Solution Manual for Basic College Mathematics 12th Edition by Bittinger Beecher Johnson ISBN 0321931912 9780321931917

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Chapter 11

Algebra: Solving Equations and Problems

~~ExerciseSet11.1~~

RC2. $3q = 3 \times q$, so multiplication is involved.

RC4. $\frac{3}{q} = 3 \div q$, so division is involved.

$9t = 9 \cdot 8 =$

$\frac{18}{6} =$

$n3$

6. $\frac{5y}{3z} \cdot \frac{5(-15)}{z} = \frac{-75}{-25} =$

$p \cdot \frac{q}{14} = \frac{17 - 3}{2} =$

$= 7$

10. $ba = 4(-5) =$

-20

12. $5(a + b) = 5(16 + 6) = 5 \cdot 22 = 110$

$7a - 5b$

$38x + 14$

$11 - 92d$, or $-92d + 11$

$-4t$

$9t$

$-3m + 4$

$3x + y + 2$

66. $12y - \frac{9}{13}$

68. $2a + 5b - 3a - 10b - 42$

$= 2a + 3a + 5b - 10b - 42$

$5a + 5b = 5 \cdot 16 + 5 \cdot 6 = 80 + 30 = 110$

14. $5(a - b) = 5(16 - 6) = 5 \cdot 10 = 5a - 5b = 5 \cdot 16 - 5 \cdot 6 = 80 - 30 = 50$

16. $4x + 12$

18. $4(1 - y) = 4 \cdot 1 - 4 \cdot y = 4 - 4y$

6 − 6 10 − 10 −

20. 54m + 63

20x + 32 + 12p

−9y + 63

14x + 35y − 63

$\frac{3}{5}$

$\frac{1}{3}b - 42$

$= 6a +$

$\frac{1}{10}$

$\frac{3}{5}$

$\frac{4}{16}$

28. $5x - 2y - 5z$

30. $8.82x + 9.03y + 4.62$

$5(y + 4)$

$7(x + 4)$

$6(3a + 4b)$

$9(a + 3b + 9)$

$10(x - 5)$

$6(4 - m)$

$3(3a + 2b - 5)$

$-7(2x - 3y - 1)$, or $7(-2x + 3y + 1)$

48. $17x$

$-9x$

.

$= \frac{3}{-42}a + b$

$2.6a + 1.4b$

$d = 2 \cdot 8.2 \text{ m} = 16.4 \text{ m}$

$C \approx 2 \cdot 3.14 \cdot 8.2 \text{ m} \approx 51.496 \text{ m}$

$\approx 3.14 \cdot 8.2 \text{ m} \cdot 8.2 \text{ m} \approx 211.1336 \text{ m}^2$

$d = 2 \cdot 2400 \text{ cm} = 4800 \text{ cm}$

$\approx 2 \cdot 3.14 \cdot 2400 \text{ cm} \approx 15,072 \text{ cm}$

$\approx 3.14 \cdot 2400 \text{ cm} \cdot 2400 \text{ cm} \approx 18,086,400 \text{ cm}^2$

$r = \frac{264 \text{ km}}{2} =$ k m

$C \approx 3.14 \cdot 264 \text{ km} \approx 828.96 \text{ km}$

$A \approx 3.14 \cdot 132 \text{ km} \cdot 132 \text{ km} \approx 54,711.36 \text{ km}^2$

$r = \frac{10.3 \text{ m}}{2} = 5.15 \text{ m}$

$C \approx 3.14 \cdot 10.3 \text{ m} \approx 32.342 \text{ m}$

$A \approx 3.14 \cdot 5.15 \text{ m} \cdot 5.15 \text{ m} \approx 83.28065 \text{ m}^2$

$21x + 44xy + 15y - 16x - 8y - 38xy + 2y + xy$

$5x + 7xy + 9y$

Exercise Set 11.2

RC2. To solve the equation $3 + x = -15$, we would first subtract 3 on both sides. The correct choice is (c).

RC4. To solve the equation $x + 4 = 3$, we would first add -4 on both sides. The correct choice is (a).

2. 7

4. -14

6. 29

8. 4

10. 6

12. -22

14. -42

16. -26

18. 11

20. 17

22. -6

24. -11

26. 16

28. 24

30. -15

32. 4

34. $x + \frac{2}{5} = \frac{3}{9}$

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

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

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

46. $5\frac{1}{4} = \frac{2}{3} 4\frac{3}{8} + x$

$5\frac{3}{12} - 4\frac{8}{12} = x$

$4\frac{15}{12} - 4\frac{12}{12} = x$

$\frac{7}{12} = x$

48. $12\frac{1}{8}$

50. $-3 + 8 = -24$

52. -1.7

54. $-\frac{5}{3} - \frac{16}{8} = -\frac{15}{24} - \frac{24}{24} = -\frac{31}{24}$

56. $3.2 - (-4.9) = 3.2 + 4.9 = 8.1$

58. $-\frac{2}{3} \cdot \frac{5}{8} = -\frac{2 \cdot 5}{3 \cdot 8} = -\frac{10}{24} = -\frac{5}{12}$

60. -15.68

62. $-\frac{2}{3} \div \frac{5}{8} = -\frac{2}{3} \cdot \frac{8}{5} = -\frac{16}{15}$

64. -4.9

66. $-\frac{5}{16} + \frac{7}{20} = \frac{3}{14} x - \frac{4}{15}$

$-\frac{20}{20} + \frac{14}{20} + \frac{15}{20}$

$\frac{13}{20} = x$

68. $8 - 25 = 8 + x - 21$

$-17 = x -$

$-4 = x$

70. $x + x = x$

$2x = x$

$x = 0$

72. The distance of x from 0 is 5. Thus, $x = 5$ or $x = -5$.

36. $y - \frac{4}{10} = \frac{6}{9}$

$y = \frac{19}{12} + \frac{12}{12}$

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

38. $-\frac{\overline{8}}{} + y = -\frac{}{4}$

Exercise Set 11.3

RC2. To solve the equation $-6x = 12$, we would first divide

6 1

by −6 on both sides. The correct choice is (d).

$y = -8 + 8$

$y = -$ 5 8

40. 4.7

42. 17.8

44. −10.6

.

RC4. To solve the equation $\frac{1}{6}x = 12$, we would first multiply by 6 on both sides. The correct choice is (b).

13

7

9

−50

−9

−6

14. −7

16. −8

18. 8

20. 2

22. −88

24. 20

26. −54

28. $-\frac{8}{5}$

30. $\frac{5}{4}y = -\frac{2}{5}$

$\frac{15}{2} \cdot \frac{5}{2}y = -\frac{4}{15} \cdot \frac{5}{2}$

$y = -\frac{5 \cdot 2 \cdot 2}{2 \cdot 3 \cdot 2}$

$y = -\frac{2}{3}$

$-7x = -\frac{14}{5}$

$\frac{7}{7} \cdot \frac{10}{14}$

$-5 \cdot -7 \quad x = -\frac{5}{14}$

$x = \frac{7 \cdot 5 \cdot 2}{5 \cdot 2 \cdot 7}$

$x = 1$

34. −20

−2

8

40. $\frac{9}{7}$

$y = 12.06$

$\frac{7}{9} \quad 7$

48. $V = l \cdot w \cdot h = 1.3 \text{ cm} \times 10 \text{ cm} \times 2.4 \text{ cm} = 31.2 \text{ cm}^3$

50. $A = \frac{1}{2} \cdot 9 \text{ m} \cdot 8.5 \text{ m} = 38.25 \text{ m}^2$

52. $0 \cdot x = 0$ is true for all real numbers, so the solution is all real numbers.

54. $4|x| = 48$

$|x| = 12$

The distance of x from 0 is 12. Thus, $x = 12$ or $x = -12$.

56. To "undo" the last step, divide 22.5 by 0.3.

$22.5 \div 0.3 = 75$

Now divide 75 by 0.3.

$75 \div 0.3 = 250$

The answershould be 250 not 22.5.

Chapter 11 Mid-Chapter Review

1. False; $2(x + 3) = 2x + 3$, or $2x + 6 = 2x + 3$.

True; see page 629 in the text.

True; see page 630 in the text.

4. False; $-x = 4x$ is equivalent to $3 - x + x = 4x + x$, or $3 = 5x$, or $x = \frac{3}{5}$; 3 is equivalent to $x = \frac{3}{5}$.

$5x = -5$

$6x - 3y + 18 = 3 \cdot 2x - 3 \cdot y + 3 \cdot 6 = 3(2x - y + 6)$

$x + 5 = -3$

$+5 - 5 = -3$

5

$x + 0 = -8$

$x = -8$

$-6x = 42$

$\frac{-6x}{} = \frac{42}{}$

$- \ _9 \cdot - \ _7 y \quad = - \ \overline{9} \ \cdot$ -6 -6

(12.06)

$$y = -\frac{84.4}{\frac{2}{9}}$$

$$= -9.38$$

$$\frac{-x}{16} = -$$

$$8 \cdot \frac{-x}{8} = \mathbf{8}(-16)$$

$$-x = -128$$

$$x = 128$$

$$= 10$$

$$-3 \cdot \frac{m}{10} = -3 \cdot$$

$$m = -30$$

46. $C = \pi \cdot d \approx 3.14 \cdot 24$ cm = 75.36 cm

$$r = \frac{d}{2} = \frac{24}{2}\ \text{cm} = 12\ \text{cm}$$

$A = \pi \cdot r \cdot r \approx 3.14 \times 12$ cm $\times 12$ cm $= 452.16$ cm^2

.

$$1 \cdot x = -7$$

$$x = -7$$

$$4x = 4(-7) = -28$$

$$\frac{a}{8} = \frac{56}{8} = 7$$

10. $\frac{b}{m-n}$ $\frac{17-2}{3} = \frac{15}{3} = 5$

$= 3$

$3(x + 5) = 3 \cdot x + 3 \cdot 5 = 3x + 15$

$4(2y - 7) = 4 \cdot 2y - 4 \cdot 7 = 8y - 28$

$6(3x + 2y - 1) = 6 \cdot 3x + 6 \cdot 2y - 6 \cdot 1 = 18x + 2y - 6$

$-2(-3x - y + 8) = -2(-3x) - 2(-y) - 2 \cdot 8 = 6x + 2y - 16$

$3y + 21 = 3 \cdot y + 3 \cdot 7 = 3(y + 7)$

$5z + 45 = 5 \cdot z + 5 \cdot 9 = 5(z + 9)$

$9x - 36 = 9 \cdot x - 9 \cdot 4 = 9(x - 4)$

18. $24a - 8 = 8 \cdot 3a - 8 \cdot 1 = 8(3a - 1)$

19. $4x + 6y - 2 = 2 \cdot 2x + 2 \cdot 3y - 2 \cdot 1 = 2(2x + 3y - 1)$

20. $12x - 9y + 3 = 3 \cdot 4x - 3 \cdot 3y + 3 \cdot 1 = 3(4x - 3y + 1)$

21. $4a - 12b + 32 = 4 \cdot a - 4 \cdot 3b + 4 \cdot 8 = 4(a - 3b + 8)$

22. $30a - 18b - 24 = 6 \cdot 5a - 6 \cdot 3b - 6 \cdot 4 = 6(5a - 3b - 4)$

23. $7x + 8x = (7 + 8)x = 15x$

24. $3y - y = 3y - 1 \cdot y = (3 - 1)y = 2y$

−9

$(5 - 3)x + (-2 + 1)y + (6 - 9)$

$2x - y - 3$

6

$x + 5 = 11$

$+5 - 5 = 11$
$- 5$
$x = 6$

The solution is 6.

$x + 9 = -3$
$+9 - 9 = -3$
$- 9$
$= -12$

The solution is −12.

$8 = t + 1$
$8 - 1 = t + 1 - 1$
$= t$

The solution is 7.

$-7 = y + 3$
$-7 - 3 = y + 3 - 3$
$-10 = y$

The solution is −10.

$x - 6 = 14$
$-6 + 6 = 14 + 6$
$x = 20$

The solution is 20.

$y - 7 = -2$
$y - 7 + 7 = -2 + 7$
$y = 5$

34. $y + \frac{1}{3} = -\frac{1}{2}$

$y + \frac{1}{3} - \frac{1}{3} = -\frac{1}{2} - \frac{1}{3}$

$y = -\frac{2}{6} - \frac{3}{6}$

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

The solution $-\frac{5}{6}$.

35. $\frac{3}{2} + x = -\frac{3}{4}$

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

$x = -\frac{3}{4} - \frac{6}{4}$

$x = -\frac{9}{4}$

THe solution is $-\frac{9}{4}$.

4.6 = x + 3.9

$4.6 - 3.9 = x + -3.9$
3.9
$0.7 = x$

The solution is 0.7.

$-3.3 = -1.9$
t
$-3.3 + 1.9 = -1.9 + t + 1.9$
$-1.4 = t$

The solution is −1.4.

$7x = 42$

$\frac{7x}{7} = \frac{42}{7}$

$x = 6$

The solution is 6.

$144 = 12y$

$\frac{144}{12} = \frac{12y}{12}$

The solution is 5.

$3 + t = 10$
$3 + t - 3 = 10 - 3$

$12 = y$

The solution is 7.

$t = 7$

The solution is 7.

$-5 + x = 5$

$-5 + x + 5 = 5$

$= 10$

The solution is 10.

tion is 12.

$17 = -t$

$-1 \cdot 17 = -1(-t)$

$-17 = t$

The solution is -17.

41. $6x = -54$

$\frac{6x}{6} = \frac{-54}{6}$

$= -9$

The solution is -9.

$-5y = -85$

$\frac{-5y}{-5} = \frac{-85}{-5}$

$= 17$

The solution is 17.

$-8x =$

$$\frac{-8x}{48} =$$

-8

-8

$=$

-6

The solution is -6.

$\frac{2}{3}x = 12$

$\frac{3}{2}\cdot\frac{2}{3}x = \frac{3}{2}\cdot 12$

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

$=$

18

The solution is 18.

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

5

$5 \quad 1 \quad 5$

$-1 \quad 5 = -\cdot$

$t \quad 3 \; 1$

$t = -15$

The solution is -15.

$\frac{3}{4}x - = \frac{9}{8}$

$4 \quad 3 \quad 4$

$\frac{3}{4}\cdot\frac{4}{3}x = \frac{9}{8}\cdot\frac{3}{4}$

$x = \frac{36}{32}$

$x = \frac{24}{32}$

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

The solution is $\frac{3}{4}$.

$\frac{5}{2}\cdot\frac{2}{5} = \frac{25}{10}$

They are not equivalent. For example, let $a = 2$ and $b = 3$.

Then $(a + b)^2 = (2 + 3)^2 = 5^2 = 25$, but $a^2 + b^2 = 2^2 + 3^2 = 4 + 9 = 13$.

We use the distributive law when we collect like terms even though we might not always write this step.

52. The student probably added $\frac{1}{3}$ on both sides of the equation rather than adding $-\frac{1}{3}$ (or subtracting $\frac{1}{3}$) on both sides. The correct solution is -2.

53. The student apparently multiplied by $-\frac{3}{2}$ on both sides rather than dividing by $\frac{3}{2}$ on both sides. The correct solution is $-\frac{2}{3}$.

ExerciseSet11.4

RC2. The correct choice is (a).

RC4. The correct choice is (e).

$8x + 6 = 30$

$8x = 24$

$x = 3$

$8z + 7 = 79$

$8z = 72$

$z = 9$

$4x - 11 = 21$

$4x = 32$

$x = 8$

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$6t = -18$

$6x - 9 = 57$

$-\frac{6}{5}t = -\frac{5}{6} - \frac{6}{18}$

$\frac{6 \cdot 25}{5 \cdot 18} = \frac{6/5/\cdot 5}{\cdot 3 \cdot}$

$t = \frac{5}{3}$

$t = \frac{5}{3}$

The solution is $\frac{5}{3}$.

$1.8y = -5.4$

$\frac{1.8y}{1.8} = \frac{-5.4}{1.8}$

$y = -3$

The solution is -3.

$-y = 5\,7$

$7\frac{-y}{5} = 7$

$7 \cdot$

$-y = 35$

$-1(-y) = -1 \cdot 35$

$= -35$

The solution is -35.

$6x = 66$

$x = 11$

10. $5x + 4 = -41$

$5x = -45$

$x = -9$

12. $-91 = 9t + 8$

$-99 = 9t$

$-11 = t$

$-5x - 7 = 108$

$-5x = 115$

$x = -23$

$-6z - 18 = -132$ $-6z = -114$

$z = 19$

$4x + 5x = 45$

$9x = 45$

$= 5$

22. $6x + 19x =$

100

$25x = 100$

$x = 4$

24. $-4y - 8y =$

48

$-12y = 48$

$y = -4$

26. $-10y - 3y = -39$

$-13y =$

-39

$y = 3$

28. $6.8y - 2.4y =$

-88

$4.4y =$

-88

$y =$

-20

30. $\frac{1}{5}x + \frac{4}{5}x =$, LCM is 15

10

$5x + 4x =$

10

$4x = 10$

4

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

$x = 8$

32. $4x - 6 = 6x$

$-6 =$

$2x$

$-3 =$

x

34. $5y - 2 = 28 - y$

$6y = 30$

$y = 5$

36. $5x - 2 = 6 + x$

$4x = 8$

$x = 2$

38. $5y + 3 = 2y + 15$

$3y =$

48. $-\frac{3}{2} + x = \frac{5}{6} - \frac{4}{3}$, LCM is 6

$-9 + 6x = -5 - 8$

$-9 + 6x = -13$

$6x =$

-4

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

50. $\frac{1}{2} + 4m = 3 - m$, LCM is 2

2

$1 + 8m = 6m - 5$

$2m =$

-6

$m =$

-3

52. $\frac{2}{3}y - \frac{9}{5} = \frac{y}{3} - 2$

15

$10y = 3y + 9$

27

$10y - 3y = 9$

15

$7y =$

21

$y = 3$

54. $0.96y - 0.79 = 0.21y + 0.46$

$96y - 79 = 21y + 46$

$75y = 125$

$y = \frac{125}{75}$

$= \frac{5}{3}$

56. $1.7t + 8 - 1.62t = 0.4t - 0.32 + 8$

$170t + 800 - 162t = 40t - 32 + 800$

$8t + 800 = 40t + 768$

$-32t =$

-32

58. $\frac{5}{8}y - \frac{3}{16}y = 2 - \frac{1}{4}y$, LCM is 16

$16 + 4$

$3x = 30$

$x = 10$

12

$y = 4$

40. $10 - 3x = 2x - 8x + 40$

$10 - 3x = -6x + 40$

42. $5 + 4x - 7 = 4x - 2 - x$

$4x - 2 = 3x - 2$

$x = 0$

44. $5y - 7 + y = 7y + 21 - 5y$

$6y - 7 = 2y + 21$

$4y = 28$

$y = 7$

5*y* + 6*y* = 32 + 4*y*

7*y* = 32

$y = \frac{32}{7}$

60. $4(2y - 3) = 28$

$8y - 12 = 28$

$8y = 40$

$y = 5$

$9 = 3(5x - 2)$

$= 15x - 6$

$= 15x$

$= x$

$3(5 + 3m) - 8 = 88$

$15 + 9m - 8 = 88$

$7 + 9m = 88$

$9m = 81$

$m = 9$

$6b - (3b + 8) = 16$

$6b - 3b - 8 = 16$

$3b - 8 = 16$

$3b = 24$

$b = 8$

46. $\frac{7}{8}x - \frac{1}{4} = 1 + \frac{3}{16}x$, LCM is 16

$14x - 4 + 12x = 1 + 16x$

$26x - 4 = 1 + 16x$

$10x = 5$

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

68. $10 - 3(2x - 1) = 1$
$10 - 6x + 3 = 1$
$13 - 6x = 1$
$-6x = -12$
$x = 2$

70. $3(t - 2) = 9(t + 2)$
$3t - 6 = 9t + 18$
$-24 = 6t$
$-4 = t$

$7(5x - 2) = 6(6x - 1)$

$35x - 14 = 36x - 6$

$-8 = x$

74. $5(t + 3) + 9 = 3(t - 2) + 6$
$5t + 15 + 9 = 3t - 6 + 6$
$5t + 24 = 3t$
$24 = -2t$
$-12 = t$

76. $13 - (2c + 2) = 2(c + 2) + 3c$
$13 - 2c - 2 = 2c + 4 + 3c$
$11 - 2c = 5c + 4$
$7 = 7c$
$1 = c$

78. $0.9(2x + 8) = 20 - (x + 5)$
$1.8x + 7.2 = 20 - x - 5$
$18x + 72 = 200 - 10x - 50$
$18x + 72 = 150 - 10x$
$28x = 78$

$x = \frac{78}{28}$

$x = \frac{39}{14}$

$0.05y - 1.82 = 0.708y - 0.504$ $1000(0.05y - 1.82) = 1000(0.708y - 0.504)$
$50y - 1820 = 708y - 504$
$-1820 + 504 = 708y - 50y$
$-1316 = 658y$

$-\frac{658}{658} = y$

$-2 = y$

$\frac{2}{3} \quad \frac{7}{8} \qquad \frac{5}{8} \quad \frac{3}{8}$

96. $x \; 4 \qquad =$

$\frac{7}{24} \qquad \frac{5}{24} \qquad \frac{3}{24}$

=, LCM is 24

x

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$.8 - 4(b - 1) = 0.2 + 3(4 - b)$ $0.8 - 4b + 4 = 0.2 + 12 - 3b$ $8 - 40b + 40 = 2 + 120 - 30b$
$48 - 40b = 122 - 30b$
$-74 = 10b$ $-7.4 = b$

0.09% = 0.0009

1
2
−
3

−

8

8
1
4
−
6
4
x
−
1
5
=
9

$-1 - 64x = 9$

$-64x = 10$

$\frac{-64x}{} = \frac{10}{}$

$\frac{1}{0}$

$x = -\frac{64}{5}$

19

84. $\frac{7}{25} = \frac{}{100} = 76\%$

Move the decimal point 3 places to the left.

14.7 m = 0.0147 km

88. $90^\circ - 52^\circ = 38^\circ$

Let s = the new salary. Solve: $42, 100 - 6\% \cdot 42, 100 = s$ $s = \$39, 574$

$3x = 4x$

$0 =$

x

$x = -32$

Exercise Set 11.5

RC2. Translate to an equation.

RC4. Check yourpossible answerin the original problem.

Let x = the number; $\frac{3x}{}$. *a*

4. Let b = the number; $43\%b$, or $0.43b$

6. Let n = the number; $8n - 75$

Solve: $8n = 2552$ $n =$ 319

The numberis 319.

Let c = the numberof calories in a cup of whole milk.

Solve: $c - 89 = 60$

$c = 149$ calories

Solve: $5x - 36 = 374$

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82 The numberis 82.

3

Solve: $2y + 85 = y\,4$

$=$

-68

The original number is -68.

Let h = the height of the control tower at the Memphis airport, in feet.

Solve: $h + 59 = 385$

$h = 326$ ft

Solve: $84.95 + 0.60m = 250$ $m =$ _

275.083

Molly can drive 275 mi.

.

20. Let p = the price of one shirt.Then $2p$ = the price of anothershirt.

Solve: $\frac{p + 2p + 27}{3} = 34$

p = \$25, so $2p = 2 \cdot \$25 = \$50$. The prices of the other two shirts are \$25 and \$50.

Let w = the width of the two-by-four, in inches.

Solve: $2(2w + 2) + 2w = 10$

$w = \frac{1}{2}$ or $1\frac{1}{2}$

If $w = 1\frac{1}{2}$, then $w + 2 = 3\frac{1}{2}$.

The length is $3\frac{1}{2}$ in. and the width is $1\frac{1}{2}$ in.

Let p = the average listing price of a home in Arizona.

Solve: $3p + 72,000 = 876,000$

$p = \$268,000$

26. Solve: $4a = 30,172$

$a = 7543$

The area of Lake Ontario is 7543 mi^2.

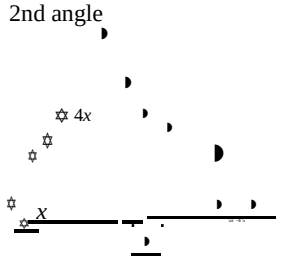
Solve: $x + 2x + 3 \cdot 2x = 180$

$x = 20$

If $x = 20$, then $2x = 40$, and $3 \cdot 2x = 120$.

The first piece is 20 ft long, the second is 40 ft, and the third is 120 ft.

We draw a picture. We let x = the measure of the first angle. Then $4x$ = the measure of the second angle, and $(x + 4x) - 45$, or $5x - 45$ = the measure of the third angle.



1st angle

So

38. Let p = the price of the battery before tax.

Solve: $p + 6.5\% \cdot p = 117.15$

$p = \$110$

Let c = the cost of the meal before the tip was added.

Solve: $c + 0.18c = 40.71$ $c = \$34.50$

42. Solve: $2(w + 60) + 2w =$

$= 100$

If $w = 100$, then $w + 60 = 160$.

The length is 160 ft, the width is 100 ft, and the area is 160 ft · 100 ft = 16, 000 ft^2.

44. $-5 + 8 = -40 + 40 = -40$

46. $-\frac{4}{5} \div 8 = -\frac{32}{5} \cdot \frac{4}{3}$

$= \frac{8}{15}$

48. 409.6

50. -41.6

$\frac{1}{3}c + \frac{1}{4}c + \frac{1}{8}c + \frac{1}{5}c + 10 + 1 = c$

52. Solve: $c = 120$

There were 120 cookies on the tray.

$\frac{2 \cdot 85 + s}{3}$

54. $=$

Solve: 82

$s = 76$

The score on the third test was 76.

angle.

Chapter 11 VocabularyReinforcement

When we replace a variable with a number, we say that we are substituting forthe variable.

A letterthat stands forjust one numberis called a :

$+ 4x + (5x - 45) =$
180

3rd angle

cons tant.

3. The identit y proper ty of 1 states that forany real numbe r $a, a \cdot 1 = a = a$.

$x = 22.5$, $4x = (22.5) = 90$, and $5x - 45 = 5(22.5) - 45 =$
67.5, so the measures of the first, second, and third angles are 22.5°, 90°, and 67.5°, respectively.

Let m = the numberof miles a passengercan travel for $26.

Solve: $1.80 + 2.20m = 26$
$m = 11$ mi

Let a = the amount Ella invested. Solve: $a + 0.06a = 6996$
$a =$ $6600

Let b = the amount borrowed.
Solve: $b + 0.1b = 7194$
= $6540

4. The multiplication principle forsolving equations states that for any real numbers a, b, and c, $a = b$ is equivalent to $a \cdot c = b \cdot c$.

The distributive law of multiplication over subtraction states that forany numbers a, b, and c, $a(b - c) = ab - ac$.

The addition principle forsolving equations states that for any real numbers a, b, and c, $a = b$ is equivalent to $a + c =$

$b + c$.

Equations with the same solutions are called equivalent equations.

Chapter11ConceptReinforcement

True; for instance, when $x = 1$, we have $x - 7 = 1 - 7 = -6$ but $7 - x = 7 - 1 = 6$. The expressions are not equivalent.

False; the variable is not raised to the same power in both terms, so they are not like terms.

$x + 5 = 2$

$x + 5 - 5 = 2$

$x = -3$

Since $x = -3$ and $x = 3$ are not equivalent, we know that $x + 5 = 2$ and $x = 3$ are not equivalent. The given statement is false.

This is true because division is the same as multiplying by a reciprocal.

Chapter 11 StudyGuide

$\frac{a}{7}b - 2 = -5 \cdot 8 - 2 = -40 - 2 = -42$

$= 6$

$4(x + 5y - 7) = 4 \cdot x + 4 \cdot 5y - 4 \cdot 7 = 4x + 20y - 28$

$24a - 8b + 16 = 8 \cdot 3a - 8 \cdot b + 8 \cdot 2 = 8(3a - b + 2)$

$7x + 3y - x - 6y = 7x - x + 3y - 6y$

$7x - 1 \cdot x + 3y - 6y$

$(7 - 1)x + (3 - 6)y$

$6x - 3y$

$y - 4 = -2$

$y - 4 + 4 = -2 + 4$

$y + 0 = 2$

$y = 2$

The solution is 2.

$9x = -72$

$\frac{9x}{9} = \frac{-72}{9}$

$x = -8$

The solution is -8.

$6x - 4 - x = 2x - 10$

$5x - 4 = 2x - 10$

$5x - 4 - 2x = 2x - 10 - 2x$

$3x - 4 = -10$

$3x - 4 + 4 = -10 + 4$

$3x = -6$

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

$x = -2$

The solution is -2.

$2(y - 1) = 5(y - 4)$

$2y - 2 = 5y - 20$

$2y - 2 - 5y = 5y - 20 - 5y$

$-3y - 2 = -20$

$-3y - 2 + 2 = -20 + 2$

$-3y = -18$

$\frac{-3y}{-3} = \frac{-18}{-3}$

$y = 6$

The solution is 6.

Let n = the number. We have $n + 5$, or $5 + n$.

Chapter 11 Review Exercises

1. $\frac{x}{3} - \frac{y}{3} = 1 - \frac{7}{3} - \frac{5}{3} = \frac{12}{3} = 4$

2. $5(3x - 7) = 5 \cdot 3x - 5 \cdot 7 = 15x - 35$

3. $2(4x - 5) - (2 - 8x) = (10 - 8x) + 10$

$8x - 10 - 2 + 8x = 10 - 8x + 10$

$16x - 12 = 20 - 8x$

$16x - 12 + 8x = 20 - 8x + 8x$

$24x - 12 = 20$

$24x - 12 + 12 = 20 + 12$

$24x = 32$

$\frac{24x}{24} = \frac{32}{24}$

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

4. $\frac{9x}{-72} = \frac{-72}{-72}$

$10(0.4x + 1.5) = 10 \cdot 0.4x + 10 \cdot 1.5 = 4x + 15$

$-8(3 - 6x+2y) = -8 \cdot 3 - 8(-6x) - 8(2y) = -24+48x-16y$

$2x - 14 = 2 \cdot x - 2 \cdot 7 = 2(x- 7)$

$6x - 6 = 6 \cdot x - 6 \cdot 1 = 6(x- 1)$

9 9
+ 5 · 2 = 5(*x* + 2)

1 · *x* =
−8

x = −8

The solution is
−8.

5*y* + 1 =

5*y* + 1 − 1 = 6
1

5*y* = 5

$\frac{5y}{5} = \frac{5}{5}$

= −2*x* + 5*y*

y = 1

The solution is 1.

.

8. 5*x* + 10 = 5 · *x*

12 − 3*x* + 6*z* = 3 · 4 − 3 · *x* + 3 · 2*z* = 3(4 − *x* + 2*z*)

11*a* + − 4*a* − 5*b* = 11*a* 4*a* + − 5*b*
2*b* – 2*b*

(11 − 4)*a* + (2 − 5)*b*

7*a* − 3*b*

7*x* − 3*y*− 9*x* + 8*y* = 7*x*9*x* −3*y* + 8*y*
–

□Ā Ā ĀĀĀ □
7 − 9)*x* + (−3 + 8)*y*

6*x* + 3*y* − *x* − 4*y* = 6*x* − *x* + 3*y* − 4*y*

(6 − 1)*x* + (3 − 4)*y*

□ Ā □

x −

y

$-3a + 9b + 2a - b = -3a + 2a + 9b - b$

$(-3 + 2)a + (9 - 1)b$

$-a + 8b$

$x + 5 = -17$

$-5 - 5 = -17$

$x = -22$

The number -22 checks. It is the solution.

$-8x = -56$

$\frac{-8x}{-8} = \frac{-56}{-8}$

$x = 7$

The number 7 checks. It is the solution.

16. $-\frac{x}{4} = 48$

$\frac{1}{4} \cdot x = 48$

$-4 - \frac{1}{4} \cdot \frac{x}{1} = -4 \cdot 48$

$x = -192$

The number -192 checks. It is the solution.

$n - 7 = -6$

$n - 7 + 7 = -6 + 7$

$n = 1$

The number 1 checks. It is the solution.

$15x = -35$

$\frac{15x}{15} = \frac{-35}{15}$

$\frac{35}{5} = \frac{5 \cdot 7}{5} = 7$

$x = -\frac{15}{3} = x = -5$

21. $-\frac{4}{3} - 5y = -16$

$5 \quad 4 \quad 5 \quad 3$

$\frac{4}{4} \cdot 5y = 4 \cdot 16$

$y = -\frac{5 \cdot 3}{4 \cdot 16} = \frac{15}{64}$

The number -64 checks. It is the solution.

$y - 0.9 = 9.09$

$-0.9 + 0.9 = 9.09 + 0.9$

$y = 9.99$

The number 9.99 checks. It is the solution.

$5 - x = 13$

$5 - x - 5 = 13 - 5$

$-x = 8$

$-1 \cdot x = -1 \cdot 8$

$-1 \cdot (-1 \cdot x) = -1 \cdot 8$

The number -8 checks. It is the solution.

$5t + 9 = 3t - 1$

$5t + 9 - 3t = 3t - 1 - 3t$

$2t + 9 = -1$

$2t + 9 - 9 = -1 - 9$

$2t = -10$

$\frac{2t}{2} = \frac{-10}{2}$

$t = -5$

The number -5 checks. It is the solution.

3

7

$\cdot 5 = 3 \cdot 5$

25.

$7x - 6 = 25x$

$7x - 6 - 7x = 25x - 7x$

$-6 = 18x$

$\frac{-6}{18} = \frac{18x}{18}$

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

The number $-\frac{1}{3}$ checks. It is the solution.

$x - 11 = 14$

$-11+11=14+11$

$x = 25$

The number 25 checks. It is the solution.

20. $-\frac{2}{3} + x = -6$

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

$x = -\frac{16}{3} + \frac{2}{3}$

$x = -\frac{14}{3} = -\frac{7}{3}$

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

The number $-4\frac{2}{3}$ checks. It is the solution.

26. $\frac{1}{4}x - \frac{5}{8} = \frac{3}{8}$

$8\left(\frac{1}{4}x - \frac{5}{8}\right) = 8\left(\frac{3}{8}\right)$

$2x - 5 = 3$

$2x - 5 + 5 = 3 + 5$

$2x = 8$

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

$x = 4$

The number 4 checks. It is the solution.

$14y = 23y - 17 - 10$

$14y = 23y - 27$

$14y - 23y = 23y - 27 - 23y$

$-9y = -27$

$\frac{-9y}{-9} = \frac{-27}{-9}$

$y = 3$

The number3 checks. It is the solution.

$0.22y - 0.6 = 0.12y + 3 - 0.8y$

$0.22y - 0.6 = -0.68y + 3$

$0.22y - 0.6 + 0.68y = -0.68y + 3 + 0.68y$

$0.9y - 0.6 = 3$

$0.9y - 0.6 + 0.6 = 3 + 0.6$

$0.9y = 3.6$

$\frac{0.9y}{0.9} = \frac{3.6}{0.9}$

$y = 4$

The number4 checks. It is the solution.

29. $\frac{1}{4}x - \frac{1}{8}x = 3 - \frac{1}{16}x$

$\frac{1}{8}x - \frac{1}{8}x = 3 - \frac{1}{16}x$

$\frac{1}{8}x = 3 - \frac{1}{16}x$

$\frac{1}{8}x + \frac{1}{16}x = 3 - \frac{1}{16}x + \frac{1}{16}x$

$\frac{2}{16}x + \frac{1}{16}x = 3$

$x = 3$

$\frac{16}{3} \cdot \frac{3x}{16} = \frac{3}{3} \cdot 16$

$3(5x - 7) = -66$

$15x - 21 = -66$

$15x - 21 + 21 = -66 + 21$

$15x = -45$

$\frac{15x}{15} = \frac{-45}{15}$

$= -3$

The number −3 checks. It is the solution.

$8(x - 2) - 5(x + 4) = 20x + x$

$8x - 16 - 5x - 20 = 21x$

$3x - 36 = 21x$

$3x - 36 - 3x = 21x - 3x$

$-36 = 18x$

$\frac{-36}{18} = \frac{18x}{18}$

$-2 = x$

The number −2 checks. It is the solution.

$-5x + 3(x + 8) = 16$

$-5x + 3x + 24 = 16$

$-2x + 24 = 16$

$-2x + 24 - 24 = 16 - 24$

$-2x = -8$

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

$x = 4$

The number4 checks. It is the solution.

Let x = the number; 19%x, or $0.19x$

Familiarize. Let w = the width. Then $w + 90$ = the length.

Translate. We use the formula for the perimeter of a rectangle, $P = 2 \cdot l + 2 \cdot w$.

$$= \frac{3}{16} \cdot \frac{3}{16 \cdot 3}$$

$x = \frac{3 \cdot 1}{3} = \frac{\cdot}{1}$

$= 16$

The number16 checks. It is the solution.

$4(x + 3) = 36$

$4x + 12 = 36$

$4x + 12 - 12 = 36 - 12$

$4x = 24$

$\frac{4x}{4} = \frac{24}{4}$

$365 \text{ mi} + 2 \cdot 275 \text{ mi} = 730 \text{ mi} + 550 \text{ mi} = x = 6$

The number6 checks. It is the solution.

$1280 = 2 \cdot (w + 90) + 2 \cdot w$

Solve.

$1280 = 2 \cdot (w + 90) + 2 \cdot w$

$1280 = 2w + 180 + 2w$

$1280 = 4w + 180$

$1100 = 4w$

$275 = w$

If $w = 275$, then $w + 90 = 275 + 90 = 365$. *Check*. The length is 90 mi more than the width. The perimeter is $2 \cdot$ 1280 mi. The answerchecks.

State. The length is 365 mi, and the width is 275 mi.

36. *Familiarize*. Let l = the length of the shorter piece, in ft.

Then $l + 5$ = the length of the longerpiece.

Translate.

Length of shorter piece		length of longer piece		Total length	
↓	↓	↓	↓	↓	
l	+	$(l + 5)$			= 21

Solve.

$l + (l + 5) = 21$

$2l + 5 = 21$

$2l = 16$

$l = 8$

If $l = 8$, then $l + 5 = 8 + 5 = 13$.

Check. A 13-ft piece is 5 ft longer than an 8-ft piece and the sum of the length is 8 ft + 13 ft, or 21 ft. The answer checks.

State. The lengths of the pieces are 8 ft and 13 ft.

37. *Familiarize.* Let p = the price of the mower in February.

Translate.

Price in February | plus | Additional cost | Price in June | is

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

$$p + 332 = 2449$$

Solve.

$p + 332 = 2449$

$p = 2117$

Check. $2117 + $332 = $2449, the price in June, so the answer checks.

State. The price of the mower in February was $2117.

Familiarize. Let a = the number of appliances Ty sold.

Translate.

Commission is | Commission for each appliance | times | Number of appliances sold

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

$$216 = 8 \cdot a$$

Solve.

$216 = 8a$

$27 = a$

Check. $27 \cdot $8 = $216, so the answer checks.

State. Ty sold 27 appliances.

Familiarize. Let x = the measure of the first angle. Then $x + 50$ = the measure of the second angle and $2x - 10$ = the measure of the third angle.

Check. The second angle, 85°, is 50° more than the first angle, 35°, and the third angle, 60°, is 10° less than twice the first angle. The sum of the measures is $35^\circ + 85^\circ + 60^\circ$, or 180°. The answer checks.

State. The measure of the first angle is 35°, the measure of the second angle is 85°, and the measure of the third angle is 60°.

40. *Familiarize.* Let p = the marked price of the bread maker.

Translate.

Marked price | minus | 30% of | Marked price | is | Sale price

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

$$p - 0.3 \cdot p = 154$$

Solve.

$p - 0.3p = 154$

$0.7p = 154$

$p = 220$

Check. 30% of $220 = 0.3 · $220 = $66 and $220 − $66 = $154. The answer checks.

State. The marked price of the bread maker was $220.

41. *Familiarize.* Let a = the amount the organization actually owes. This is the cost of the office supplies without sales tax added.

Translate.

Amount | is | A | minus | 5% of | Amount

owed t of bill unt owed

↓ ↓ ↓

$a = 145.90 - 0.05 \cdot a$

Solve.

$= 145.90 - 0.05a$

$1.05a = 145.90$

$a \approx 138.95$

Check. 5% of \$138.95 = 0.05 · \$138.95 ≈ \$6.95 and

\$138.95 + \$6.95 = \$145.90.
The answerchecks.

State. The organization actually owes \$138.95.

Familiarize. Let s = the previous salary.

Translate.

the measure of the third angle.

Translate. The sum of the measures of the angles of a triangle is 180°, so we have

$$x + (x + 50) + (2x - 10) = 180.$$

Solve.

$$x + (x + 50) + (2x - 10) = 180$$
$$4x + 40 = 180$$
$$4x = 140$$
$$x = 35$$

If $x = 35$, then $x + 50 = 35 + 50 = 85$ and $2x - 10 = 2 \cdot 35 - 10 = 70 - 10 = 60$.

..

Previous salary plus 5% of previous salary is New salary

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

$$s + 0.05 \cdot s = 71,400$$

Solve.

$$s + 0.05s = 71,400$$
$$1.05s = 71,400$$
$$s = 68,000$$

Check. 5% of \$68, 000 = $0.05 \cdot \$68,000 =$ \$3400 and
\$68, 000 + \$3400 = \$71, 400. The answerchecks.

State. The previous salary was \$68,000.

43. *Familiarize.* Let c = the cost of the television in January.

Translate.

Cost in May	is	Cost in January	less	$38
829	=	c	−	38

Solve.

$$829 = c - 38$$
$$829 + 38 = c - 38 + 38$$
$$867 = c$$

Check. $38 less than $867 is $867 − $38, or $829. This is the cost of the television in May, so the answer checks.

State. The television cost $867 in January.

44. *Familiarize.* Let l = the length. Then $l - 6$ = the width.

Translate. We use the formula for the perimeter of a rectangle, $P = 2 \cdot l + 2 \cdot w$.

$$56 = 2 \cdot l + 2 \cdot (l - 6)$$

Solve.

$$56 = 2l + 2(l - 6)$$
$$56 = 2l + 2l - 12$$
$$56 = 4l - 12$$
$$68 = 4l$$
$$17 = l$$

If $l = 17$, then $l - 6 = 17 - 6 = 11$.

Check. 11 cm is 6 cm less than 17 cm. The perimeter is $2 \cdot 17$ cm + $2 \cdot 11$ cm = 34 cm + 22 cm = 56 cm. The answer checks.

State. The length is 17 cm, and the width is 11 cm.

45. *Familiarize.* The Nile River is 234 km longer than the Amazon River, so we let l = the length of the Amazon River and $l + 234$ = the length of the Nile River.

Translate.

Length of Nile	plus	Length of Amazon River	is	Total length
↓	↓	↓	↓	↓
$(l + 234)$	+	l	=	13, 108

Solve.

$$(l + 234) + l = 13, 108$$
$$2l + 234 = 13, 108$$
$$2l = 12, 874$$
$$l = 6437$$

If $l = 6437$, then $l + 234 = 6437 + 234 = 6671$.

47. $3x - 2y + x - 5y = 3x + x - 2y - 5y$
$= 3x + 1 \cdot x - 2y - 5y$
$= (3 + 1)x + (-2 - 5)y$
$= 4x - 7y$

Answer A is correct.

48. $2|n| + 4 = 50$
$2|n| = 46$
$|n| = 23$

The solutions are the numbers whose distance from 0 is 23. Thus, $n = -23$ or $n = 23$. These are the solutions.

49. $|3n| = 60$

$3n$ is 60 units from 0, so we have:

$3n = -60$ *or* $3n = 60$
$n = -20$ *or* $n = 20$

The solutions are −20 and 20.

Chapter 11 Discussion and Writing Exercises

1. The distributive laws are used to multiply, factor, and collect like terms in this chapter.
2. For an equation $x + a = b$, we add the opposite of a on both sides of the equation to get x alone.
3. For an equation $ax = b$, we multiply by the reciprocal of a on both sides of the equation to get x alone.
4. Add $-b$ (or subtract b) on both sides and simplify. Then multiply by the reciprocal of c (or divide by c) on both sides and simplify.

Chapter 11 Test

1. $\frac{3}{5}y = \frac{3}{5} \cdot \frac{10}{3} = \frac{30}{5} = 6$

2. $3(6 - x) = 3 \cdot 6 - 3 \cdot x = 18 - 3x$

$6a - 30b + 3 = 3 \cdot 2a - 3 \cdot 10b + 3 \cdot 1 = 3(2a$
$10b + 1)$ Answer C is correct.

$-5(y-1) = -5 \cdot y - (-5)(1) = -5y - (-5) = -5y + 5$

$12 - 22x = 2 \cdot 6 - 2 \cdot 11x = 2(6 - 11x)$

$7x + 21 + 14y = 7 \cdot x + 7 \cdot 3 + 7 \cdot 2y = 7(x + 3$
$2y)$

$9x - 2y - 14x + y = 9x - 14x - 2y + y$

□Ā Ā ĀĀĀ □
$x - 14x - 2y + 1 \cdot y$
□ Ā □
$9 - 14)x + (-2 + 1)y$

$-5x +$
$(-y)$
$-5x -$
y

$-a + 6b + 5a - b = -a + 5a + 6b - b$
□ Ā □
$1 \cdot a + 5a + 6b - 1 \cdot b$
Ā □ $(-1 + 5)a + (6 - 1)b$ Ā □
□ Ā □
Ā □ $a +$ Ā □ Ā □
$5b$

..

8. $x + 7 = 15$

$x + 7 - 7 = 15 - 7$ Subtracting 7 on both sides

$x + 0 = 8$ Simplifying

$x = 8$ Identity property of 0

Check: $x + 7 = 15$

$8 + 7 \stackrel{?}{=} 15$

$15 = 15$ TRUE

The solution is 8.

$t - 9 =$

$t - 9 + 9 = 17 + 9$ Adding 9 on both sides

$t = 26$

Check: $t - 9 = 17$

$26 - 9 \stackrel{?}{=} 17$

$17 = 17$ TRUE

The solution is 26.

$3x = -18$

$\frac{3x}{3} = \frac{-18}{3}$ Dividing by 3 on both sides

$1 \cdot x = -6$ Simplifying

$x = -6$ Identity property of 1

The answerchecks. The solution is -6.

$-\frac{4}{7}x = -28$

$-\frac{7}{4} \cdot -\frac{4}{7}x = -\frac{7}{4} \cdot (-28)$ Multiplying by the reciprocal on the right

$1 \cdot x = \frac{7}{4} \cdot \frac{28}{1}$ Simplifying

$x = 49$ Identity property of 1

The answerchecks. The solution is 49.

14. $8 - y = 16$

$8 - y - 8 = 16 - 8$

$-y = 8$

$-1(-y) = -1 \cdot 8$

$y = -8$

The answerchecks. The solution is -8.

$-\frac{2}{5} + x = -\frac{2}{4}$

$-\frac{2}{5} + x + \frac{2}{5} = -\frac{3}{4} + \frac{2}{5}$

$x = -\frac{15}{20} + \frac{8}{20}$

$x = -\frac{7}{20}$

The answerchecks. The solution is $-\frac{7}{20}$.

$0.4p + 0.2 = 4.2p - 7.8 - 0.6p$

$0.4p + 0.2 = 3.6p - 7.8$ Collecting like terms

$0.4p + 0.2 - 0.4p = 3.6p - 7.8 - 0.4p$

$0.2 = 3.2p - 7.8$

$0.2 + 7.8 = 3.2p - 7.8 + 7.8$

$8 = 3.2p$

$\frac{8}{3.2} = \frac{3.2p}{3.2}$

$2.5 = p$

The answerchecks. The solution is 2.5.

cal of -7 to elimin ate -7
on the left

17. $3(x + 2) = 27$
$3x + 6 = 27$ Multiplying to remove parentheses

$1 \cdot x =$

4

$x =$
49

The answerchecks. The solution is 49.

$3t + 7 = 2t - 5$ $3t + 7 - 2t =$
$2t - 5$
$2t$ $t + 7 = -5$ $t +$
$7 - 7 = -5 - 7$
$t =$
-12

The answerchecks. The solution is -12.

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

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

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

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

$= 2$

The answerchecks. The solution is 2.

$3x + 6 \quad 6 = 27 - 6$

$3x =$
21
$\frac{3x}{3} = \frac{21}{3}$
$x = 7$

The answerchecks. The solution is 7.

$-3x - 6(x - 4) = 9$ $-3x -$
$6x + 24 = 9$
$-9x + 24 =$
9
$9x + 24 - 24 = 9$
$- 24$

$-9x = -15$

$\frac{-9x}{-9} = \frac{-15}{-9}$

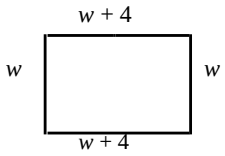
$x =$

3

The answerchecks. The solution is $\frac{5}{3}$.

19. Let x = the number; $x - 9$.

20. Familiarize. We draw a picture. Let w = the width of the photograph, in cm. Then $w + 4$ = the length.



The perimeter P of a rectangle is given by the formula $2l + 2w = P$, where l = the length and w = the width.

Translate. We substitute $w + 4$ for l and 36 for P in the formula for perimeter.

$$2l + 2w = P$$

$$2(w + 4) + 2w = 36$$

Solve. We solve the equation.

$$2(w + 4) + 2w = 36$$
$$2w + 8 + 2w = 36$$
$$4w + 8 = 36$$
$$4w = 28$$
$$w = 7$$

Possible dimensions are $w = 7$ cm and $w + 4 = 11$ cm.

Check. The length is 4 cm more than the width. The perimeter is $2 \cdot 11$ cm $+ 2 \cdot 7$ cm, or 36 cm. The result checks.

State. The width of the photograph is 7 cm and the length is 11 cm.

Familiarize. Let x = the Ragers' income.

Translate.

17% of Income is $7840

$$0.17 \cdot x = 784$$

Solve.

$$0.17 \cdot x = 7840$$
$$x = \frac{7840}{0.17}$$
$$x \approx 46,120$$

Rounding to the nearest ten

If the length of the shorter piece is 3 m, then the length of the longer piece is 3 + 2, or 5 m.

Check. The 5-m piece is 2 m longer than the 3-m piece, and the sum of the lengths is 3 + 5, or 8 m. The answer checks.

State. The pieces are 3 m and 5 m long.

23. *Familiarize.* Let t = the tuition U.S. universities received from foreign students in 2005-2006, in billions of dollars.

Translate.

2005-2006 tuition plus 52% of 2005-2006 tuition is 2010-2011 tuition

$$t + 0.52 \cdot t = 14.3$$

Solve.

$$t + 0.52 \cdot t = 14.3$$
$$1.52t = 14.3$$
$$t = \frac{14.3}{1.52} \approx 9.4$$

Check. 52% of $9.4 = 0.52 \cdot 9.4 = 4.888$, and $9.4 + 4.888 = 14.288 \approx 14.3$, so the answer checks.

State. U.S. universities received about $9.4 billion in tuition from foreign students in 2005-2006.

Familiarize. Let n = the original number. *Translate.*

Three times a number minus 14 is $\frac{2}{3}$ of the number

Check. 17% of $46,120 = 0.17 \cdot \$46,120 = \$7840.4 \approx \$7840$, so the answer checks.

↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓

$$3 \cdot n - \frac{2}{3} \cdot n = 14$$

Solve.

2

$3n - 14 = n$

3

7

$-14 = -3n$ Subtracting $3n$

$\frac{3}{7}$

$\frac{3}{7}(-14) = -7$

n

$6 = n$

2

State. The Ragers' income was about $46,120.

Familiarize. Using the labels on the drawing in the text, we let x and $x + 2$ represent the lengths of the pieces, in meters.

Translate.

Length of shorter piece | plus | Length of longer piece | is | Length of the board

x + $x + 2$ = 8

Solve.

$x + x + 2 = 8$

$2x + 2 = 8$

$2x = 6$ Subtracting 2

$x = 3$ Dividing by 2

Check. $3 \cdot 6 - 14 = 18 - 14 = 4$ and $3 \cdot 6 = 4$, so answer checks.

State. The original number is 6.

Familiarize. We draw a picture. We let x = the measure of the first angle. Then $3x$ = the measure of the second angle, and $(x + 3x) - 25$, or $4x - 25$ = the measure of the third angle.

2nd angle: $3x$

x | $4x - 25$

1st angle | 3rd angle

Recall that the measures of the angles of any triangle add up to 180°.

Translate.

Measure plus easure f plus

of se o le

first cond

↓ ↓ ↓ ↓

x + $3x$ +

measure of third angle is

180°.

↓ ↓ ↓

$(4x - 25)$ = 180

Solve. We solve the equation. $x + 3x + (4x - 25) = 180$

$8x - 25 = 180$

$8x = 205$

$= 25.625$

Although we are asked to find only the measure of the first angle, we find the measures of the other two angles as well so that we can check the answer.

Possible answers for the angle measures are as follows: First angle: $x = 25.625^\circ$

Second angle: $3x = 3(25.625) = 76.875^\circ$

Third angle: $4x - 25 = 4(25.625) - 25$

$= 102.5 - 25 = 77.5^\circ$

Check. Consider 25.625°, 76.875°, and 77.5°. The second is three times the first, and the third is 25° less than four times the first. The sum is 180°. These numbers check.

State. The measure of the first angle is 25.625°.

$5y - 1 = 3y + 7$ $5y - 1 - 3y = 3y + 7 - 3y$

$2y - 1 = 7$

$2y - 1 + 1 = 7 + 1$ $2y = 8$

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

value of the last digit.

Solve. First we collect like terms on the

$\frac{1}{3}t + \frac{1}{4}t + \frac{1}{5}t + 8 + 5 = t$

$\frac{20}{60}t + \frac{15}{60}t + \frac{12}{60}t + 13 = t$

$\frac{47}{60}t + 13 = t$

Subtracting $\frac{47}{60}t$

$13 = \frac{13}{60}t$

$60 \cdot 13 = 60 \cdot \frac{13}{60}t$

$60 \cdot 13 = 13 \cdot t$

$60 = t$

Check. $\frac{1}{3} \cdot 60 = 20$, $\frac{1}{4} \cdot 60 = 15$, and $\frac{1}{5} \cdot 60 = 12$. Since $20 + 15 + 12 + 8 + 5 = 60$, the answerchecks.

State. 60 tickets were given away.

~~Cumulative Review Chapters 1 - 11~~

1. 47,201

The digit 7 tells the numberof thousands.

7405 = 7 thousands + 4 hundreds + 0 tens + 5 ones, or

7 thousands + 4 hundreds + 5 ones

7.463

Write a word name for

$y = 4$

The answer checks. The solution is 4. Answer D is correct.

27. $3|w| - 8 = 37$

$3|w| = 45$ Adding 8

the whole number.
Seven b) Write “and” for the
Seven
decimal point.
and c) Write a word name for the
numberto the right
Seven
of the decimal point, and

followed by the fourhundred place

sixty-three

$|w| = 15$ Dividing by 3

Since $|w| = 15$, the distance of w from 0 on the number line is 15. Thus, $w = 15$ or $w = -15$.

28. *Familiarize.* Let t = the numberof tickets given away.

Then the first person got $\frac{1}{3}t$ tickets, the second person got $\frac{1}{4}t$, the third person got $\frac{1}{5}t$, the fourth person got 8 tickets, and the fifth person got 5.

Translate. There were t tickets given away, so we have

$$\frac{1}{3}t + \frac{1}{4}t + \frac{1}{5}t + 8 + 5 = t.$$

thousandths

A word name for7.463 is seven and fourhundred sixty- three thousandths.

$$7\ 41^{1}$$
$$2\ 7\ 1$$
$$\square \qquad \bar{A}\ \square \qquad \bar{A}\ \square$$
$$1$$
$$2$$
$$4\ 90^{1\ 1}$$
$$3$$
$$5\ 2\ 78$$
$$6\ 3\ 91$$

$$451\ 3$$
$$21{,}085$$

$$6.\frac{2}{13} = \frac{2}{13} + \frac{1}{2} \cdot \frac{2}{26} + \frac{1}{26}$$

$$= \frac{4}{26} + \frac{1}{26}$$

$$= \frac{5}{26}$$

7. $2\frac{4}{9} = \frac{4}{9}$

$$\left[3\frac{3}{9}\cdot 3\right] + 3 = \frac{9}{9}$$

$$5\frac{7}{9}$$

8. 2.04
8
63.91
4
+428.0
493.97

9. 34.56
2.78
0.43
+765.1
802.87

11. /4//

12. $\frac{7}{8} \cdot \frac{2}{3} = \frac{7}{8\cdot 3} \cdot \frac{3}{2} \cdot \frac{2}{8}$

$$\frac{16}{24}$$

$$= \frac{5}{24}$$

13. $\left[4\frac{8}{3}\cdot\frac{8}{8}\right] = 4\frac{8}{24} = \frac{32}{24}$

$$\left[\frac{5}{15}\cdot\frac{3}{15}\right] = \frac{15}{15}$$

19. 3 4 9
× 763
1 0 4
2 7
2 0 9
4 0
2 4430 0
266,28

20. $1\frac{3}{4} \cdot 2 = \frac{7}{4} \cdot \frac{7}{3} = \frac{7\cdot 7}{43} = \frac{49}{4\cdot 3} = \frac{1}{12} = 4\frac{12}{12}$

21. $\frac{9}{3\cdot 7} \cdot \frac{14}{2\cdot 7} = \frac{9\cdot 14}{3\cdot 7\cdot 2\cdot 7} = \frac{3\cdot 2}{7\cdot 7} = \frac{3\cdot 2}{7\cdot 3\cdot 3\cdot 7} = \frac{6}{15} = \frac{6}{15} = \frac{3\cdot 2}{5} = \frac{6}{5}$

22. $12\cdot\frac{5}{6} = \frac{12\cdot 5}{6\cdot 1} = \frac{2\cdot 6\cdot 5}{6\cdot 1} = \frac{6}{6}\cdot\frac{2\cdot 5}{1} = 10$

3 4. 0 9(2 decimal places)
7. 6(1 decimal place)
20454
2 3 8 6 3 0
2 5 9.084 (3 decimal places)

24. To convert $\frac{18}{5}$ to a mixed numeral, we divide.

$$\begin{array}{r} 3 \\ 5\overline{)18} \\ 15 \\ \hline 3 \end{array}$$

$$\frac{18}{5} = 3\frac{3}{5}$$

$$\begin{array}{r} 573 \\ 6\overline{)3438} \\ 30 \\ \hline 43 \\ 42 \\ \hline 18 \\ 18 \\ \hline 0 \end{array}$$

$$\frac{3438}{6} = 573$$

$8 \cdot 3 = -1 \dfrac{24}{24} = -1 \dfrac{24}{17}$

1

8 0

1 9 9 9 9 10

14. 2 0. 0 0

0 0/

− 0.0027

1 9. 9 9

7 3

15. 12

399210

40.0 / 0/

−5.789

34. 2 4

1

16. 21 = 3 · 3 7 7 ·

7 = ·= 1 · =

30 3 3 10 10

· 10 10

17. 27 = 5 · 5 = 1 · 55 =

5 55 55 · 55

5 5 · 1 5 1

1

18. 2 9

7

× 1 6

1 7 8

2

2 9 7

0

4 7 5

2

The answeris

573.

26. 34 $56\overline{)14}$

9

7 0

2 1

4

2 0

4

1 0

The answeris 56

10.

A mixed numeral for the quotient in Exercise 26 is:

$$56\frac{10}{.} = -56^{5}$$

34

17

4 4 4·154·3·54·53 3

8. 15

28. 5 ÷ 15 = 5 · 85·8 = 5·2· = 4 · 5 · 2 = 2

4

1 7 7 1 7

29.23 30= 3 30 =3 30 = 90

30. 2.7. $\overline{)105.3}$ quotient 39.

81
43
43
0

The answeris 39.

68,4[8] 9 ↑

The digit 8 is in the thousands place.
Considerthe next digit to the right. Since the digit, 4, is 4 or lower round

down, meaning that 8 thousands stay as
8 thousands. Then change all digits to the right of the thousands digit
to zeros.

The answeris 68,000.

32. 0.42 7 [5] Ten-thousandths digit is 5 orhigher. Round up.

0.428

33. Round 1. 8 3 8 3 .. . to the nearest hundredth.

orhigher.

2 1. 8 4 Round up.

A numberis divisible by 6 if it is even and the sum of its digits is divisible by 3. The number1368 is even. The sum

of its digits, 1 + 3 + 6 + 8, or 18, is divisible by 3, so 1368 is divisible by 6.

We find as many two-factorfactorizations as we can.

15= 1·15

15= 3·5

The factors of 15 are 1, 3, 5, and 15.

To compare two numbers in decimal notation, start at the left and compare corresponding digits moving from left to right. When two digits differ, the number with the larger digit is the larger of the two numbers.

1.001
↓ Different; 1 is larger than 0.
0.9976

Thus, 1.001 is larger.

40. $\frac{\$0.95}{8.5 \text{ oz}} = \frac{95¢}{8.5 \text{ oz}} \approx 11.176¢/\text{oz}$

$\frac{\$1.66}{5\frac{1}{2} \text{ oz}} = \frac{166}{15 \text{ oz}} \approx 11.067¢/\text{oz}$ (186¢/oz)

$\frac{\$1.86}{15\frac{1}{4} \text{ oz}} = \frac{186¢}{15.25 \text{ oz}} \approx 12.197¢/\text{oz}$

$\frac{\$2.54}{24 \text{ oz}} = \frac{254}{24 \text{ oz}} \approx 10.583¢/\text{oz}$

$\frac{\$3.07}{29 \text{ oz}} = \frac{307¢}{29 \text{ oz}} = 10.586¢/\text{oz}$

Brand D has the lowest unit price.

a) $C = \pi \cdot d$

$C \approx \frac{22}{7} \cdot 1400 \text{ mi} = 4400 \text{ mi}$

b) First we find the radius.

$r = \frac{d}{2} = \frac{1400 \text{ mi}}{2} = 700 \text{ mi}$

Now we find the volume.

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

16= 2·2·2·2

25= 5·5

32= 2·2·2·2·2

$\frac{4}{3}\frac{22}{}$

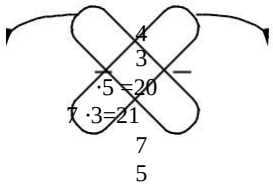
$3 \times 7 \times (700 \text{ mi})$

$4 \times 22 \times 343, 000,000 \text{ mi}^3$

The LCM is $2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 5 \cdot 5$, or 800.

37. We multiply these two numbers:

We multiply these two numbers:



Since $20 = 21$,

38. $\frac{4}{3} = \frac{5}{7}$

$\frac{4}{3} = \frac{2}{7}$

$\frac{5}{7} = \frac{535}{7}$

$\frac{5}{7} = 5 \cdot 7$

$= 35$

$\frac{20}{4} \quad \frac{21}{3}$

Since $20 < 21$, it follows that $35 < 35$, so $\frac{5}{7} < \frac{p}{5}$.

$= 3 \times 7$

$\approx 1,437,333,333$ mi

42. Let c = the cost of the cabinets.

Translate.

What number is 40% of $26,888?

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

$= 40\% \cdot 26,888$

Solve. We convert 40% to decimal notation and multiply.

$$\begin{array}{r} 26,888 \\ \times \quad 0.4 \\ \hline 10,755.2 \end{array}$$

The cabinets cost $10,755.20.

Let p = the percent of the cost represented by the countertops.

Translate.

$4033.20 is what percent of $26,888?

$4033.20 = \quad \cdot 26,888$

Solve.

$4033.20 = p \cdot 26,888$

$\frac{4033.20}{26,888} = \frac{p \cdot 26,888}{26,888}$

$0.15 = p$

$15\% = p$

The countertops account for 15% of the total cost.

Let a = the cost of the appliances. *Translate*.

What number is 13% of $26,888?

$a = 13\% \cdot 26,888$

Solve. Convert 13% to decimal notation and multiply.

$$\begin{array}{r} 26,888 \\ \times\ 0.13 \\ \hline 80\,64 \\ 2\,68\,80 \\ \hline 3495.44 \end{array}$$

The appliances cost $3495.44.

Let p = the percent of the cost represented by the fixtures.

Translate.

$8066.40 is what percent of $26,888?

$8066.40 = p \cdot 26,888$

Solve.

$8066.40 = p \cdot 26,888$

$\frac{8066.40}{26,888} = \frac{p \cdot 26,888}{26,888}$

$0.3 = p$

$30\% = p$

The fixtures account for 30% of the total cost.

Let f = the cost of the flooring.

Translate.

What number is 2% of

$\frac{13}{50.} = \frac{13 \cdot 4}{25 \cdot 4} = \frac{52}{100} = 0.52$

$51.\ 8\frac{4}{9} = 8 + \frac{4}{9}$

$9\overline{)4.00}$

$\begin{array}{r} 0.88 \\ 9\overline{)8.00} \\ 72 \\ \hline 80 \\ 72 \\ \hline 8 \end{array}$

Since 8 keeps reappearing as a remainder, the digits repeat

and $\frac{8}{9} = 0.888\ldots$, or $0.\overline{8}$.

7%

Replace the percent symbol with $\times 0.01$.

$\times\ 0.01$

Move the decimal point two places to the left.

$0.07.$

Thus, 7% = 0.07.

$\frac{463}{100}$

$53.\ 4.63$

$4.63.$

2 places Move 2 places.2 zeros

$4.63 = \frac{463}{100}$

$\frac{1}{29}$

54. $7\frac{4}{4} = \frac{29}{4}$ ($7 \cdot 4 = 28$ and $28 + 1 = 29$)

55. $40\% = \frac{40}{100}$ Definition of percent

$= \frac{2 \cdot 20}{5 \cdot 20}$

$= \frac{2}{5} \cdot \frac{20}{20}$

$\frac{2}{5}$

$= 2\% \cdot 26,888$

Solve. Convert 2% to decimal notation and multiply.

26,888

0.02

537.76

The flooring cost $537.76.

Since 987 is to the right of 879 on the number line, we have

$987 > 879$.

48. The rectangle is divided into 5 equal parts.

The denominatoris 5. We have 3 parts shaded. This tells us that the numerator is 3. Thus, $\frac{3}{5}$ is 5 shaded.

49. $\frac{37}{1000}$ 0.037.

3 zeros Move 3 places.

$\frac{37}{100} = 0.037$

0

.

56. $\frac{17}{20} = \frac{17 \cdot 5}{20 \cdot 5} = \frac{85}{100} = 85\%$

1.5

Move the decimal point two places to the right.

1.50.

b) Write a percent symbol: 150% Thus, 1.5 = 150%.

$\frac{1}{5}$ The unit is.

58. $234 + y = 789$

$234 + y - 234 = 789 - 234$

$= 555$

The number555 checks. It is the solution.

$3.9 \times y = 249.6$

$\frac{3.9 \times y}{249.6}$

$3.9 \quad 3.9$
$= 64$

The number64 checks. It is the solution.

$\frac{2}{3} \cdot t = \frac{5}{6}$

$\frac{5}{2}$ minutes it takes to

$t = \frac{6}{3} \div$ Dividing both sides by 3

$t = \frac{5}{2} \cdot \frac{6}{3} = \frac{5 \cdot 3}{2 \cdot 3 \cdot 2} = \frac{3}{3} \cdot \frac{5}{2}$

$= \frac{5}{4}$

The number $\frac{5}{4}$ checks. It is the solution.

61. $\frac{8}{36} = \frac{17}{x}$

$8 \cdot x = 17 \cdot 36$ Equating cross products

$\frac{8 \cdot x}{8} = \frac{17 \cdot 36}{8}$

$x = \frac{17 \cdot 4 \cdot 9}{2 \cdot 4} = \frac{153}{2}$, or 76.5, or $76\frac{1}{2}$

On the horizontal scale, in four equally-spaced intervals, indicate responses. Label this scale "Responses." Then make

Solve. We carry out the addition.

$627 + 48 = d$

$675 = d$

Check. We can repeat the calculation. The answer checks.

State. The total donation was \$675.

66. *Familiarize*. Let m = the numberof wrap 8710 candy bars.

Translate.

Number of bars per minute	Number of minutes	is	Number of wrapped bars
134	$\times m$	=	8710

Solve.

$134 \times m = 8710$

$\frac{134 \times m}{134} = \frac{8710}{134}$

$m = 65$

Check. $134 \cdot 65 = 8710$, so the answerchecks.

State. It takes 65 min to wrap 8710 candy bars.

Familiarize. Let p = the price of the stock when it was resold.

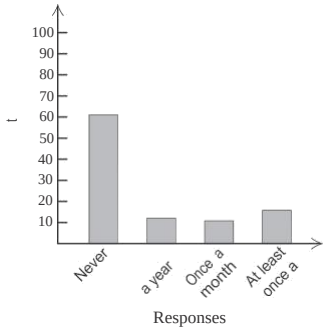
Translate.

Original price	minus	Drop in price	is	Price

ten equally-spaced tick marks on the vertical scale price s price before resale

and label them by 10's. Label this scale "Percent." Draw

vertical bars above the responses to show the percents.



$x + 22^\circ + 40^\circ = 180^\circ$

$+62^\circ = 180^\circ$

$180^\circ - 62^\circ$

118°

From Exercise 63 we know that $m(A) = 118^\circ$, so A is an obtuse angle. Thus, the triangle is an obtuse triangle.

Familiarize. Let d = the total donation.

Translate.

First donation plus Second donation is Total donation

$627 + 48 = d$

$29.63 - 3.88 = p$

Solve. We carry out the subtraction.

$29.63 - 3.88 = p$

$25.75 = p$

Check. we can repeat the calculation. The answer checks.

State. The price of the stock before it was resold was $25.75.

Familiarize. Let t = the length of the trip, in miles.

Translate.

Starting mileage plus t is driven ending mileage

$27,428.6 + t = 27,914.5$

Solve.

$27,428.6 + t = 27,914.5$

$27,428.6 + t - 27,428.6 = 27,914.5 - 27,428.6$

$t = 485.9$

Check. $27,428.6 + 485.9 = 27,914.5$, so the answer checks.

State. The trip was 485.9 mi long.

Familiarize. Let a = the amount that remains after the taxes are paid. *Translate*.

Income minus Federal taxes	minus State taxes	is	Amount remaining
$12,000 - 2300 - 1600 =$	t		

Solve. We carry out the calculations on the left side of the equation.

$$12,000 - 2300 - 1600 = t$$
$$9700 - 1600 = t$$
$$8100 = t$$

Check. The total taxes paid were \$2300 + \$1600, or \$3900, and \$12,000 − \$3900 = \$8100 so the answer checks.

State. \$8100 remains after the taxes are paid.

Familiarize. Let p = the amount the teacher was paid.

Translate.

Daily pay	times	Number of days	is	Amount paid
87	×	9		
		p		

Solve. We carry out the multiplication.

$$87 \times 9 = p$$
$$783 = p$$

Check. We can repeat the calculation. The answer checks.

State. The teacher was paid \$783.

Familiarize. Let d = the distance Celeste would walk in $1\frac{1}{2}$ hr, in kilometers.

Solve.

$$s \times 8 = 679.68$$
$$\frac{s \times 8}{8} = \frac{679.68}{8}$$
$$= 84.96$$

Check. $8 \cdot \$84.96 = \$679.68$, so the answer checks.

State. Each sweater cost \$84.96.

Familiarize. Let p = the number of gallons of paint needed to cover 650 ft^2.

Translate. We translate to a proportion.

$$\frac{\text{Gallons} \rightarrow}{\text{Area} \rightarrow} \frac{8}{400} = \frac{p}{650} \leftarrow \frac{\text{Gallons}}{\text{Area covered}}$$

Solve. We equate cross products.

$$\frac{8}{400} = \frac{p}{650}$$
$$8 \cdot 650 = 400 \cdot p$$
$$\frac{8 \cdot 650}{400} = \frac{400 \cdot p}{400}$$
$$13 = p$$

Check. We can substitute in the proportion and check the cross products.

$$\frac{8}{13} = \frac{5200}{400}; \quad 8 \cdot 650 = 5200; \quad 400 \cdot 650 = 5200$$

The cross products are the same so the answer checks.

State. 13 gal of paint is needed to cover 650 ft^2.

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

$$\$4000 \times 5\% \times \frac{3}{4}$$

Translate.

Speed	times	Time	is

Distance

$4000 × 0.05 × 4
$150

Commission = Commission rate × Sales

$\frac{3}{5} \cdot \frac{1}{2} = d$

Solve. We carry out the multiplication.

$\frac{3}{5} \cdot \frac{1}{2} = d$

$\frac{3}{10} = d$

Check. We can repeat the calculation. The answer checks.

State. Celeste would walk $\frac{3}{10}$ km in 2 hr.

Familiarize. Let s = the cost of each sweater.

Translate.

Cost of each sweater		Number of sweaters		Total cost
s	$\cdot$	8	=	679.68

$5800 = r \cdot 84,000$

We divide both sides of the equation by 84,000.

$$\frac{5880}{84,000} = \frac{r \cdot 84,000}{84,000}$$

$0.07 = r$

$7\% = r$

The commission rate is 7%.

Familiarize. Let p = the population aftera year.

Translate.

Current population		plus 4% of current population	is	Population aftera year
29,000		+ 4% · 29,000	=	p

Solve.

$29,000 + 0.04 \cdot 29,000 = p$

$29,000 + 1160 = p$

$30,160 = p$

Check. The new population will be 104% of the origi- nal population. Since 104% of 29, 000 = 1.04 · 29, 000 =

30, 160, the answerchecks.
State. Aftera yearthe population will be 30,160.

77. To find the average age we add the ages and divide by the numberof addends.

$$\frac{18+21+26+31+32+19}{6} = \frac{147}{7} = 28$$

The average age is 28.

To find the median we first arrange the numbers from smallest to largest. The median is the middle number.

18, 18, 21, 26, 31, 32,

↑ Middle number

The median is 26.

The number 18 occurs most frequently, so it is the mode.

78. $18^2 = 18 \cdot 18 = 324$

79. $7^3 = 7 \cdot 7 \cdot 7 = 343$

$\sqrt{9} =$

The square root of 9 is 3 because $3^2 = 9$.

$\sqrt{121} = 11$

The square root of 121 is 11 because $11^2 = 121$.

82. $\sqrt{20} \approx 4.472$ Using a calculator

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

$= 1$ yd $+ \frac{1}{3} \times 3$ ft

$= 1$ yd $+ \frac{1}{3} \times 36$ in.

$= 1$ yd $+ \frac{36}{3}$ in.

$= 1$ yd $+ 12$ in.

4280 mm = cm

Think: To go from mm to cm in the table is a move of 1 place to the left. Thus, we move the decimal point 1 place to the left.

87. 5 lb = 5 × 1 lb
= 5 × 16 oz
= 80 oz

88. 0.008 cg = ____ mg

Think: To go from cg to mg in the table is a move of 1 place to the right. Thus, we move the decimal point 1 place to the right.

0.008
0.0.08
↑

0.008 cg = 0.08 mg

89. 8190 mL = 8190 × 1 mL
= 8190 × 0.001 L
= 8.19 L

90. 20 qt = $20 \text{ qt} \times \frac{1 \text{ gal}}{4 \text{ qt}}$

$= \frac{20}{4} \times 1$ gal
= 5 gal

$a^2 + b^2 = c^2$ Pythagorean equation

$5^2 + 5^2 = c^2$
$25 + 25 = c^2$
$50 = c^2$
$\sqrt{50} = c$ Exact answer
$7.071 \approx c$ Approximation

The length of the third side is $\sqrt{50}$ ft, orapproximately 7.071 ft.

4280 mm = 428 cm

3 days = 3 × 1 day
= 3 × 24 hr
= 72 hr

7.071 ft.

$d = 2 \cdot r = 2 \cdot 10.4$ in. = 20.8 in.

$C = 2 \cdot \pi \cdot r$
$C \approx 2 \cdot 3.14 \cdot 10.4$ in. = 65.312 in.

$A = \pi \cdot r \cdot r$
$A \approx 3.14 \cdot 10.4$ in. $\cdot$ 10.4 in. = 339.6224 in^2

20,000 g = kg

Think: To go from g to kg in the table is a move of 3 places to the left. Thus, we move the decimal point 3 places to the left.

20,000 → 20.000

20,000 g = 20 kg

$P = 2 \cdot (l + w)$
$P = 2 \cdot (10.3 \text{ m} + 2.5 \text{ m})$ $P = 2 \cdot (12.8 \text{ m})$
$P = 25.6$ m

$A = l \cdot w$
$A = (10.3 \text{ m}) \cdot (2.5 \text{ m})$ $A = 10.3 \cdot 2.5 \cdot \text{m} \cdot \text{m}$
$A = 25.75 \text{ m}^2$

94. $A = \frac{1}{2} b h$
$= \frac{1}{2} \cdot 10 \text{ in.} \cdot 5 \text{ in.}$
$A = 25 \text{ in}^2$

95. $A = b \cdot h$
$A = 15.4 \text{ cm} \cdot 4 \text{ cm}$
$A = 61.6 \text{ cm}^2$

96. $A = \frac{1}{2} \cdot (a + b)h$
$A = \frac{1}{2} \cdot 8.3 \text{ yd} \cdot (10.8 \text{ yd} + 20.2 \text{ yd})$
$A = \frac{8.3 \cdot 31}{2} \text{ yd}^2$
$A = 128.65 \text{ yd}^2$

97. $V = l \cdot w \cdot h$
$V = 10 \text{ m} \cdot 2.3 \text{ m} \cdot 2.3 \text{ m}$
$V = 23 \cdot 2.3 \text{ m}^3$
$= 52.9 \text{ m}^3$

98. $V = Bh = \pi \cdot r^2 \cdot h$
$V \approx 3.14 \cdot 4 \text{ ft} \cdot 4 \text{ ft} \cdot 16 \text{ ft}$
V

99. $V = \frac{1}{3} \cdot r^2 \cdot h$
$\approx \frac{1}{3} \cdot 3.14 \cdot 4 \text{ cm} \cdot 4 \text{ cm} \cdot 16 \text{ cm}$
$67.94\overline{6} \text{ cm}^3$

$7 - x = 12$
$7 - x - 7 = 12$
$-x = 5$
$-1 \cdot x = -1 \cdot 5$
$x = -5$
The number -5 checks. It is the solution.

$-4.3x = -17.2$
$\frac{-4.3x}{-4.3} = \frac{-17.2}{-4.3}$
$x = 4$
The number 4 checks. It is the solution.

103. $5(x - 2) - 8(x - 4) = 20$
$5x - 10 - 8x + 32 = 20$
$-3x + 22 = 20$
$3x + 22 - 22 = 20 - 22$
$-3x = -2$
$\frac{-3x}{-3} = \frac{-2}{-3}$
$x = \frac{2}{3}$
The number $\frac{2}{3}$ checks. It is the solution.

104. $12 \times 20 - 10 \div 5 = 240 - 2 = 238$

105. $4^3 - 5^2 + (16 \cdot 4 + 23 \cdot 3) = 4^3 - 5^2 + (64 + 69)$
$= 4^3 - 5^2 + 133$
$= 64 - 25 + 133$
$= 39 + 133$
$= 172$

$|(-1) \cdot 3| = |-3| = 3$
$17 + (-3)$
The absolute values are 17 and 3. The difference is $17 - 3$, or 14. The positive number has the larger absolute value, so the answer is positive.
$17 + (-3) = 14$

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

109. $(-6) \cdot (-5) = 30$

110. $-\frac{5}{14} \cdot \frac{5}{14} = \frac{5}{7} \cdot \frac{2}{35} = \frac{2}{7 \cdot 5} \cdot \frac{5 \cdot 7}{7} = \frac{2}{7}$

$-\frac{48}{7}$

$-6 = -8$ Check: $-8 \cdot (-6) = 48$

112. Let y = the

number; $y + 17$,
or$17 + y$

$-4.3 \quad -4.3$

$x = 4$

The number4 checks. It is the solution.

$5x + 7 = 3x - 9$

$5x + 7 - 3x = 3x - 9$
$3x$

$2x + 7 = -9$

$2x + 7 - 7 = -9$
7

$2x = -16$

$\frac{2x}{2} = \frac{-16}{2}$

$x = -8$

The number -8 checks. It is the solution.

Let x = the number; 38%x, or 0.38x

Familiarize. Let s = the amount Rachel paid forher scooter. Then $s + 98$ = the amount Nathan paid forhis.

Translate.

Amount Rachel paid | plus | Amount Nathan paid is | Total amount

$s + (s + 98) = 192$

Solve.

$s + (s +$

$2s + 98 = 192$
$2s = 94$
$= 47$

We were asked to find only s, but we also find $s + 98$ so that we can check the answer.

If $s = 47$, then $s + 98 = 47 + 98 = 145$.

Check. $145 is $98 more than $47, and $47 + $145 = $192.

The answerchecks.

State. Rachel paid $47 forherscooter.

115. *Familiarize*. Let P = the amount originally invested.

Using the formula for simple interest, $I = P \cdot r \cdot t$, we know amounttheinterestintheis $P \cdot 4\% \cdot 1$, or$0.04P$, and the account after1 yearis $P + 0.04P$, or $1.04P$.

Translate.

Amount in the account after1 yr	is	$2288
$1.04P$	=	2288

Solve.

$$1.04P = 2288$$
$$P = \frac{2288}{1.04}$$
$$P = 2200$$

Check. $2200 \cdot 0.04 \cdot 1 = \$88$ and $\$2200 + \$88 = \$2288$, so the answerchecks.

State. Originally, there was $2200 in the account.

Familiarize. Let x = the length of the first piece, in meters. Then $x + 3$ = the length of the second piece and $\frac{4}{5}x$ = the length of the third piece.

Translate.

Length of 1st piece	plus	Length of 2nd piece	plus	Length of 3rd piece	is	Total length
x	+	$(x+3)$	+	$\frac{4}{5}x$	=	143

Solve.

$$x + (x+3) + \frac{4}{5}x = 143$$
$$\frac{10}{5}x + \frac{5}{5}x + \frac{4}{5}x = 143$$
$$\frac{19}{5}x + 3 = 143$$
$$\frac{19}{5}x = 140$$
$$\frac{5}{19}\cdot\frac{19}{5}x = \frac{5}{19}\cdot 140$$
$$x = \frac{700}{19}$$

$$x + 3 = \frac{700}{19} + 3 = \frac{757}{19}$$

$$\frac{4}{5}x = \frac{4}{5}\cdot\frac{700}{19} = \frac{560}{19}$$

Check. $\frac{700}{19} + \frac{757}{19} + \frac{560}{19} = \frac{2017}{19} = 106\frac{3}{19}$, the total length.

State. The lengths of the pieces are $\frac{700}{19}$ m, $\frac{757}{19}$ m, and $\frac{560}{19}$ m.

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

$$6\left(\frac{2}{3}x + \frac{1}{6}x\right) = 6\left(\frac{1}{6} - 3x\right)$$
$$4x + x = 1 - 18x$$
$$5x = 1 - 18x$$
$$5x + 18x = 1 - 18x + 18x$$
$$23x = 1$$
$$\frac{1}{23}\cdot 23x = \frac{1}{23}\cdot 1$$
$$x = \frac{1}{23}$$

The number$\frac{1}{23}$ checks. It is the solution.

119. $\frac{3}{4}x - \frac{3}{4}y - \frac{1}{4}x - \frac{3}{4}y = \frac{1}{4}x - \frac{1}{4}x - \frac{3}{4}y - \frac{3}{4}y$

$$\frac{2}{4}x - \frac{6}{4}y = 0 - \frac{6}{4}y$$
$$\frac{1}{2}x - \frac{3}{2}y = -\frac{3}{2}y$$
$$2\left(\frac{1}{2}x - \frac{3}{2}y\right) = 2\left(-\frac{3}{2}y\right)$$
$$x - 3y = -3y$$
$$x - 3y + 3y = -3y + 3y$$
$$x = 0$$

The number0 checks. It is the solution.

$$29.966 - 8.673y = -8.18 + 10.4y$$
$$29.966 - 8.673y + 8.673y = -8.18 + 10.4y + 8.673y$$
$$29.966 = -8.18 + 19.073y$$
$$29.966 + 8.18 = -8.18 + 19.073y + 8.18$$
$$38.146 = 19.073y$$
$$\frac{38.146}{19.073} = \frac{19.073y}{19.073}$$
$$2 = y$$

The number2 checks. It is the solution.

$= \quad +$

$x +$

y

$- \quad - \quad - \quad -$

$$x + (x + 3) + \frac{4}{5}x = 143$$

$$\frac{14}{14}x + 3 = \frac{5}{5}143$$

$$\frac{14}{14}x + 3 - 3 = 143 - 3$$

$$\frac{14}{14}x = \frac{5}{14}140$$

$$\frac{14}{14}\cdot x = \frac{5}{14}\cdot\frac{5\cdot 14\cdot 10}{1}$$

$$x = \frac{5\cdot 140}{14} = \frac{14}{14}\cdot\frac{5\cdot 10}{1}$$

$$x = 50$$

If $x = 50$, then $x + 3 = 50 + 3 = 53$ and $\frac{4}{5}x = \frac{4}{5}\cdot 50 = 40$.

Check. The second piece is 3 m longerthan the first piece,

and the third piece is four-fifths as long as the first piece.

Also, 50 m + 53 m + 40 m = 143 m, so the answerchecks.

State. The length of the first piece of wire is 50 m, the length of the second piece is 53 m, and the length of the third piece is 40 m.

$$\frac{4}{4}\left(\frac{2}{x} + \frac{6}{y}\right) = \frac{4}{1}\cdot\frac{2}{x} + \frac{4}{3}\cdot\frac{6}{y} = \frac{8}{x} - \frac{24}{y}$$

Answer C is

120. correct.

$$8x + 4y - 12z = 4\cdot 2x + 4\cdot y - 4\cdot 3z$$

$$4(2x + y - 3z)$$

Answer B is correct.

121. $-\frac{13}{25} \div -\frac{5}{13} = \frac{13}{25}\cdot\frac{13}{5} = \frac{13\cdot 5}{25\cdot 5}\cdot\frac{13}{13} = \frac{13\cdot 5\cdot 1}{5\cdot 5\cdot 13}\cdot\frac{13\cdot 5}{13\cdot 5} = \frac{1}{5}\cdot\frac{1}{5}$

Answer D is correct.

122. $-27 + (-11)$

We have two negative numbers. Add the absolute values,
27 and 11, getting 38. Make the answernegative.

$-27 + (-11) = -38$

Answer A is correct.

Familiarize. The difference of the numbers is 40, so one number is 40 more than the other. Let x = the smaller number. Then $x + 40$ = the larger number.

Translate. The sum of the numbers is 430, so we have $x + (x + 40) = 430$.

Solve.

$$x + (x + 40) = 430$$
$$2x + 40 = 430$$
$$2x = 390$$
$$x = 195$$

If $x = 195$, then $x + 40 = 235$.

Check. The sum of the numbers is $195 + 235$, or 430, and their difference is $235 - 195$, or 40. The answer checks.

State. The numbers are 195 and 235.