Introductory Algebra

Problem Set 2.3

Solutions to Every Odd-Numbered Problem

Name _____

Date _____

2.3 Multiplication Property of Equality

1. Solving the equation:

$$5x = 10$$

$$\frac{1}{5}(5x) = \frac{1}{5}(10)$$

$$x = 2$$

3. Solving the equation:

$$7a = 28$$

$$\frac{1}{7}(7a) = \frac{1}{7}(28)$$

$$a = 4$$

5. Solving the equation:

$$-8x = 4$$

$$-\frac{1}{8}(-8x) = -\frac{1}{8}(4)$$

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

7. Solving the equation:

$$8m = -16$$

$$\frac{1}{8}(8m) = \frac{1}{8}(-16)$$

$$m = -2$$

9. Solving the equation:

$$-3x = -9$$

$$-\frac{1}{3}(-3x) = -\frac{1}{3}(-9)$$

$$x = 3$$

11. Solving the equation:

$$-7y = -28$$

$$-\frac{1}{7}(-7y) = -\frac{1}{7}(-28)$$

$$y = 4$$

13. Solving the equation:

$$2x = 0$$

$$\frac{1}{2}(2x) = \frac{1}{2}(0)$$

$$x = 0$$

15. Solving the equation:

$$-5x = 0$$

$$-\frac{1}{5}(-5x) = -\frac{1}{5}(0)$$

$$x = 0$$

17. Solving the equation:

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

$$3\left(\frac{x}{3}\right) = 3(2)$$

$$x = 6$$

19. Solving the equation:

$$-\frac{m}{5} = 10$$

$$-5\left(-\frac{m}{5}\right) = -5(10)$$

$$m = -50$$

21. Solving the equation:

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

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

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

23. Solving the equation:

$$\frac{2}{3}a = 8$$

$$\frac{3}{2}\left(\frac{2}{3}a\right) = \frac{3}{2}(8)$$

$$a = 12$$

Name _____

Date _____

25. Solving the equation:

$$-\frac{3}{5}x=\frac{9}{5}$$
$$-\frac{5}{3}\left(-\frac{3}{5}x\right)=-\frac{5}{3}\left(\frac{9}{5}\right)$$
$$x=-3$$

27. Solving the equation:

$$-\frac{5}{8}y=-20$$
$$-\frac{8}{5}\left(-\frac{5}{8}y\right)=-\frac{8}{5}(-20)$$
$$y=32$$

29. Simplifying and then solving the equation:

$$-4x-2x+3x=24$$
$$-3x=24$$
$$-\frac{1}{3}(-3x)=-\frac{1}{3}(24)$$
$$x=-8$$

31. Simplifying and then solving the equation:

$$4x+8x-2x=15-10$$
$$10x=5$$
$$\frac{1}{10}(10x)=\frac{1}{10}(5)$$
$$x=\frac{1}{2}$$

33. Simplifying and then solving the equation:

$$-3-5=3x+5x-10x$$
$$-8=-2x$$
$$-\frac{1}{2}(-8)=-\frac{1}{2}(-2x)$$
$$x=4$$

35. Eliminating fractions:

$$18-13=\frac{1}{2}a+\frac{3}{4}a-\frac{5}{8}a$$
$$8(5)=8\left(\frac{1}{2}a+\frac{3}{4}a-\frac{5}{8}a\right)$$
$$40=4a+6a-5a$$
$$40=5a$$
$$\frac{1}{5}(40)=\frac{1}{5}(5a)$$
$$a=8$$

37. Solving by multiplying both sides of the equation by –1:

$$-x=4$$
$$-1(-x)=-1(4)$$
$$x=-4$$

39. Solving by multiplying both sides of the equation by –1:

$$-x=-4$$
$$-1(-x)=-1(-4)$$
$$x=4$$

41. Solving by multiplying both sides of the equation by –1:

$$15=-a$$
$$-1(15)=-1(-a)$$
$$a=-15$$

43. Solving by multiplying both sides of the equation by –1:

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

45. Solving the equation:

$$3x - 2 = 7$$
$$3x - 2 + 2 = 7 + 2$$
$$3x = 9$$
$$\frac{1}{3}(3x) = \frac{1}{3}(9)$$
$$x = 3$$

47. Solving the equation:

$$2a + 1 = 3$$
$$2a + 1 + (-1) = 3 + (-1)$$
$$2a = 2$$
$$\frac{1}{2}(2a) = \frac{1}{2}(2)$$
$$a = 1$$

49. Eliminating fractions:

$$\frac{1}{8} + \frac{1}{2}x = \frac{1}{4}$$
$$8\left(\frac{1}{8} + \frac{1}{2}x\right) = 8\left(\frac{1}{4}\right)$$
$$1 + 4x = 2$$
$$(-1) + 1 + 4x = (-1) + 2$$
$$4x = 1$$
$$\frac{1}{4}(4x) = \frac{1}{4}(1)$$
$$x = \frac{1}{4}$$

51. Solving the equation:

$$6x = 2x - 12$$
$$6x + (-2x) = 2x + (-2x) - 12$$
$$4x = -12$$
$$\frac{1}{4}(4x) = \frac{1}{4}(-12)$$
$$x = -3$$

53. Solving the equation:

$$2y = -4y + 18$$
$$2y + 4y = -4y + 4y + 18$$
$$6y = 18$$
$$\frac{1}{6}(6y) = \frac{1}{6}(18)$$
$$y = 3$$

55. Solving the equation:

$$-7x = -3x - 8$$
$$-7x + 3x = -3x + 3x - 8$$
$$-4x = -8$$
$$-\frac{1}{4}(-4x) = -\frac{1}{4}(-8)$$
$$x = 2$$

57. Solving the equation:

$$\begin{aligned}
8x+4&=2x-5\\
8x+(-2x)+4&=2x+(-2x)-5\\
6x+4&=-5\\
6x+4+(-4)&=-5+(-4)\\
6x&=-9\\
\frac{1}{6}(6x)&=\frac{1}{6}(-9)\\
x&=-\frac{3}{2}
\end{aligned}$$

59. Eliminating fractions:

$$\begin{aligned}
x+\frac{1}{2}&=\frac{1}{4}x-\frac{5}{8}\\
8\left(x+\frac{1}{2}\right)&=8\left(\frac{1}{4}x-\frac{5}{8}\right)\\
8x+4&=2x-5\\
8x+(-2x)+4&=2x+(-2x)-5\\
6x+4&=-5\\
6x+4+(-4)&=-5+(-4)\\
6x&=-9\\
\frac{1}{6}(6x)&=\frac{1}{6}(-9)\\
x&=-\frac{3}{2}
\end{aligned}$$

61. Solving the equation:

$$\begin{aligned}
6m-3&=m+2\\
6m+(-m)-3&=m+(-m)+2\\
5m-3&=2\\
5m-3+3&=2+3\\
5m&=5\\
\frac{1}{5}(5m)&=\frac{1}{5}(5)\\
m&=1
\end{aligned}$$

63. Eliminating fractions:

$$\begin{aligned}
\frac{1}{2}m-\frac{1}{4}&=\frac{1}{12}m+\frac{1}{6}\\
12\left(\frac{1}{2}m-\frac{1}{4}\right)&=12\left(\frac{1}{12}m+\frac{1}{6}\right)\\
6m-3&=m+2\\
6m+(-m)-3&=m+(-m)+2\\
5m-3&=2\\
5m-3+3&=2+3\\
5m&=5\\
\frac{1}{5}(5m)&=\frac{1}{5}(5)\\
m&=1
\end{aligned}$$

65. Solving the equation:

$$\begin{aligned}
9y+2&=6y-4\\
9y+(-6y)+2&=6y+(-6y)-4\\
3y+2&=-4\\
3y+2+(-2)&=-4+(-2)\\
3y&=-6\\
\frac{1}{3}(3y)&=\frac{1}{3}(-6)\\
y&=-2
\end{aligned}$$

67. **a**. Solving the equation:

$$2x = 3$$
$$\frac{1}{2}(2x) = \frac{1}{2}(3)$$
$$x = \frac{3}{2}$$

b. Solving the equation:

$$2 + x = 3$$
$$2 + (-2) + x = 3 + (-2)$$
$$x = 1$$

c. Solving the equation:

$$2x + 3 = 0$$
$$2x + 3 + (-3) = 0 + (-3)$$
$$2x = -3$$
$$\frac{1}{2}(2x) = \frac{1}{2}(-3)$$
$$x = -\frac{3}{2}$$

d. Solving the equation:

$$2x + 3 = -5$$
$$2x + 3 + (-3) = -5 + (-3)$$
$$2x = -8$$
$$\frac{1}{2}(2x) = \frac{1}{2}(-8)$$
$$x = -4$$

e. Solving the equation:

$$2x + 3 = 7x - 5$$
$$2x + (-7x) + 3 = 7x + (-7x) - 5$$
$$-5x + 3 = -5$$
$$-5x + 3 + (-3) = -5 + (-3)$$
$$-5x = -8$$
$$-\frac{1}{5}(-5x) = -\frac{1}{5}(-8)$$
$$x = \frac{8}{5}$$

69. Solving the equation:

$$7.5x = 1500$$
$$\frac{7.5x}{7.5} = \frac{1500}{7.5}$$
$$x = 200$$

The break-even point is 200 tickets.

71. Solving the equation:

$$G - 0.21G - 0.08G = 987.5$$
$$0.71G = 987.5$$
$$G \approx 1390.85$$

Your gross income is approximately $1,390.85.

Name _____

Date _____

73. Solving the equation:

$$2x = 4$$
$$\frac{1}{2}(2x) = \frac{1}{2}(4)$$
$$x = 2$$

75. Solving the equation:

$$30 = 5x$$
$$5x = 30$$
$$\frac{1}{5}(5x) = \frac{1}{5}(30)$$
$$x = 6$$

77. Solving the equation:

$$0.17x = 510$$
$$x = \frac{510}{0.17} = 3{,}000$$

79. Simplifying: $3(x-5)+4 = 3x-15+4 = 3x-11$

81. Simplifying: $0.09(x+2{,}000) = 0.09x+180$

83. Simplifying: $7-3(2y+1) = 7-6y-3 = 4-6y = -6y+4$

85. Simplifying: $3(2x-5)-(2x-4) = 6x-15-2x+4 = 4x-11$

87. Simplifying: $10x+(-5x) = 5x$

89. Simplifying: $0.08x+0.09x = 0.17x$