

Transform the equation if necessary, and then solve it to find the value of x that makes the equation true.

1. $x - (9x - 10) + 11 = 12x + 3\left(-2x + \frac{1}{3}\right)$

$$x - (9x - 10) + 11 = 12x + 3\left(-2x + \frac{1}{3}\right)$$

$$x - 9x + 10 + 11 = 12x - 6x + 1$$

$$-8x + 21 = 6x + 1$$

$$-8x + 8x + 21 = 6x + 8x + 1$$

$$21 = 14x + 1$$

$$21 - 1 = 14x + 1 - 1$$

$$20 = 14x$$

$$\frac{20}{14} = \frac{14}{14}x$$

$$\frac{10}{7} = x$$

$$2. \quad 7x + 8\left(x + \frac{1}{4}\right) = 3(6x - 9) - 8$$

$$7x + 8\left(x + \frac{1}{4}\right) = 3(6x - 9) - 8$$

$$7x + 8x + 2 = 18x - 27 - 8$$

$$15x + 2 = 18x - 35$$

$$15x - 15x + 2 = 18x - 15x - 35$$

$$2 = 3x - 35$$

$$2 + 35 = 3x - 35 + 35$$

$$37 = 3x$$

$$\frac{37}{3} = \frac{3}{3}x$$

$$\frac{37}{3} = x$$

$$3. \quad -4x - 2(8x + 1) = -(-2x - 10)$$

$$-4x - 2(8x + 1) = -(-2x - 10)$$

$$-4x - 16x - 2 = 2x + 10$$

$$-20x - 2 = 2x + 10$$

$$-20x + 20x - 2 = 2x + 20 + 10$$

$$-2 = 22x + 10$$

$$-2 - 10 = 22x + 10 - 10$$

$$-12 = 22x$$

$$-\frac{12}{22} = \frac{22}{22}x$$

$$-\frac{6}{11} = x$$

4. $11(x + 10) = 132$

$$\begin{array}{r|l} 11x + 110 = 132 & \\ -110 & -110 \\ \hline 11x & 22 \\ \hline 11 & 11 \\ \hline & x = 2 \end{array}$$

$$\begin{aligned} 11(x + 10) &= 132 \\ \left(\frac{1}{11}\right) 11(x + 10) &= \left(\frac{1}{11}\right) 132 \\ x + 10 &= 12 \\ x + 10 - 10 &= 12 - 10 \\ x &= 2 \end{aligned}$$

5. $37x + \frac{1}{2} - \left(x + \frac{1}{4}\right) = 9(4x - 7) + 5$

$$37x + \frac{1}{2} - \left(x + \frac{1}{4}\right) = 9(4x - 7) + 5$$

$$37x + \frac{1}{2} - x - \frac{1}{4} = 36x - 63 + 5$$

$$36x + \frac{1}{4} = 36x - 58$$

$$36x - 36x + \frac{1}{4} = 36x - 36x - 58$$

$$\frac{1}{4} = -58$$

~~$\frac{1}{4} = -58$~~
False

This equation has no solution.

$$6. \quad 3(2x - 14) + x = 15 - (-9x - 5)$$

$$3(2x - 14) + x = 15 - (-9x - 5)$$

$$6x - 42 + x = 15 + 9x + 5$$

$$7x - 42 = 20 + 9x$$

$$7x - 7x - 42 = 20 + 9x - 7x$$

$$-42 = 20 + 2x$$

$$-42 - 20 = 20 - 20 + 2x$$

$$-62 = 2x$$

$$-31 = x$$

7. $8(2x + 9) = 56$

$$\begin{array}{r} 16x + 72 = 56 \\ -72 \quad -72 \\ \hline 16x = -16 \\ \frac{16}{16} \quad \frac{-16}{16} \\ x = -1 \end{array}$$

$$\begin{aligned} 8(2x + 9) &= 56 \\ \left(\frac{1}{8}\right) 8(2x + 9) &= \left(\frac{1}{8}\right) 56 \\ 2x + 9 &= 7 \\ 2x + 9 - 9 &= 7 - 9 \\ 2x &= -2 \\ \left(\frac{1}{2}\right) 2x &= \left(\frac{1}{2}\right) - 2 \\ x &= -1 \end{aligned}$$

Lesson 7: Classification of Solutions

Classwork

Exercises

Solve each of the following equations for x .

1. $7x - 3 = 5x + 5$

$$\begin{array}{r} -5x \quad | \quad -5x \\ \hline 2x - 3 = 5 \\ +3 \quad | \quad +3 \\ \hline 2x = 8 \\ \underline{2} \quad \quad \underline{2} \\ \textcircled{x = 4} \end{array}$$

$$\begin{array}{r|l} 2. & 7x - 3 = 7x + 5 \\ & -7x \quad -7x \\ \hline & -3 = 5 \end{array}$$

3. $\cancel{7x} - 3 = -3 + \cancel{7x} \rightarrow 7x - 3 = 7x + -3$
 $\underline{ - 3 = -3}$
 $7x - 3 = 7x - 3$

Give a brief explanation as to what kind of solution(s) you expect the following linear equations to have. Transform the equations into a simpler form if necessary.

4. $11x - 2x + 15 = 8 + 7 + 9x$

$$9x + 15 = 15 + 9x$$

$$9x + 15 = 9x + 15$$

ANS: Infinitely many solutions

5. $3(x - 14) + 1 = -4x + 5$

$$3x - 42 + 1 = -4x + 5$$

$$3x - 41 = -4x + 5$$

EXACTLY 1 SOLUTION

6. $(-3x + 32) - 7x = -2(5x + 10)$

$$-10x + 32 = -10x - 20$$

NO SOLUTIONS

7. $\frac{1}{2}(8x + 26) = 13 + 4x$

8. Write two equations that have no solutions.

$$\underline{13}x + 1 = \underline{13}x + 1,000,000$$

$$\pi x + 1.72 = \pi x - 2.8$$

9. Write two equations that have **one unique solution** each.

$$7x + 8 = 11x + 12$$

$$4x + 9 = 5x + 32$$

10. Write two equations that have infinitely many solutions.

$$7x + 13 = 7x + 13$$
$$20x + 8 = 4(5x + 2)$$

