

1.2A Linear Equations

Learning Targets:

- Solve linear equations in one variable
- Solve linear equations containing fractions

- A **linear equation** can be written in the form $ax + b = 0$, where a and b are real numbers, and $a \neq 0$
- **Solving an equation** means to determine all values of x that result in a true statement. These are called solutions or roots.

Steps for Solving

1. Simplify the algebraic expression on each side by removing grouping symbols and combining like terms
2. Collect all the variable terms on one side and all the numbers, or constant terms on the other side.
3. Isolate the variable and solve
4. Check the proposed solution in the original equation

Solve and check

Use inverse operations to solve for the variable.

Example 1:

$$\begin{array}{r} 2x + 3 = 17 \\ -3 = -3 \\ \hline 2x = 14 \\ \frac{2x}{2} = \frac{14}{2} \\ x = 7 \end{array}$$

Subtract 3 from both sides

Divide both sides by 2

Check:

$$\begin{array}{l} 2(7) + 3 = 17 \\ 14 + 3 = 17 \end{array}$$

Plug 7 into original equation

Solve and check

Use inverse operations to solve for the variable.

Your Turn 1:

$$\begin{array}{r} 4x + 5 = 29 \\ -5 = -5 \\ \hline 4x = 24 \\ \frac{4x}{4} = \frac{24}{4} \\ x = 6 \end{array}$$

Subtract 5 from both sides

Divide both sides by 4

Check:

$$\begin{array}{l} 4(6) + 5 = 29 \\ 24 + 5 = 29 \end{array}$$

Plug 6 into original equation

Solve and check

Use inverse operations to solve for the variable.

Example 2: $2(x - 3) - 17 = 13 - 3(x + 2)$

$$2x - 6 - 17 = 13 - 3x - 6$$

$$2x - 23 = -3x + 7$$

$$+3x \quad = +3x$$

$$5x - 23 = 7$$

$$+23 = +23$$

$$5x = 30$$

$$\frac{5x}{5} = \frac{30}{5}$$

$$x = 6$$

Distribute on both sides

Combine like terms on each sides

Combine variable to one sides

Add 23 to both sides

Divide by 5 on both sides

Solve and check

Use inverse operations to solve for the variable.

Your Turn 2: $4(2x + 1) = 29 + 3(2x - 5)$

$$8x + 4 = 29 + 6x - 15$$

$$8x + 4 = 6x + 14$$

$$\begin{array}{r} -6x \\ \hline \end{array} = -6x$$

$$2x + 4 = 14$$

$$\begin{array}{r} -4 \\ \hline \end{array} = -4$$

$$2x = 10$$

$$\frac{2x}{2} = \frac{10}{2}$$

$$x = 5$$

Distribute on both sides

Combine like terms on each sides

Combine variable to one sides

Subtract 4 to both sides

Divide by 2 on both sides

Solve and check

Use inverse operations to solve for the variable.

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

$$\overset{3}{\cancel{(12)}} \left(\frac{x + 2}{\cancel{4}} \right) - \overset{4}{\cancel{(12)}} \left(\frac{x - 1}{\cancel{3}} \right) = (12)(2)$$

$$3(x + 2) - 4(x - 1) = (12)(2)$$

$$3x + 6 - 4x + 4 = 24$$

$$-x + 10 = 24$$

$$-x = 14$$

$$x = -14$$

Multiply both sides by the LCD

Simplify both sides (reduce)

Distribute

Combine like terms

Subtract 10 from both sides

Divide by -1 on both sides

Solve and check

Use inverse operations to solve for the variable.

Your Turn 3: $\frac{x - 3}{4} = \frac{5}{14} - \frac{x + 5}{7}$

Multiply both sides by the LCD

$$\overset{7}{\cancel{(28)}} \left(\frac{x - 3}{\cancel{4}} \right) = \overset{2}{\cancel{(28)}} \frac{5}{\cancel{14}} - \overset{4}{\cancel{(28)}} \left(\frac{x + 5}{\cancel{7}} \right)$$

Simplify both sides (reduce)

$$7(x - 3) = 2(5) - 4(x + 5)$$

Distribute

$$7x - 21 = 10 - 4x - 20$$

Combine like terms

$$7x - 21 = -4x - 10$$

$$11x - 21 = -10$$

Add 4x to both sides

$$11x = 11$$

Add 21 to both sides

$$x = 1$$

Divide by 11 on both sides

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- Pg 104 #1-13 odds, 17-29 odds