

Solution Manual for Beginning and Intermediate Algebra 6th Edition by  
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## Chapter 2 Linear Equations and Inequalities in One Variable

### 2.1 The Addition Property of Equality

#### Classroom Examples, Now Try Exercises

1. Note: When solving equations we will write “Add 5” as a shorthand notation for “Add 5 to each side” and “Subtract 5” as a notation for “Subtract 5 from each side.”

$$\begin{aligned}x - 12 &= -3 && \text{Given} \\x - 12 + 12 &= -3 + 12 && \text{Add 12.} \\x &= 9 && \text{Combine like terms.}\end{aligned}$$

We check by substituting 9 for  $x$  in the *original* equation.

$$\begin{aligned}\text{Check } x - 12 &= -3 && \text{Original equation} \\9 - 12 &= -3 && ?\end{aligned}$$

$$9 - 12 = -3 \quad \text{Let } x = 9.$$

$$-3 = -3 \quad \text{True}$$

Since a true statement results,  $\{9\}$  is the solution set.

**N1.**

$$\begin{aligned}x - 13 &= 4 && \text{Given} \\x - 13 + 13 &= 4 + 13 && \text{Add 13.} \\x &= 17 && \text{Combine like terms.}\end{aligned}$$

We check by substituting 17 for  $x$  in the *original* equation.

$$\text{Check } x - 13 = 4 \quad \text{Original equation}$$

$$\begin{aligned}17 - 13 &= 4 && ? \\4 &= 4 && \text{True}\end{aligned}$$

Since a true statement results,  $\{17\}$  is the solution set.

#### 2.1 The Addition Property of Equality 89

**N2.**

$$\begin{aligned}t - 5.7 &= -7.2 \\t - 5.7 + 5.7 &= -7.2 + 5.7 && \text{Add 5.7.} \\t &= -1.5 \\ \text{Check } t = -1.5: & -7.2 = -7.2 && \text{True} \\ \text{The solution set is } & \{-1.5\}.\end{aligned}$$

**3.**

$$\begin{aligned}-22 &= x + 16 \\-22 - 16 &= x + 16 - 16 && \text{Subtract 16.} \\-38 &= x \\ \text{Check } x = -38: & -22 = -22 && \text{True} \\ \text{The solution set is } & \{-38\}.\end{aligned}$$

**N3.**

$$\begin{aligned}-15 &= x + 12 \\-15 - 12 &= x + 12 - 12 && \text{Subtract 12.} \\-27 &= x \\ \text{Check } x = -27: & -15 = -15 && \text{True} \\ \text{The solution set is } & \{-27\}.\end{aligned}$$

**4.**

$$\begin{aligned}11z - 9 &= 12z \\11z - 9 - 11z &= 12z - 11z && \text{Subtract } 11z. \\-9 &= z \\ \text{Check } z = -9: & -108 = -108 && \text{True} \\ \text{The solution set is } & \{-9\}.\end{aligned}$$

**N4.**

$$\begin{aligned}x - 5 &= 2x \\x - 5 - x &= 2x - x && \text{Subtract } x. \\-5 &= x && \text{Combine terms.} \\ \text{Check } x = -5: & -10 = -10 && \text{True} \\ \text{The solution set is } & \{-5\}.\end{aligned}$$

**5.**

$$\begin{aligned}\frac{7}{2}p + 1 &= \frac{9}{2}p \\ \frac{7}{2}p + 1 - \frac{7}{2}p &= \frac{9}{2}p - \frac{7}{2}p && \text{Subtract } \frac{7}{2}p. \\1 &= p\end{aligned}$$

2.  $m - 4.1 = -6.3$

$$m - 4.1 + 4.1 = -6.3 + 4.1 \text{ Add } 4.1.$$

$$\text{Check } p = 1 : \frac{9}{2} = \frac{9}{2} \text{ True}$$

$$m = -2.2$$

Check  $m = -2.2$ :  $-6.3 = -6.3$  True

This is a shorthand notation for showing that if we substitute  $-2.2$  for  $m$ , both sides are equal to  $-6.3$ , and hence a true statement results. In

practice, this is what you will do, especially if

you're using a calculator.

The solution set is  $\{-2.2\}$ .

The solution set is  $\{1\}$ .

**N5.**

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

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

$$4 = x \quad \text{Subtract } 3x.$$

$$4 = x \quad \text{Combine terms.}$$

$$\text{Check } x = 4: \frac{20}{3} = \frac{20}{3} \quad \text{True}$$

The solution set is  $\{4\}$ .

$$\begin{aligned}
 \mathbf{6.} \quad & 10 - x = -2x + 9 && \text{Given} \\
 & 10 - x + 2x = -2x + 9 + 2x && \text{Add } 2x. \\
 & 10 + x = 9 && \text{Combine terms.} \\
 & 10 + x - 10 = 9 - 10 && \text{Subtract } 10. \\
 & x = -1 && \text{Combine terms.}
 \end{aligned}$$

$$\text{Check } x = -1: 11 = 11 \quad \text{True}$$

The solution set is  $\{-1\}$ .

$$\begin{aligned}
 \mathbf{N6.} \quad & 6x - 8 = 12 + 5x \\
 & 6x - 8 - 5x = 12 + 5x - 5x && \text{Subtract } 5x. \\
 & x - 8 = 12 && \text{Combine terms.} \\
 & x - 8 + 8 = 12 + 8 && \text{Add } 8. \\
 & x = 20 && \text{Combine terms.}
 \end{aligned}$$

$$\text{Check } x = 20: 112 = 112 \quad \text{True}$$

The solution set is  $\{20\}$ .

$$\begin{aligned}
 \mathbf{7.} \quad & 9r + 4r + 6 - 2 = 9r + 4 + 3r \\
 & 13r + 4 = 12r + 4 && \text{Combine terms.} \\
 & 13r + 4 - 12r = 12r + 4 - 12r && \text{Subtract } 12r. \\
 & r + 4 = 4 && \text{Combine terms.} \\
 & r + 4 - 4 = 4 - 4 && \text{Subtract } 4. \\
 & r = 0 && \text{Combine terms.}
 \end{aligned}$$

$$\text{Check } r = 0: 4 = 4 \quad \text{True}$$

The solution set is  $\{0\}$ .

$$\begin{aligned}
 \mathbf{N7.} \quad & 5x - 10 - 12x = 4 - 8x - 9 \\
 & -7x - 10 = -8x - 5 && \text{Combine terms.} \\
 & -7x - 10 + 8x = -8x - 5 + 8x && \text{Add } 8x. \\
 & x - 10 = -5 && \text{Combine terms.} \\
 & x - 10 + 10 = -5 + 10 && \text{Add } 10. \\
 & x = 5 && \text{Combine terms.}
 \end{aligned}$$

$$\text{Check } x = 5: -45 = -45 \quad \text{True}$$

The solution set is  $\{5\}$ .

$$\begin{aligned}
 \mathbf{8.} \quad & 4(x + 1) - (3x + 5) = 1 \\
 & 4(x + 1) - 1(3x + 5) = 1 && -a = -1a \\
 & 4x + 4 - 3x - 5 = 1 && \text{Distributive prop.} \\
 & x - 1 = 1 && \text{Combine terms.} \\
 & x - 1 + 1 = 1 + 1 && \text{Add } 1. \\
 & x = 2 &&
 \end{aligned}$$

$$\text{Check } x = 2: 1 = 1 \quad \text{True}$$

The solution set is  $\{2\}$ .

$$\begin{aligned}
 \mathbf{N8.} \quad & 4(3x - 2) - (11x - 4) = 3 \\
 & 4(3x - 2) - 1(11x - 4) = 3 && -a = -1a \\
 & 12x - 8 - 11x + 4 = 3 && \text{Distributive prop.} \\
 & x - 4 = 3 && \text{Combine terms.} \\
 & x - 4 + 4 = 3 + 4 && \text{Add } 4. \\
 & x = 7 &&
 \end{aligned}$$

$$\text{Check } x = 7: 3 = 3 \quad \text{True}$$

The solution set is  $\{7\}$ .

### Exercises

1. An equation includes an equality symbol, while an expression does not.

2. A linear equation in one variable (here  $x$ ) can be written in the form  $Ax + B = C$ .

3. Equations that have exactly the same solution set are equivalent equations.

4. The addition property of equality states that the same expression may be added to or subtracted from each side of an equation without changing the solution set.

5. (a)  $5x + 8 - 4x + 7$

This is an expression, not an equation, since there is no equals symbol. It can be simplified by rearranging terms and then combining like terms.

$$\begin{aligned}
 5x + 8 - 4x + 7 &= 5x - 4x + 8 + 7 \\
 &= x + 15
 \end{aligned}$$

(b)  $-6y + 12 + 7y - 5$

This is an expression, not an equation, since there is no equals symbol. It can be simplified by rearranging terms and then combining like terms.

$$\begin{aligned}
 -6y + 12 + 7y - 5 &= -6y + 7y \\
 &+ 12 - 5 = y + 7
 \end{aligned}$$

(c)  $5x + 8 - 4x = 7$

This is an equation because of the equals symbol.

$$5x + 8 - 4x = 7$$

$$x + 8 = 7$$

$$x = -1$$

The solution set is  $\{-1\}$ .

(d) This is an equation because of the equals symbol.

$$-6y + 12 + 7y = -5$$

$$y + 12 = -5$$

$$y = -17$$

The solution set is  $\{-17\}$ .

sets are equivalent equations.

$$x + 2 = 6$$

$$x + 2 - 2 = 6 - 2 \text{ Subtract 2.}$$

$$x = 4$$

So  $x + 2 = 6$  and  $x = 4$  are equivalent equations.

$$10 - x = 5$$

$$10 - x - 10 = 5 - 10 \text{ Subtract 10.}$$

$$-x = -5$$

$$-1(-x) = -1(-5) \text{ Multiply by } -1.$$

$$x = 5$$

So  $10 - x = 5$  and  $x = -5$  are not equivalent equations.

Subtract 3 from both sides to get  $x = 6$ , so  $x + 3 = 9$  and  $x = 6$  are equivalent equations. Subtract 4 from both sides to get  $x = 4$ . The second equation is  $x = -4$ , so  $4 + x = 8$  and  $x = -4$  are not equivalent equations. The pairs of equations in A and C are equivalent.

7. Equations A ( $x^2 - 5x + 6 = 0$ ) and B ( $x^3 = x$ ) are not linear equations in one variable because they cannot be written in the form  $Ax + B = C$ . Note that in a linear equation the exponent on the variable must be 1.

8. Check by replacing the variable(s) in the original equation with the proposed solution. A true statement will result if the proposed solution is correct.

9.  $x - 3 = 9$

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

$$x = 12$$

Check this solution by replacing  $x$  with 12 in the original equation.

$$x - 3 = 9$$

?

$$12 - 3 = 9 \text{ Let } x = 12.$$

$$9 = 9 \text{ True}$$

Because the final statement is true,  $\{12\}$  is the solution set.

10.  $x - 9 = 8$

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

$$x = 17$$

$$\text{Check } x = 17$$

?

$$17 - 9 = 8 \text{ Let } x = 17.$$

$$8 = 8 \text{ True}$$

Thus,  $\{17\}$  is the solution set.

11.  $x - 12 = 19$

$$x - 12 + 12 = 19 + 12$$

$$x = 31$$

$$\text{Check } x = 31$$

$$31 - 12 \stackrel{?}{=} 19 \text{ Let } x = 31.$$

$$19 = 19 \text{ True}$$

Thus,  $\{31\}$  is the solution set.

12.  $x - 18 = 22$

$$x - 18 + 18 = 22 + 18$$

$$x = 40$$

Checking yields a true statement, so  $\{40\}$  is the solution set.

13.  $x - 6 = -9$

$$x - 6 + 6 = -9 + 6$$

$$x = -3$$

Checking yields a true statement, so  $\{-3\}$  is the solution set.

14.  $x - 5 = -7$

$$x - 5 + 5 = -7 + 5$$

$$x = -2$$

Checking yields a true statement, so  $\{-2\}$  is the solution set.

15.  $r + 8 = 12$

$$r + 8 - 8 = 12 - 8$$

$$r = 4$$

Checking yields a true statement, so  $\{4\}$  is the solution set.

16.  $x + 7 = 11$

$$x + 7 - 7 = 11 - 7$$

$$x = 4$$

Checking yields a true statement, so  $\{4\}$  is the solution set.

17.  $x + 28 = 19$   
 $x + 28 - 28 = 19 - 28$   
 $x = -9$

Checking yields a true statement, so  $\{-9\}$  is the solution set.

18.  $x + 47 = 26$   
 $x + 47 - 47 = 26 - 47$   
 $x = -21$

Checking yields a true statement, so  $\{-21\}$  is the solution set.

19.  $x + \frac{1}{4} = -\frac{1}{2}$   
 $x + \frac{1}{4} - \frac{1}{4} = -\frac{1}{2} - \frac{1}{4}$

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

Check  $x = -\frac{3}{4}$ :  $-\frac{3}{4} + \frac{1}{4} = -\frac{2}{4} = -\frac{1}{2}$  True

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

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

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

$x = -\frac{1}{6} - \frac{4}{6}$   
 $x = -\frac{5}{6}$

Check  $x = -\frac{5}{6}$ :  $-\frac{5}{6} + \frac{2}{3} = -\frac{5}{6} + \frac{4}{6} = -\frac{1}{6}$  True

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

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

$\{-\frac{1}{6}\}$

21.  $7 + r = -3$   
 $r + 7 = -3$   
 $r + 7 - 7 = -3 - 7$   
 $r = -10$

The solution set is  $\{-10\}$ .

22.  $8 + k = -4$   
 $k + 8 = -4$   
 $k + 8 - 8 = -4 - 8$

23.  $2 = p + 15$   
 $2 - 15 = p + 15 - 15$   
 $-13 = p$

The solution set is  $\{-13\}$ .

24.  $5 - 19 = z + 19 - 19$   
 $-14 = z$   
 The solution set is  $\{-14\}$ .

25.  $-4 = x - 14$   
 $-4 + 14 = x - 14 + 14$   
 $10 = x$   
 The solution set is  $\{10\}$ .

26.  $-7 = x - 22$   
 $-7 + 22 = x - 22 + 22$   
 $15 = x$   
 The solution set is  $\{15\}$ .

27.  $-\frac{1}{3} = x - \frac{3}{5}$   
 $-\frac{1}{3} + \frac{3}{5} = x - \frac{3}{5} + \frac{3}{5}$   
 $-\frac{5}{15} + \frac{9}{15} = x$   
 $-\frac{5}{15} + \frac{9}{15} = x$

Check  $x = \frac{4}{15}$ :  $-\frac{1}{3} + \frac{3}{5} = \frac{4}{15} - \frac{9}{15} = -\frac{5}{15} = -\frac{1}{3}$  True

The solution set is  $\{\frac{4}{15}\}$ .

28.  $-4\frac{1}{3} = x - 3\frac{2}{3}$   
 $-\frac{13}{3} + \frac{2}{3} = x - \frac{2}{3} + \frac{2}{3}$   
 $-\frac{11}{3} = x$

Check  $x = -\frac{11}{3}$ :  $-\frac{11}{3} + \frac{2}{3} = -\frac{9}{3} = -3$  True

$k = -12$

The solution set is  $\{-12\}$ .

The solution set is  $\{-12\}$ .

- 12 True

29.  $x - 8.4 = -2.1$   
 $x - 8.4 + 8.4 = -2.1 + 8.4$   
 $x = 6.3$

The solution set is  $\{6.3\}$ .

30.  $x - 15.5 = -5.1$   
 $x - 15.5 + 15.5 = -5.1 + 15.5$   
 $x = 10.4$

The solution set is  $\{10.4\}$ .

31.  $t + 12.3 = -4.6$   
 $t + 12.3 - 12.3 = -4.6 - 12.3$   
 $t = -16.9$

The solution set is  $\{-16.9\}$ .

32.  $x + 21.5 = -13.4$   
 $x + 21.5 - 21.5 = -13.4 - 21.5$   
 $x = -34.9$

The solution set is  $\{-34.9\}$ .

33.  $3x = 2x + 7$   
 $3x - 2x = 2x + 7 - 2x$  Subtract  $2x$ .  
 $1x = 7$  or  $x = 7$

Check  $x = 7$ :  $21 = 21$  True

The solution set is  $\{7\}$ .

34.  $5x = 4x + 9$   
 $5x - 4x = 4x + 9 - 4x$  Subtract  $4x$ .  
 $1x = 9$  or  $x = 9$

Check  $x = 9$ :  $45 = 45$  True

The solution set is  $\{9\}$ .

35.  $10x + 4 = 9x$   
 $10x + 4 - 9x = 9x - 9x$  Subtract  $9x$ .  
 $1x + 4 = 0$   
 $x + 4 - 4 = 0 - 4$  Subtract  $4$ .

$$x = -4$$

Check  $x = -4$ :  $-36 = -36$  True

The solution set is  $\{-4\}$ .

36.  $8t + 5 = 7t$

$$8t + 5 - 7t = 7t - 7t \text{ Subtract } 7t.$$

$$1t + 5 = 0$$

$$t + 5 - 5 = 0 - 5 \text{ Subtract } 5.$$

$$t = -5$$

Check  $t = -5$ :  $-35 = -35$  True

The solution set is  $\{-5\}$ .

37.  $8x - 3 = 9x$   
 $8x - 3 - 8x = 9x - 8x$  Subtract  $8x$ .  
 $-3 = x$

Check  $x = -3$ :  $8(-3) - 3 = 9(-3)$  True

The solution set is  $\{-3\}$ .

38.  $6x - 4 = 7x$   
 $6x - 4 - 6x = 7x - 6x$  Subtract  $6x$ .  
 $-4 = x$

Check  $x = -4$ :  $6(-4) - 4 = 7(-4)$  True

The solution set is  $\{-4\}$ .

39.  $6t - 2 = 5t$   
 $6t - 2 - 5t = 5t - 5t$  Subtract  $5t$ .  
 $t - 2 = 0$

$$t - 2 + 2 = 2 \quad \text{Add } 2.$$

$$t = 2$$

Check  $t = 2$ :  $6(2) - 2 = 5(2)$  True

The solution set is  $\{2\}$ .

40.  $4z - 6 = 3z$   
 $4z - 6 - 3z = 3z - 3z$  Subtract  $3z$ .  
 $z - 6 = 0$

$$z - 6 + 6 = 6 \quad \text{Add } 6.$$

$$z = 6$$

Check  $z = 6$ :  $4(6) - 6 = 3(6)$  True

The solution set is  $\{6\}$ .

41.  $\frac{2}{5}w - 6 = \frac{7}{5}w$   
 $\frac{2}{5}w - 6 - \frac{2}{5}w = \frac{7}{5}w - \frac{2}{5}w$   $\frac{2}{5}$

$$5 \quad 5 \quad 5 \quad 5 \quad \text{Subtract } 5w.$$

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

$$-6 = w$$

Check  $w = -6$ :  $\frac{2}{5}(-6) - 6 = \frac{7}{5}(-6)$  True

The solution set is  $\{-6\}$ .



$$42. \quad \frac{2}{7}z - 2 = \frac{9}{7}z$$

$$\frac{2}{7}z - 2 - \frac{2}{7}z = \frac{9}{7}z - \frac{2}{7}z \quad \underline{2}$$

Subtract  $7z$ .

$$\frac{7}{7}(-2) = \frac{7}{7}z$$

$$-2 = z$$

$$\underline{2} \quad \underline{9}$$

$$\text{Check } z = -2: \frac{2}{7}(-2) - 2 = \frac{9}{7}(-2) \quad \text{True}$$

The solution set is  $\{-2\}$ .

$$43. \quad \frac{1}{2}x + 5 = -\frac{1}{2}x$$

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

$$x + 5 = 0$$

$$x + 5 - 5 = 0 - 5$$

$$x = -5$$

The solution set is  $\{-5\}$ .

$$44. \quad \frac{1}{5}x + 7 = -\frac{4}{5}x$$

$$\frac{1}{5}x + 7 + \frac{4}{5}x = -\frac{4}{5}x + \frac{4}{5}x$$

$$\frac{5}{5}x + 7 = 0$$

$$x + 7 - 7 = 0 - 7$$

$$x = -7$$

The solution set is  $\{-7\}$ .

$$45. \quad 5.6x + 2 = 4.6x$$

$$5.6x + 2 - 4.6x = 4.6x - 4.6x$$

$$1.0x + 2 = 0$$

$$x + 2 - 2 = 0 - 2$$

$$x = -2$$

The solution set is  $\{-2\}$ .

$$46. \quad 9.1x + 5 = 8.1x$$

$$9.1x + 5 - 8.1x = 8.1x - 8.1x$$

$$1.0x + 5 = 0$$

$$x + 5 - 5 = 0 - 5$$

$$x = -5$$

The solution set is  $\{-5\}$ .

$$47. \quad 1.4x - 3 = 0.4x$$

$$1.4x - 3 - 0.4x = 0.4x - 0.4x$$

$$1.0x - 3 = 0$$

$$1.0x - 3 + 3 = 0 + 3$$

$$x = 3$$

The solution set is  $\{3\}$ .

$$48. \quad 1.9t - 6 = 0.9t$$

$$1.9t - 6 - 0.9t = 0.9t - 0.9t$$

$$1.0t - 6 = 0$$

$$1.0t - 6 + 6 = 0 + 6$$

$$t = 6$$

The solution set is  $\{6\}$ .

$$49. \quad 5p = 4p$$

$$5p - 4p = 4p - 4p$$

$$p = 0$$

The solution set is  $\{0\}$ .

$$50. \quad 8z = 7z$$

$$8z - 7z = 7z - 7z$$

$$z = 0$$

The solution set is  $\{0\}$ .

$$51. \quad 3x + 7 - 2x = 0$$

$$x + 7 = 0$$

$$x + 7 - 7 = 0 - 7$$

$$x = -7$$

The solution set is  $\{-7\}$ .

$$52. \quad 5x + 4 - 4x = 0$$

$$x + 4 = 0$$

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

$$x = -4$$

The solution set is  $\{-4\}$ .

$$53. \quad 3x + 7 = 2x + 4$$

$$3x + 7 - 2x = 2x + 4 - 2x$$

$$x + 7 = 4$$

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

$$x = -3$$

The solution set is  $\{-3\}$ .

54.  $9x + 5 = 8x + 4$

$$9x + 5 - 8x = 8x + 4 - 8x$$

$$x + 5 = 4$$

$$x + 5 - 5 = 4 - 5$$

$$x = -1$$

Check  $x = -1$ :  $-4 = -4$  True

The solution set is  $\{-1\}$ .

55.  $8t + 6 = 7t + 6$

$$8t + 6 - 7t = 7t + 6 - 7t$$

$$t + 6 = 6$$

$$t + 6 - 6 = 6 - 6$$

$$t = 0$$

The solution set is  $\{0\}$ .

56.  $13t + 9 = 12t + 9$

$$13t + 9 - 12t = 12t + 9 - 12t$$

$$t + 9 = 9$$

$$t + 9 - 9 = 9 - 9$$

$$t = 0$$

The solution set is  $\{0\}$ .

57.  $-4x + 7 = -5x + 9$

$$-4x + 7 + 5x = -5x + 9 + 5x$$

$$x + 7 = 9$$

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

$$x = 2$$

The solution set is  $\{2\}$ .

58.  $-6x + 3 = -7x + 10$

$$-6x + 3 + 7x = -7x + 10 + 7x$$

$$x + 3 = 10$$

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

$$x = 7$$

The solution set is  $\{7\}$ .

59.  $5 - x = -2x - 11$

$$5 - x + 2x = -2x - 11 + 2x \quad \text{Add } 2x.$$

$$5 + x - 5 = -11 - 5 \quad \text{Subtract } 5.$$

$$x = -16$$

The solution set is  $\{-16\}$ .

60.  $3 - 8x = -9x - 1$

$$3 - 8x + 9x = -9x - 1 + 9x \quad \text{Add } 9x.$$

$$3 + x = -1$$

$$3 + x - 3 = -1 - 3 \quad \text{Subtract } 3.$$

$$x = -4$$

The solution set is  $\{-4\}$ .

61.  $1.2y - 4 = 0.2y - 4$

$$1.2y - 4 - 0.2y = 0.2y - 4 - 0.2y$$

$$1.0y - 4 = -4$$

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

$$y = 0$$

The solution set is  $\{0\}$ .

62.  $7.7r - 6 = 6.7r - 6$

$$7.7r - 6 - 6.7r = 6.7r - 6 - 6.7r$$

$$1.0r - 6 = -6$$

$$r - 6 + 6 = -6 + 6$$

$$r = 0$$

The solution set is  $\{0\}$ .

63.  $3x + 6 - 10 = 2x - 2$

$$3x - 4 = 2x - 2 \quad \text{Combine terms.}$$

$$3x - 4 - 2x = 2x - 2 - 2x \quad \text{Subtract } 2x.$$

$$x - 4 = -2$$

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

$$x = 2$$

The solution set is  $\{2\}$ .

64.  $8x + 4 - 8 = 7x - 1$

$$8x - 4 = 7x - 1 \quad \text{Combine terms.}$$

$$8x - 4 - 7x = 7x - 1 - 7x \quad \text{Subtract } 7x.$$

$$x - 4 = -1$$

$$x - 4 + 4 = -1 + 4$$

$$x = 3$$

The solution set is  $\{3\}$ .

65.  $5t + 3 + 2t - 6t = 4 + 12$

$$(5 + 2 - 6)t + 3 = 16$$

$$t + 3 - 3 = 16 - 3$$

$$t = 13$$

Check  $t = 13$ :  $16 = 16$  True

The solution set is  $\{13\}$ .

66.  $4x - 6 + 3x - 6x = 3 + 10$

$$x - 6 = 13$$

$$x - 6 + 6 = 13 + 6 \quad \text{Add } 6.$$

$$x = 19$$

Check  $x = 19$ :  $13 = 13$  True

The solution set is  $\{19\}$ .

67.  $6x + 5 + 7x + 3 = 12x + 4$

$$\begin{aligned} 13x + 8 &= 12x + 4 \\ 13x + 8 - 12x &= 12x + 4 - 12x \\ x + 8 &= 4 \\ x + 8 - 8 &= 4 - 8 \\ x &= -4 \end{aligned}$$

Check  $x = -4$ :  $-44 = -44$  True

68.  $4x + 3 + 8x + 1 = 11x + 2$

$$\begin{aligned} 12x + 4 &= 11x + 2 \\ 12x + 4 - 11x &= 11x + 2 - 11x \\ x + 4 &= 2 \\ x + 4 - 4 &= 2 - 4 \\ x &= -2 \end{aligned}$$

Check  $x = -2$ :  $-20 = -20$  True

The solution set is  $\{-2\}$ .

69.  $5.2q - 4.6 - 7.1q = -0.9q - 4.6$

$$\begin{aligned} -1.9q - 4.6 &= -0.9q - 4.6 \\ -1.9q - 4.6 + 0.9q &= -0.9q - 4.6 + 0.9q \\ -1.0q - 4.6 &= -4.6 \\ -1.0q - 4.6 + 4.6 &= -4.6 + 4.6 \end{aligned}$$

$$-q = 0$$

$$q = 0$$

Check  $q = 0$ :  $-4.6 = -4.6$  True

The solution set is  $\{0\}$ .

70.  $4.0x + 2.7 - 9.6x = -4.6x + 2.7$

$$\begin{aligned} 2.7 - 5.6x &= -4.6x + 2.7 \\ 2.7 - 5.6x + 5.6x &= -4.6x + 2.7 + 5.6x \\ 2.7 &= 2.7 + x \\ 2.7 - 2.7 &= x + 2.7 - 2.7 \end{aligned}$$

$$0 = x$$

Check  $x = 0$ :  $2.7 = 2.7$  True

The solution set is  $\{0\}$ .

71.  $\frac{5}{7}x + \frac{1}{3} = -\frac{2}{5}x + \frac{2}{7}$

$$\begin{aligned} \frac{5}{7}x + \frac{1}{3} &= -\frac{2}{5}x + \frac{2}{7} \\ \frac{5}{7}x + \frac{2}{5}x + \frac{1}{3} &= -\frac{2}{5}x + \frac{2}{7} + \frac{2}{5}x \end{aligned}$$

Add  $\frac{2}{5}x$ .

$$\frac{7}{7}x + \frac{1}{3} = \frac{4}{5}$$

Combine terms.

$$1x + \frac{1}{3} = \frac{4}{5}$$

Subtract  $\frac{1}{3}$ .

$$x = \frac{12}{15} - \frac{5}{15}$$

LCD = 15

$$x = \frac{7}{15}$$

Check  $x = \frac{7}{15}$ :  $\frac{2}{3} = \frac{2}{3}$  True

The solution set is  $\left\{\frac{7}{15}\right\}$ .

72. To solve the equation, follow the simplification steps below.

$$\frac{6}{7}s - \frac{3}{4} = \frac{4}{5} - \frac{1}{7}s + \frac{1}{6}$$

$$\frac{6}{7}s - \frac{3}{4} = \frac{24}{30} - \frac{1}{7}s + \frac{5}{30}$$

LCD = 30

$$\frac{6}{7}s - \frac{3}{4} = \frac{29}{30} - \frac{1}{7}s$$

Add.

$$\frac{6}{7}s - \frac{3}{4} + \frac{1}{7}s = \frac{29}{30} - \frac{1}{7}s + \frac{1}{7}s$$

Add  $\frac{1}{7}s$ .

$$\frac{7}{7}s - \frac{3}{4} = \frac{29}{30}$$

Combine terms.

$$1s - \frac{3}{4} + \frac{3}{4} = \frac{29}{30} + \frac{3}{4}$$

Add  $\frac{3}{4}$ .

$$s = \frac{58}{60} + \frac{45}{60}$$

LCD = 60

$$s = \frac{103}{60}$$

Check  $s = \frac{103}{60}$ :  $\frac{101}{60} = \frac{101}{60}$  True

60 140 140

The solution set is  $\left\{\frac{103}{60}\right\}$ .

73.  $(5y + 6) - (3 + 4y) = 10$

$$5y + 6 - 3 - 4y = 10 \quad \text{Distributive prop.}$$

$$y + 3 = 10 \quad \text{Combine terms.}$$

$$y + 3 - 3 = 10 - 3 \quad \text{Subtract 3.}$$

$$y = 7$$

Check  $y = 7$ :  $10 = 10$  True

The solution set is  $\{7\}$ .

74.  $(8r + 3) - (1 + 7r)$

$$= 6r + 3 - 1 -$$

$$7r = 6r + 2 = 6$$

$$r + 2 - 2 = 6 - 2$$

$$r = 4$$

Check  $r = 4$ :  $6 = 6$  True

The solution set is  $\{4\}$ .

75.  $2(p + 5) - (9 + p) =$

$$-3 \quad 2p + 10 - 9 -$$

$$p = -3p + 1 = -3$$

$$p + 1 - 1 = -3 - 1$$

$$p = -4$$

Check  $p = -4$ :  $-3 = -3$  True

The solution set is  $\{-4\}$ .

76.  $4(k + 6) - (8 + 3k) =$

$$-5 \quad 4k + 24 - 8 - 3k$$

$$= -5k + 16 = -5$$

$$k + 16 - 16 = -5 - 16$$

$$k = -21$$

Check  $k = -21$ :  $-5 = -5$  True

The solution set is  $\{-21\}$ .

77.  $-6(2b + 1) + (13b - 7)$

$$= 0 \quad -12b - 6 + 13b$$

$$- 7 = 0 \quad b - 13 = 0 + 13$$

$$b - 13 + 13 = 0 + 13$$

$$b = 13$$

Check  $b = 13$ :  $0 = 0$  True

The solution set is  $\{13\}$ .

78.  $-5(3w - 3) + (16w + 1)$

$$= 0 \quad -15w + 15 + 16w$$

$$+ 1 = 0 \quad w + 16 = 0$$

$$w + 16 - 16 = 0 - 16$$

$$w = -16$$

Check  $w = -16$ :  $0 = 0$  True

The solution set is  $\{-16\}$ .

79.  $10(-2x + 1) = -19(x + 1)$

$$-20x + 10 = -19x - 19$$

$$-20x + 10 + 19x = -19x - 19 + 19x$$

$$-x + 10 = -19$$

$$-x + 10 - 10 = -19 - 10$$

$$-x = -29$$

$$x = 29$$

Check  $x = 29$ :  $-570 = -570$  True

The solution set is  $\{29\}$ .

80.  $2(-3r + 2) = -5(r - 3)$

$$-6r + 4 = -5r + 15$$

$$-6r + 4 + 5r = -5r + 15 + 5r$$

$$4 - r = 15$$

$$4 - r - 4 = 15 - 4$$

$$-r = 11$$

$$r = -11$$

Check  $r = -11$ :  $70 = 70$  True

The solution set is  $\{-11\}$ .

81.  $-2(8p + 2) - 3(2 - 7p) - 2(4 + 2p) = 0 - 16$

$$p - 4 - 6 + 21p - 8 - 4p = 0$$

$$p - 18 = 0$$

$$p - 18 + 18 = 0 + 18$$

$$p = 18$$

Check  $p = 18$ :  $0 = 0$  True

The solution set is  $\{18\}$ .

82.  $-5(1 - 2z) + 4(3 - z) - 7(3 + z) = 0 - 5$

$$+ 10z + 12 - 4z - 21 - 7z = 0$$

$$-z - 14 = 0$$

$$-z - 14 + z = 0 + z$$

$$-14 = z$$

Check  $z = -14$ :  $0 = 0$  True

The solution set is  $\{-14\}$ .

83.  $4(7x - 1) + 3(2 - 5x) - 4(3x + 5) = -6$

$$28x - 4 + 6 - 15x - 12x - 20 = -6$$

$$x - 18 = -6$$

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

$$x = 12$$

Check  $x = 12$ :  $-6 = -6$  TrueThe solution set is  $\{12\}$ .

84.  $9(2m - 3) - 4(5 + 3m) - 5(4 + m) = -3$

$$18m - 27 - 20 - 12m - 20 - 5m = -3$$

$$m - 67 = -3$$

$$m - 67 + 67 = -3 + 67$$

$$m = 64$$

Check  $m = 64$ :  $-3 = -3$  TrueThe solution set is  $\{64\}$ .

85. Answers will vary. One example is  $x - 6 = -8$ .

86. Answers will vary. One example is  $x + \frac{1}{2} = 1$ .

87. "Three times a number is 17 more than twice the number."

$$3x = 2x + 17$$

$$3x - 2x = 2x + 17 - 2x$$

$$x = 17$$

The number is 17 and  $\{17\}$  is the solution set.

88. "One added to three times a number is three less than four times the number."

$$1 + 3x = 4x - 3$$

$$1 + 3x - 3x = 4x - 3 - 3x$$

$$1 = x - 3$$

$$1 + 3 = x - 3 + 3$$

$$4 = x$$

The number is 4 and  $\{4\}$  is the solution set.

89. "If six times a number is subtracted from seven times the number, the result is  $-9$ ."

$$7x - 6x = -9$$

$$x = -9$$

The number is  $-9$  and  $\{-9\}$  is the solution set.

90. "If five times a number is added to three times the number, the result is the sum of seven times the number and 9."

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

$$8x = 7x + 9$$

$$8x - 7x = 7x + 9 - 7x$$

$$x = 9$$

The number is 9 and  $9^{(1)}$  is the solution set.

## 2.2 The Multiplication Property of Equality

### Classroom Examples, Now Try Exercises

1.  $15x = 75$

$$\frac{15x}{15} = \frac{75}{15} \text{ Divide by 15.}$$

$$x = 5$$

Check  $x = 5$ :  $75 = 75$  True

The solution set is  $\{5\}$ .

N1.  $8x = 80$

$$\frac{8x}{8} = \frac{80}{8} \text{ Divide by 8.}$$

$$x = 10$$

Check  $x = 10$ :  $80 = 80$  True

The solution set is  $\{10\}$ .

2.  $8x = -20$

$$\frac{8x}{8} = \frac{-20}{8} \text{ Divide by 8.}$$

$$x = -\frac{20}{8} = -\frac{5}{2} \text{ Write in lowest terms.}$$

Check  $x = -\frac{5}{2}$ :  $-20 = -20$  True

The solution set is  $\left\{-\frac{5}{2}\right\}$ .

N2.  $10x = -24$

$$\frac{10x}{10} = \frac{-24}{10} \text{ Divide by 10.}$$

$$x = -\frac{24}{10} = -\frac{12}{5} \text{ Write in lowest terms.}$$

Check  $x = -\frac{12}{5}$ :  $-24 = -24$  True

The solution set is  $\left\{-\frac{12}{5}\right\}$ .

3.  $5.04 = -0.7x$

$$\frac{5.04}{-0.7} = \frac{-0.7x}{-0.7} \quad \text{Divide by } -0.7.$$

$$x = -7.2$$

Check  $x = -7.2$ :  $5.04 = 5.04$  TrueThe solution set is  $\{-7.2\}$ .

N3.  $7.02 = -1.3x$

$$\frac{7.02}{-1.3} = \frac{-1.3x}{-1.3} \quad \text{Divide by } -1.3.$$

$$x = -5.4$$

Check  $x = -5.4$ :  $7.02 = 7.02$  TrueThe solution set is  $\{-5.4\}$ .

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

$$\frac{1}{4}x = -6$$

$$4x = -6$$

$$\frac{1}{4}x = -6$$

 $4 \cdot \frac{1}{4}x = 4(-6)$  Multiply by 4.

$x = -24$

Check  $x = -24$ :  $-6 = -6$  TrueThe solution set is  $\{-24\}$ .

N4.  $\frac{x}{5} = -7$

$\frac{1}{5}x = -7$

 $5 \cdot \frac{1}{5}x = 5(-7)$  Multiply by 5.

$$x = -35$$

Check  $x = -35$ :  $-7 = -7$  TrueThe solution set is  $\{-35\}$ .

5.  $-\frac{2}{3}t = -12$

$$-\frac{2}{3} \left( \frac{3}{2}t \right) = -\frac{3}{2}(-12) \quad \text{Multiply by } -\frac{3}{2}.$$

$$1 \cdot t = -2 \cdot \frac{3}{2} \cdot -1 \cdot \frac{12}{2}$$

$t = 18$

Check  $t = 18$ :  $-12 = -12$  True

N5.  $\frac{4}{7}z = -16$

$$\frac{7}{7} \left( \frac{4}{7}z \right) = 7(-16) \quad \frac{7}{4}$$

$$4 \left( \frac{7}{4}z \right) = 4(-112) \quad \text{Multiply by } \frac{7}{4}$$

$$1 \cdot z = \frac{7}{4} \cdot \frac{-112}{1}$$

$z = -28$

Check  $z = -28$ :  $-16 = -16$  TrueThe solution set is  $\{-28\}$ .

6.  $-p = -7$

$$-1 \cdot p = -7 \quad (-1)(-1) \cdot p - p = -1 \cdot p$$

$$= (-1)(-7)$$

$1 \cdot p = 7$

$p = 7$

Check  $p = 7$ :  $-7 = -7$  TrueThe solution set is  $\{7\}$ .

N6.  $-x = -9$

$-1 \cdot x = -9$

$-x = -1 \cdot x$

$$(-1)(-1) \cdot x = (-1)(-9) \quad \text{Multiply by } -1.$$

$1 \cdot x = 9$

$x = 9$

Check  $x = 9$ :  $-9 = -9$  TrueThe solution set is  $\{9\}$ .

7.  $4r - 9r = 20$

$-5r = 20$  Combine terms.

$\frac{-5r}{-5} = \frac{20}{-5}$

$r = -4$  Divide by  $-5$ .

$r = -4$

Check  $r = -4$ :  $20 = 20$  TrueThe solution set is  $\{-4\}$ .

N7.  $9n - 6n = 21$

$3n = 21$  Combine terms.

$$\frac{3n}{3} = \frac{21}{3} \quad \text{Divide by } 3.$$

The solution set is  $\{7\}$ .

$$\begin{array}{l} 3 \cdot 3 \\ n = 7 \end{array}$$

Check  $n = 7$ :  $21 = 21$  True

The solution set is  $\{7\}$ .

## Exercises

1. (a) multiplication property of equality; to get  $x$  alone on the left side of the equation, multiply each side by  $\frac{1}{3}$  (or divide each side by 3).  
 (b) addition property of equality; to get  $x$  alone on the left side of the equation, add  $-3$  (or subtract 3) on each side.  
 (c) multiplication property of equality; to get  $x$  alone on the left side of the equation, multiply each side by  $-1$  (or divide each side by  $-1$ ).  
 (d) addition property of equality; to get  $x$  alone on the right side of the equation, add  $-6$  (or subtract 6) on each side.
2. Choice C doesn't require the use of the multiplicative property of equality. After the equation is simplified, the variable  $x$  is alone on the left side.  

$$5x - 4x = 7$$

$$x = 7$$
3. Choice B; to find the solution of  $-x = -4\frac{3}{4}$ , multiply (or divide) each side by  $-1$ , or use the rule "If  $-x = a$ , then  $x = -a$ ."
4. Choice A; to find the solution of  $-x = -24$ , multiply (or divide) each side of the equation by  $-1$ , or use the rule "If  $-x = a$ , then  $x = -a$ ."
5. To get just  $x$  on the left side, multiply both sides of the equation by the reciprocal of  $\frac{4}{5}$ , which is  $\frac{5}{4}$ .
6. To get just  $x$  on the left side, multiply both sides of the equation by the reciprocal of  $\frac{2}{3}$ , which is  $\frac{3}{2}$ .
7. This equation is equivalent to  $10^1 x = 5$ . To get just  $x$  on the left side, multiply both sides of the equation by the reciprocal of  $10^1$ , which is 10.
8. This equation is equivalent to  $100^{\frac{1}{4}} x = 10$ . To get just  $x$  on the left side, multiply both sides of the equation by the reciprocal of  $100^{\frac{1}{4}}$ , which is 100.
9. To get just  $x$  on the left side, multiply both sides of the equation by the reciprocal of  $-\frac{9}{2}$ , which is  $-\frac{2}{9}$ .
10. To get just  $x$  on the left side, multiply both sides of the equation by the reciprocal of  $-\frac{8}{3}$ , which is  $-\frac{3}{8}$ .
11. This equation is equivalent to  $-1x = 0.75$ . To get just  $x$  on the left side, multiply both sides of the equation by the reciprocal of  $-1$ , which is  $-1$ .
12. This equation is equivalent  $-1x = 0.48$ . To get just  $x$  on the left side, multiply both sides of the equation by the reciprocal of  $-1$ , which is  $-1$ .
13. To get just  $x$  on the left side, divide both sides of the equation by the coefficient of  $x$ , which is 6.
14. To get just  $x$  on the left side, divide both sides of the equation by the coefficient of  $x$ , which is 7.
15. To get just  $x$  on the left side, divide both sides of the equation by the coefficient of  $x$ , which is  $-4$ .
16. To get just  $x$  on the left side, divide both sides of the equation by the coefficient of  $x$ , which is  $-13$ .
17. To get just  $x$  on the left side, divide both sides of the equation by the coefficient of  $x$ , which is 0.12.
18. To get just  $x$  on the left side, divide both sides of the equation by the coefficient of  $x$ , which is 0.21.
19. This equation is equivalent to  $-1x = 25$ . To get just  $x$  on the left side, divide both sides of the equation by the coefficient of  $x$ , which is  $-1$ .
20. This equation is equivalent to  $-1x = 50$ . To get just  $x$  on the left side, divide both sides of the equation by the coefficient of  $x$ , which is  $-1$ .



21.  $6x = 36$   
 $\frac{6x}{6} = \frac{36}{6}$  Divide by 6.  
 $1x = 6$   
 $x = 6$   
 Check  $x = 6$ :  $36 = 36$  True  
 The solution set is  $\{6\}$ .

22.  $8x = 64$   
 $\frac{8x}{8} = \frac{64}{8}$  Divide by 8.  
 $x = 8$   
 Check  $x = 8$ :  $64 = 64$  True  
 The solution set is  $\{8\}$ .

23.  $2m = 15$   
 $\frac{2m}{2} = \frac{15}{2}$  Divide by 2.  
 $m = \frac{15}{2}$   
 $2 \cdot \frac{15}{2} = 15$

Check  $m = \frac{15}{2}$ :  $2 \cdot \frac{15}{2} = 15$  True  
 The solution set is  $\left\{ \frac{15}{2} \right\}$ .

24.  $3m = 10$   
 $\frac{3m}{3} = \frac{10}{3}$  Divide by 3.  
 $m = \frac{10}{3}$   
 Check  $m = \frac{10}{3}$ :  $3 \cdot \frac{10}{3} = 10$  True  
 The solution set is  $\left\{ \frac{10}{3} \right\}$ .

25.  $4x = -20$   
 $\frac{4x}{4} = \frac{-20}{4}$  Divide by 4.  
 $x = -5$   
 Check  $x = -5$ :  $-20 = -20$  True  
 The solution set is  $\{-5\}$ .

26.  $5x = -60$   
 $\frac{5x}{5} = \frac{-60}{5}$  Divide by 5.  
 $x = -12$   
 Check  $x = -12$ :  $-60 = -60$  True

27.  $-7x = 28$   
 $\frac{-7x}{-7} = \frac{28}{-7}$  Divide by  $-7$ .  
 $x = -4$   
 Check  $x = -4$ :  $28 = 28$  True  
 The solution set is  $\{-4\}$ .

28.  $-9x = 36$   
 $\frac{-9x}{-9} = \frac{36}{-9}$  Divide by  $-9$ .  
 $x = -4$   
 Check  $x = -4$ :  $36 = 36$  True  
 The solution set is  $\{-4\}$ .

29.  $10t = -36$   
 $\frac{10t}{10} = \frac{-36}{10}$  Divide by 10.  
 $t = -\frac{36}{10} = -\frac{18}{5}$  Lowest terms  
 Check  $t = -\frac{18}{5}$ :  $-36 = -36$  True

The solution set is  $\left\{ -\frac{18}{5} \right\}$ , or  $\{-3.6\}$ .

30.  $10s = -54$   
 $\frac{10s}{10} = \frac{-54}{10}$  Divide by 10.  
 $s = -\frac{54}{10} = -\frac{27}{5}$  Lowest terms

Check  $s = -\frac{27}{5}$ :  $-54 = -54$  True

The solution set is  $\left\{ -\frac{27}{5} \right\}$ , or  $\{-5.4\}$ .

31.  $-6x = -72$   
 $\frac{-6x}{-6} = \frac{-72}{-6}$  Divide by  $-6$ .  
 $x = 12$   
 Check  $x = 12$ :  $-72 = -72$  True  
 The solution set is  $\{12\}$ .

32.  $-4x = -64$   
 $\frac{-4x}{-4} = \frac{-64}{-4}$  Divide by  $-4$ .  
 $x = 16$   
 The solution set is  $\{16\}$ .

$$x = 16$$

Check  $x = 16$ :  $-64 = -64$  True

The solution set is  $\{16\}$ .

33.  $4r = 0$

$$\frac{4r}{4} = \frac{0}{4} \quad \text{Divide by 4.}$$

$$r = 0$$

Check  $r = 0$ :  $0 = 0$  True

The solution set is  $\{0\}$ .

34.  $7x = 0$

$$\frac{7x}{7} = \frac{0}{7} \quad \text{Divide by 7.}$$

$$x = 0$$

Check  $x = 0$ :  $0 = 0$  True

The solution set is  $\{0\}$ .

35.  $-x = 12$

$$-1 \cdot (-x) = -1 \cdot 12 \quad \text{Multiply by } -1.$$

$$x = -12$$

Check  $x = -12$ :  $12 = 12$  True

The solution set is  $\{-12\}$ .

36.  $-t = 14$

$$-1 \cdot (-t) = -1 \cdot 14 \quad \text{Multiply by } -1.$$

$$t = -14$$

Check  $t = -14$ :  $14 = 14$  True

The solution set is  $\{-14\}$ .

37.

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

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

$$\underline{3}$$

$$x = 4$$

Check  $x = 4$ :  $-\frac{3}{4} = -\frac{3}{4}$  True

$$\left[ \frac{3}{4} \right]$$

The solution set is

$$\left\{ \frac{3}{4} \right\}$$

38.  $-x = -\frac{1}{2}$

$$-1 \cdot (-x) = -1 \cdot \left(-\frac{1}{2}\right)$$

$$\underline{1}$$

$$x = 2$$

Check  $x = 2$ :  $-\frac{1}{2} = -\frac{1}{2}$  True

$$\left[ \frac{1}{2} \right]$$

The solution set is

$$\left\{ \frac{1}{2} \right\}$$

39.  $0.2t = 8$

$$\frac{0.2t}{0.2} = \frac{8}{0.2}$$

$$t = 40$$

Check  $t = 40$ :  $8 = 8$  True

The solution set is  $\{40\}$ .

40.  $0.9x = 18$

$$\frac{0.9x}{0.9} = \frac{18}{0.9}$$

$$x = 20$$

Check  $x = 20$ :  $18 = 18$  True

The solution set is  $\{20\}$ .

41.  $-0.3x = 9$

$$\frac{-0.3x}{-0.3} = \frac{9}{-0.3}$$

$$x = -30$$

Check  $x = -30$ :  $9 = 9$  True

The solution set is  $\{-30\}$ .

42.  $-0.5x = 20$

$$-0.5x = 20$$

$$\frac{-0.5x}{-0.5} = \frac{20}{-0.5} \quad \text{Divide by } -0.5.$$

$$x = -40$$

Check  $x = -40$ :  $20 = 20$  True

The solution set is  $\{-40\}$ .

43.  $0.6x = -1.44$

$$\frac{0.6x}{0.6} = \frac{-1.44}{0.6}$$

$$= -2.4 \quad \text{Divide by 0.6.}$$

$$x = -2.4$$

Check  $x = -2.4$ :  $-1.44 = -1.44$  True

The solution set is  $\{-2.4\}$ .

44.  $0.8x = -2.96$

$$\frac{0.8x}{0.8} = \frac{-2.96}{0.8} \quad \text{Divide by 0.8.}$$

$$x = -3.7$$

Check  $x = -3.7$ :  $-2.96 = -2.96$

True The solution set is  $\{-3.7\}$ .

45.  $-9.1 = -2.6x$

$$\frac{-9.1}{-2.6} = \frac{-2.6x}{-2.6}$$

$$= x \quad \text{Divide by } -2.6.$$

$\{2\}$ 

$$-2.6 \quad -2.6$$

$$x = 3.5$$

Check  $x = 3.5$ :  $-9.1 = -9.1$  True

The solution set is  $\{3.5\}$ .

46.  $-7.2 = -4.5x$

$$\frac{-7.2}{-4.5} = \frac{-4.5x}{-4.5} \quad \text{Divide by } -4.5.$$

$$x = 1.6$$

Check  $x = 1.6$ :  $-7.2 = -7.2$  True

The solution set is  $\{1.6\}$ .

47.  $-2.1m = 25.62$

$$\frac{-2.1m}{-2.1} = \frac{25.62}{-2.1} \quad \text{Divide by } -2.1.$$

$$m = -12.2$$

Check  $m = -12.2$ :  $25.62 = 25.62$  True

The solution set is  $\{-12.2\}$ .

48.  $-3.9x = 32.76$

$$\frac{-3.9x}{-3.9} = \frac{32.76}{-3.9}$$

$$x = -8.4$$

Check  $x = -8.4$ :  $32.76 = 32.76$  True

The solution set is  $\{-8.4\}$ .

49.  $4x = -12$

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

$$4 \cdot \frac{x}{4} = 4(-12) \quad \text{Multiply by 4.}$$

$$x = -48$$

Check  $x = -48$ :  $-12 = -12$  True

The solution set is  $\{-48\}$ .

50.  $5p = -3$

$$5 \cdot \frac{1}{5} p = 5(-3) \quad \text{Multiply by 5.}$$

$$p = -15$$

Check  $p = -15$ :  $-3 = -3$  True

The solution set is  $\{-15\}$ .

51.  $6z = 12$

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

$$z = 2$$

$$6 \cdot \frac{1}{6} z = 6 \cdot 2$$

$$z = 2$$

**2.2 The Multiplication Property of Equality**

52.  $5^x = 15$

$$\frac{1}{5} 5^x = \frac{1}{5} 15$$

$$5 \cdot \frac{1}{5} 5^x = 5 \cdot 15$$

$$5^x = 75$$

Check  $x = 75$ :  $15 = 15$  True

The solution set is  $\{75\}$ .

53.  $7^x = -5$

$$\frac{1}{7} 7^x = \frac{1}{7} (-5)$$

$$7^x = -5$$

$$7 \left( \frac{1}{7} \right)^x = 7(-5)$$

$$x = -35$$

Check  $x = -35$ :  $-5 = -5$  True

The solution set is  $\{-35\}$ .

54.  $8r = -3$

$$\frac{1}{8} 8r = \frac{1}{8} (-3)$$

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

$$8r = -24$$

$$r = -24$$

Check  $r = -24$ :  $-3 = -3$  True

The solution set is  $\{-24\}$ .

55.  $7^2 p = 4$

$$\frac{7}{7} \left( \frac{2}{7} p \right) = \frac{7}{7} (4) \quad \text{Multiply by } \frac{7}{7}.$$

$$2(7) p = 2(4)$$

$$p = 14$$

Check  $p = 14$ :  $4 = 4$  True

The solution set is  $\{14\}$ .

56.  $8^3 x = 9$

$$\left( \frac{8}{3} \right) \left( \frac{3}{8} \right) \left( \frac{8}{3} \right) x = \left( \frac{8}{3} \right) (9) \quad \text{Multiply by } \frac{8}{3}.$$

$$x = 24$$

Check  $x = 24$ :  $9 = 9$  True

The solution set is  $\{24\}$ .

Check  $z = 72$ :  $12 = 12$  True

The solution set is  $\{72\}$ .

