline{-5} &\quad \underline{-5} \\ 3x+0 &= -12 \\ 3x &= -12 \\ \frac{3x}{3} &= \frac{-12}{3} \\ x &= -4 \end{aligned}$$

24. Let x be the number.

$$\begin{aligned} \frac{x}{5}-2 &= 6 \\ 5\left(\frac{x}{5}-2\right) &= 5\cdot 6 \\ x-10 &= 30 \\ \underline{+10} &\quad \underline{+10} \\ x+0 &= 40 \\ x &= 40 \end{aligned}$$

26. Let x be the number.

$$\begin{aligned} 4x-7(x+6) &= -21 \\ 4x-7x-42 &= -21 \\ -3x-42 &= -21 \\ \underline{+42} &\quad \underline{+42} \\ -3x+0 &= 21 \\ -3x &= 21 \\ \frac{-3x}{-3} &= \frac{21}{-3} \\ x &= -7 \end{aligned}$$

28. Let x be the number.

$$\begin{aligned} (x+6)+(3x-4) &= 14 \\ x+6+3x-4 &= 14 \\ 4x+2 &= 14 \\ \underline{-2} &\quad \underline{-2} \\ 4x+0 &= 12 \\ 4x &= 12 \\ \frac{4x}{4} &= \frac{12}{4} \\ x &= 3 \end{aligned}$$

30. Let x be the number.

$$\begin{aligned} 3\left(x+\frac{2}{5}\right) &= -2x-\frac{4}{5} \\ 3x+\frac{6}{5} &= -2x-\frac{4}{5} \\ 5\left(3x+\frac{6}{5}\right) &= 5\left(-2x-\frac{4}{5}\right) \\ 15x+6 &= -10x-4 \\ \underline{+10x} &\quad \underline{+10x} \\ 25x+6 &= 0-4 \\ 25x+6 &= -4 \\ \underline{-6} &\quad \underline{-6} \\ 25x+0 &= -10 \\ 25x &= -10 \\ \frac{25x}{25} &= \frac{-10}{25} \\ x &= -\frac{2}{5} \end{aligned}$$

32. Let x be the number.

$$\begin{aligned} 3x-6 &= 14-2x \\ \underline{+6} &\quad \underline{+6} \\ 3x+0 &= 20-2x \\ 3x &= 20-2x \\ \underline{+2x} &\quad \underline{+2x} \\ 5x &= 20+0 \\ 5x &= 20 \\ \frac{5x}{5} &= \frac{20}{5} \\ x &= 4 \end{aligned}$$

34. Let p be the number.

$$\begin{aligned} \frac{1}{3}p &= \frac{1}{2}p-1 \\ 6\left(\frac{1}{3}p\right) &= 6\left(\frac{1}{2}p-1\right) \\ 2p &= 3p-6 \\ \underline{-3p} &\quad \underline{-3p} \\ -p &= 0-6 \\ -p &= -6 \\ \frac{-p}{-1} &= \frac{-6}{-1} \\ p &= 6 \end{aligned}$$

36. Let x be the number.

$$\frac{x+1}{2}=\frac{2x+6}{8}$$
$$\cancel{8}^{4}\left(\frac{x+1}{\cancel{2}_{1}}\right)=\cancel{8}^{1}\left(\frac{2x+6}{\cancel{8}_{1}}\right)$$
$$4(x+1)=2x+6$$
$$4x+4=2x+6$$
$$\underline{-2x}\qquad\underline{-2x}$$
$$2x+4=0+6$$
$$2x+4=6$$
$$\underline{-4}\quad\underline{-4}$$
$$2x+0=2$$
$$2x=2$$
$$\frac{2x}{2}=\frac{2}{2}$$
$$x=1$$

38. Let t be the number.

$$-2(1-3t)=5(1-t)+4$$
$$-2+6t=5-5t+4$$
$$-2+6t=9-5t$$
$$\underline{+5t}\qquad\underline{+5t}$$
$$-2+11t=9+0$$
$$-2+11t=9$$
$$\underline{+2}\qquad\underline{+2}$$
$$0+11t=11$$
$$11t=11$$
$$\frac{11t}{11}=\frac{11}{11}$$
$$t=1$$

40. Negative three times a number plus eight is the same as ten.

42. Eight times the difference of a number and two will yield three times the number.

44. Half of the sum of a number and one is one-third the difference of the number and five.

46. Five-hundredths of a number added to three-hundredths of the difference of the number and four and five-tenths is equal to four hundred sixty-five thousandths.

48. The sum of one-half, one-third, and one-sixth of the same number will equal five.

50. Mistake: Division translated in reverse order.
Correct: $n\div 12=-8$

52. Mistake: "three subtracted from" indicates that the 3 should be after the minus sign.
Correct: $9(y+8)=y-3$

54. Mistake: "difference" was translated in reverse order.
Correct: $4(y+2)=y-(y-7)$

56. Translation: $SA=2(lw+lh+wh)$

a) $SA=2(15\cdot 6+15\cdot 4+6\cdot 4)$
$SA=2(90+60+24)$
$SA=2(174)$
$SA=348\text{ in.}^2$

b) $SA=2(9.2\cdot 12+9.2\cdot 6.5+12\cdot 6.5)$
$SA=2(110.4+59.8+78)$
$SA=2(248.2)$
$SA=496.4\text{ cm}^2$
$SA=2\left(8\cdot 2\frac{1}{2}+8\cdot 3+2\frac{1}{2}\cdot 3\right)$
$SA=2\left(8\cdot\frac{5}{2}+8\cdot 3+\frac{5}{2}\cdot 3\right)$
$SA=2\left(\cancel{8}^{4}\cdot\frac{5}{\cancel{2}}+8\cdot 3+\frac{15}{2}\right)$
$SA=2\left(20+24+\frac{15}{2}\right)$

c) $SA=2\left(44+\frac{15}{2}\right)$
$SA=88+15$
$SA=103\text{ ft.}^2$