

Section 3.1 Addition, Subtraction, Multiplication, and Division Properties of Equality

Section 3.1 Practice Exercises

1. (a) equation

(b) solution

(c) linear

(d) solution set

3. Expression

5. Equation

7. Substitute the value into the equation and determine if the right-hand side is equal to the left-hand side.

9. No;

$$4 - 1 \neq 5$$

$$3 \neq 5$$

11. Yes;

$$5(-2) = -10$$

$$-10 = -10$$

13. Yes;

$$3(-2) + 9 = 3$$

$$-6 + 9 = 3$$

$$3 = 3$$

15. $x + 6 = 5$

$$x + 6 + (-6) = 5 + (-6)$$

$$x = -1$$

17. $q - 14 = 6$

$$q - 14 + 14 = 6 + 14$$

$$q = 20$$

19. $2 + m = -15$

$$-2 + 2 + m = -15 - 2$$

$$m = -17$$

21. $-23 = y - 7$

$$-23 + 7 = y - 7 + 7$$

$$-16 = y \text{ or } y = -16$$

23. $4 + c = 4$

$$-4 + 4 + c = 4 - 4$$

$$c = 0$$

25. $4.1 = 2.8 + a$

$$4.1 - 2.8 = -2.8 + 2.8 + a$$

$$1.3 = a \text{ or } a = 1.3$$

27. $5 = z - \frac{1}{2}$

$$5 + \frac{1}{2} = z - \frac{1}{2} + \frac{1}{2}$$

$$\frac{11}{2} = z \text{ or } z = \frac{11}{2} \text{ or } z = 5\frac{1}{2}$$

29. $x + \frac{5}{2} = \frac{1}{2}$

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

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

31. $-6.02 + c = -8.15$

$$6.02 - 6.02 + c = -8.15 + 6.02$$

$$c = -2.13$$

33. $3.245 + t = -0.0225$

$$3.245 - 3.245 + t = -0.0225 - 3.245$$

$$t = -3.2675$$

35. $6x = 54$

$$\frac{6x}{6} = \frac{54}{6} \Rightarrow x = 9$$

37. $12 = -3p$

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

$$-4 = p \text{ or } p = -4$$

39. $-5y = 0$

$$\frac{-5y}{-5} = \frac{0}{-5} \Rightarrow y = 0$$

$$41. \quad -\frac{y}{5} = 3$$

$$-\frac{y}{5} \cdot (-5) = 3(-5)$$

$$y = -15$$

$$43. \quad \frac{4}{5} = -t$$

$$\frac{4}{5}(-1) = -t(-1)$$

$$-\frac{4}{5} = t \quad \text{or} \quad t = -\frac{4}{5}$$

$$45. \quad \frac{2}{5}a = -4$$

$$\frac{5}{2} \cdot \frac{2}{5}a = \frac{5}{2}(-4) = -\frac{20}{2}$$

$$a = -10$$

$$47. \quad -\frac{1}{5}b = -\frac{4}{5}$$

$$(-5)\left(-\frac{1}{5}b\right) = (-5)\left(-\frac{4}{5}\right)$$

$$b = 4$$

$$49. \quad -41 = -x$$

$$(-1)(-41) = (-1)(-x)$$

$$x = 41$$

$$51. \quad 3.81 = -0.03p$$

$$\frac{3.81}{-0.03} = \frac{-0.03p}{-0.03}$$

$$p = -127$$

$$53. \quad 5.82y = -15.132$$

$$\frac{5.82y}{5.82} = \frac{-15.132}{5.82}$$

$$y = -2.6$$

$$55. \quad \text{Let } x = \text{the number. } -8 + x = 42;$$

$$-8 + x = 42$$

$$8 - 8 + x = 42 + 8$$

$$x = 50$$

$$57. \quad \text{Let } x = \text{the number. } x - (-6) = 18;$$

$$x - (-6) = 18$$

$$x + 6 - 6 = 18 - 6$$

$$x = 12$$

$$59. \quad \text{Let } x = \text{the number.}$$

$$x \cdot 7 = -63 \quad \text{or} \quad 7x = -63$$

$$\frac{7x}{7} = \frac{-63}{7}$$

$$x = -9$$

$$61. \quad \text{Let } x = \text{the number. } x - 3.2 = 2.1$$

$$x - 3.2 + 3.2 = 2.1 + 3.2$$

$$x = 5.3$$

$$63. \quad \text{Let } x = \text{the number. } \frac{x}{12} = \frac{1}{3}$$

$$12 \cdot \frac{x}{12} = 12 \cdot \frac{1}{3}$$

$$x = 4$$

$$65. \quad \text{Let } x = \text{the number.}$$

$$x + \frac{5}{8} = \frac{13}{8};$$

$$x + \frac{5}{8} = \frac{13}{8}$$

$$x + \frac{5}{8} - \frac{5}{8} = \frac{13}{8} - \frac{5}{8}$$

$$x = \frac{8}{8} = 1$$

$$67. \quad \text{(a)} \quad x - 9 = 1$$

$$x - 9 + 9 = 1 + 9$$

$$x = 10$$

$$\text{(b)} \quad -9x = 1$$

$$\frac{-9x}{-9} = \frac{1}{-9}$$

$$x = -\frac{1}{9}$$

$$69. \quad \text{(a)} \quad -\frac{2}{3}h = 8$$

$$\left(-\frac{3}{2}\right)\left(-\frac{2}{3}h\right) = \left(-\frac{3}{2}\right) \cdot 8$$

$$h = -\frac{24}{2}$$

$$= -12$$

$$\text{(b)} \quad \frac{2}{3} + h = 8$$

$$-\frac{2}{3} + \frac{2}{3} + h = -\frac{2}{3} + 8$$

$$h = \frac{22}{3} \text{ or } 7\frac{1}{3}$$

$$71. \quad \frac{r}{3} = -12$$

$$3 \cdot \frac{r}{3} = 3(-12)$$

$$r = -36$$

$$73. \quad k + 16 = 32$$

$$k + 16 - 16 = 32 - 16$$

$$k = 16$$

$$75. \quad 16k = 32$$

$$\frac{16k}{16} = \frac{32}{16}$$

$$k = 2$$

$$77. \quad 7 = -4q$$

$$\frac{7}{-4} = \frac{-4q}{-4}$$

$$q = -\frac{7}{4} \text{ or } -1\frac{3}{4}$$

$$79. \quad -4 + q = 7$$

$$-4 + 4 + q = 4 + 7$$

$$q = 11$$

$$81. \quad -\frac{1}{3}d = 12$$

$$(-3)\left(-\frac{1}{3}d\right) = (-3)(12) \Rightarrow d = -36$$

$$83. \quad 4 = \frac{1}{2} + z$$

$$4 - \frac{1}{2} = \frac{1}{2} - \frac{1}{2} + z$$

$$z = \frac{7}{2} \text{ or } 3\frac{1}{2}$$

$$85. \quad 1.2y = 4.8$$

$$\frac{1.2y}{1.2} = \frac{4.8}{1.2}$$

$$y = 4$$

$$87. \quad 4.8 = 1.2 + y$$

$$4.8 - 1.2 = 1.2 - 1.2 + y$$

$$y = 3.6$$

$$89. \quad 0.0034 = y - 0.405$$

$$0.0034 + 0.405 = y - 0.405 + 0.405$$

$$y = 0.4084$$

91. Yes

93. No

95. Yes

97. Yes

99. For example: $y + 9 = 15$

101. For example: $2p = -8$

103. For example: $5a + 5 = 5$

105. $5x - 4x + 7 = 8 - 2$

$$x + 7 = 6$$

$$x = -1$$

107. $6p - 3p = 15 + 6$

$$3p = 21$$

$$p = \frac{21}{3}$$

$$= 7$$