

Section 3.2 Solving Linear Equations

Section 3.2 Practice Exercises

1. (a) conditional
(b) contradiction
(c) empty or null
(d) identity

3. $10 - 4w + 7w - 2 + w$
 $= 10 + 3w + w - 2$
 $= 4w + 8$

5. $8y - (2y + 3) - 19$
 $= 8y - 2y - 3 - 19 = 6y - 22$

$$7. \quad 7 = p - 12$$

$$7 + 12 = p - 12 + 12$$

$$19 = p$$

$$9. \quad -7y = 21$$

$$\frac{-7y}{-7} = \frac{21}{-7}$$

$$y = -3$$

$$11. \quad z - 23 = -28$$

$$z - 23 + 23 = -28 + 23$$

$$z = -5$$

$$13. \quad 6z + 1 = 13$$

$$6z + 1 - 1 = 13 - 1$$

$$\frac{6z}{6} = \frac{12}{6}$$

$$z = 2$$

$$15. \quad 3y - 4 = 14$$

$$3y - 4 + 4 = 14 + 4$$

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

$$y = 6$$

$$17. \quad -2p + 8 = 3$$

$$-2p + 8 - 8 = 3 - 8$$

$$\frac{-2p}{-2} = \frac{-5}{-2}$$

$$p = \frac{5}{2} \text{ or } 2\frac{1}{2}$$

$$19. \quad 0.2x + 3.1 = -5.3$$

$$0.2x + 3.1 - 3.1 = -5.3 - 3.1$$

$$\frac{0.2x}{0.2} = \frac{-8.4}{0.2} \Rightarrow x = -42$$

$$21. \quad \frac{5}{8} = \frac{1}{4} - \frac{1}{2}p$$

$$\frac{5}{8} - \frac{1}{4} = -\frac{1}{4} + \frac{1}{4} - \frac{1}{2}p$$

$$(-2)\left(\frac{3}{8}\right) = (-2)\left(-\frac{1}{2}p\right)$$

$$p = -\frac{6}{8} = -\frac{3}{4}$$

$$23. \quad 7w - 6w + 1 = 10 - 4$$

$$w + 1 = 6$$

$$w + 1 - 1 = 6 - 1$$

$$w = 5$$

$$25. \quad 11h - 8 - 9h = -16$$

$$2h - 8 + 8 = -16 + 8$$

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

$$h = -4$$

$$27. \quad 3a + 7 = 2a - 19$$

$$3a - 2a + 7 - 7 = 2a - 2a - 19 - 7$$

$$a = -26$$

$$29. \quad -4r - 28 = -58 - r$$

$$-4r + r - 28 + 28 = -58 + 28 - r + r$$

$$\frac{-3r}{-3} = \frac{-30}{-3}$$

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

$$= 10$$

$$31. \quad -2z - 8 = -z$$

$$-2z + 2z - 8 = -z + 2z$$

$$-8 = z \text{ or } z = -8$$

$$33. \quad \frac{5}{6}x + \frac{2}{3} = -\frac{1}{6}x - \frac{5}{3}$$

$$\frac{5}{6}x + \frac{1}{6}x + \frac{2}{3} - \frac{2}{3} = -\frac{1}{6}x + \frac{1}{6}x - \frac{5}{3} - \frac{2}{3}$$

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

$$35. \quad 3y - 2 = 5y - 2$$

$$3y - 5y - 2 + 2 = 5y - 5y - 2 + 2$$

$$\frac{-2y}{-2} = \frac{0}{-2}$$

$$y = 0$$

$$37. \quad 4q + 14 = 2$$

$$4q + 14 - 14 = 2 - 14$$

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

$$q = -3$$

$$39. -9 = 4n - 1$$

$$-9 + 1 = 4n - 1 + 1$$

$$-8 = 4n$$

$$\frac{-8}{4} = \frac{4n}{4}$$

$$n = -2$$

$$41. 3(2p - 4) = 15$$

$$6p - 12 = 15$$

$$6p - 12 + 12 = 15 + 12$$

$$6p = 27$$

$$\frac{6p}{6} = \frac{27}{6}$$

$$p = \frac{9}{2} \text{ or } 4\frac{1}{2}$$

$$43. 6(3x + 2) - 10 = -4$$

$$18x + 12 - 10 = -4$$

$$18x + 2 = -4$$

$$18x + 2 - 2 = -4 - 2$$

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

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

$$45. 3.4x - 2.5 = 2.8x + 3.5$$

$$3.4x - 2.8x - 2.5 = 2.8x - 2.8x + 3.5$$

$$0.6x - 2.5 + 2.5 = 3.5 + 2.5$$

$$\frac{0.6x}{0.6} = \frac{6}{0.6}$$

$$x = 10$$

$$47. 17(s + 3) = 4(s - 10) + 13$$

$$17s + 51 = 4s - 40 + 13$$

$$17s - 4s = -27 - 51$$

$$\frac{13s}{13} = \frac{-78}{13}$$

$$s = -6$$

$$49. 6(3t - 4) + 10 = 5(t - 2) - (3t + 4)$$

$$18t - 24 + 10 = 5t - 10 - 3t - 4$$

$$18t - 14 = 2t - 14$$

$$16t = 0$$

$$t = 0$$

$$51. 5 - 3(x + 2) = 5$$

$$5 - 3x - 6 = 5$$

$$-3x - 1 = 5$$

$$-3x = 6$$

$$x = -2$$

$$53. 3(2z - 6) - 4(3z + 1) = 5 - 2(z + 1)$$

$$6z - 18 - 12z - 4 = 5 - 2z - 2$$

$$-6z - 22 = -2z + 3$$

$$-4z = 25$$

$$z = -\frac{25}{4}$$

$$55. -2[(4p + 1) - (3p - 1)] = 5(3 - p) - 9$$

$$-2[4p + 1 - 3p + 1] = 15 - 5p - 9$$

$$-8p - 2 + 6p - 2 = 6 - 5p$$

$$-2p - 4 = 6 - 5p$$

$$3p = 10$$

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

or

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

$$57. 3(-0.9n + 0.5) = -3.5n + 1.3$$

$$-2.7n + 1.5 = -3.5n + 1.3$$

$$0.8n = -0.2$$

$$n = -0.25$$

$$59. 2(k - 7) = 2k - 13$$

$$2k - 14 = 2k - 13$$

$$-14 = -13$$

Contradiction; { }

$$61. \text{Conditional equation; } \{-15\}$$

$$7x + 3 = 6x - 12$$

$$x = -15$$

$$63. 3 - 5.2p = -5.2p + 3$$

$$3 = 3$$

Identity; the set of real numbers

65. One solution

67. Infinitely many solutions

$$\begin{aligned}
 69. \quad & 4p - 6 = 8 + 2p \\
 & 4p - 2p - 6 = 8 + 2p - 2p \\
 & 2p - 6 + 6 = 8 + 6 \\
 & 2p = 14 \\
 & \frac{2p}{2} = \frac{14}{2} \\
 & p = 7
 \end{aligned}$$

$$\begin{aligned}
 71. \quad & 2k - 9 = -8 \\
 & 2k - 9 + 9 = -8 + 9 \\
 & 2k = 1 \\
 & \frac{2k}{2} = \frac{1}{2} \\
 & k = \frac{1}{2}
 \end{aligned}$$

$$\begin{aligned}
 73. \quad & 7(w - 2) = -14 - 3w \\
 & 7w - 14 = -14 - 3w \\
 & 10w = 0 \\
 & w = 0
 \end{aligned}$$

$$\begin{aligned}
 75. \quad & 2(x + 2) - 3 = 2x + 1 \\
 & 2x + 4 - 3 = 2x + 1 \\
 & 2x + 1 = 2x + 1 \\
 & 2x - 2x + 1 = 2x - 2x + 1 \\
 & 1 = 1
 \end{aligned}$$

All real numbers are solutions.

$$\begin{aligned}
 77. \quad & 0.5b = -23 \\
 & \frac{0.5b}{0.5} = \frac{-23}{0.5} \\
 & b = -46
 \end{aligned}$$

$$\begin{aligned}
 79. \quad & 8 - 2q = 4 \\
 & 8 - 8 - 2q = 4 - 8 \\
 & -2q = -4 \\
 & \frac{-2q}{-2} = \frac{-4}{-2} \\
 & q = 2
 \end{aligned}$$

$$\begin{aligned}
 81. \quad & 2 - 4(y - 5) = -4 \\
 & 2 - 4y + 20 = -4 \\
 & -4y + 22 = -4
 \end{aligned}$$

$$\begin{aligned}
 -4y &= -26 \\
 y &= \frac{-26}{-4} = \frac{13}{2}
 \end{aligned}$$

$$\begin{aligned}
 83. \quad & 0.4(a + 20) = 6 \\
 & 0.4 + 8 = 6 \\
 & 0.4a = -2 \\
 & \frac{0.4a}{0.4} = \frac{-2}{0.4} \\
 & a = -5
 \end{aligned}$$

$$\begin{aligned}
 85. \quad & 10(2n + 1) - 6 = 20(n - 1) + 12 \\
 & 20n + 10 - 6 = 20n - 20 + 12 \\
 & 20n + 4 = 20n - 8 \\
 & 20n - 20n + 4 = 20n - 20n - 8 \\
 & 4 \neq -8
 \end{aligned}$$

No solution

$$\begin{aligned}
 87. \quad & c + 0.123 = 2.328 \\
 & c + 0.123 - 0.123 = 2.328 - 0.123 \\
 & c = 2.205
 \end{aligned}$$

$$\begin{aligned}
 89. \quad & \frac{4}{5}t - 1 = \frac{1}{5}t + 5 \\
 & \frac{3}{5}t = 6 \\
 & \left(\frac{15}{13}\right) \frac{3}{5}t = 26 \left(\frac{5}{31}\right) \Rightarrow t = 10
 \end{aligned}$$

$$\begin{aligned}
 91. \quad & 8 - (3q + 4) = 6 - q \\
 & 8 - 3q - 4 = 6 - q \\
 & 4 - 3q = 6 - q \\
 & -2q = 2 \\
 & q = -1
 \end{aligned}$$

$$\begin{aligned}
 93. \quad & x + a = 10 \\
 & -5 + a = 10 \\
 & a = 15
 \end{aligned}$$

$$\begin{aligned}
 95. \quad & ax = 12 \\
 & a(3) = 12 \\
 & a = 4
 \end{aligned}$$

$$\begin{aligned}
 97. \quad & \text{For example:} \\
 & 5x + 2 = 2 + 5x
 \end{aligned}$$