Objectives

The student will be able to:

1. solve equations with variables on both sides.
2. solve equations containing grouping symbols.

SOL: A.4df

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1) Solve. $3x + 2 = 4x - 1$

You need to get the variables on one side of the equation. It does not matter which variable you move. Try to move the one that will keep your variable positive.

1) Solve $3x + 2 = 4x - 1$

1. Draw "the river"
2. Subtract 3x from both sides
3. Simplify
4. Add 1 to both sides
5. Simplify
6. Check your answer

$$\begin{array}{r|l} -3x & -3x \\ \hline 2 = & x - 1 \\ +1 & +1 \\ \hline 3 = & x \end{array}$$

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

$$9 + 2 = 12 - 1$$

2) Solve $8y - 9 = -3y + 2$

1. Draw "the river"
2. Add 3y to both sides
3. Simplify
4. Add 9 to both sides
5. Simplify
6. Divide both sides by 11
7. Simplify
8. Check your answer

$$\begin{array}{rcl} +3y & & +3y \\ \hline 11y - 9 & = & 2 \\ +9 & & +9 \\ \hline 11y & = & 11 \\ \hline 11 & & 11 \end{array}$$

$$y = 1$$

$$8(1) - 9 = -3(1) + 2 \quad \checkmark$$

What is the value of x if $3 - 4x = 18 + x$?

1. -3
2. $\frac{-1}{3}$
3. $\frac{1}{3}$
4. 3

Answer Now

3) Solve $4 = 7x - 3x$

1. Draw "the river"
   – Notice the variables are on the same side!
2. Combine like terms
3. Divide both sides by 4
4. Simplify
5. Check your answer

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

$$1 = x$$

$$4 = 7(1) - 3(1)$$ ✓

4) Solve $-7(x - 3) = -7$

1. Draw "the river"
2. Distribute
3. Subtract 21 from both sides
4. Simplify
5. Divide both sides by -7
6. Simplify
7. Check your answer

$-7x + 21 = -7$

$-21 \quad -21$

$-7x = -28$

$\frac{-7x}{-7} = \frac{-28}{-7}$

$x = 4$

$-7(4 - 3) = -7$

$-7(1) = -7$ ✓

What is the value of x if $3(x + 4) = 2(x - 1)$?

1. -14
2. -13
3. 13
4. 14

Answer Now

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

1. Draw "the river"
2. Clear the fraction – multiply each term by the LCD
3. Simplify
4. Add 2x to both sides
5. Simplify
6. Add 6 to both sides
7. Simplify
8. Divide both sides by 6
9. Simplify
10. Check your answer

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

$$3 - 2x = 4x - 6$$

$$+2x \quad +2x$$

$$3 = 6x - 6$$

$$+6 \quad +6$$

$$\frac{9}{6} = \frac{6x}{6}$$

$$\frac{3}{2} \text{ or } 1.5 = x$$

$$\frac{3}{8} - \frac{1}{4}(1.5) = \frac{1}{2}(1.5) - \frac{3}{4}$$

Special Case #1

1. Draw “the river”
2. Subtract 2x from both sides
3. Simplify

6) $2x + 5 = 2x - 3$

$-2x \qquad -2x$

$5 = -3$

This is never true!

No solutions

Special Case #2

1. Draw “the river”
2. Distribute
3. Combine like terms
4. Subtract 3x from both sides
5. Simplify

$$7)\ 3(x+1)-5 = 3x-2$$

$$3x+3-5 = 3x-2$$

$$3x-2 = 3x-2$$

$$-3x \qquad -3x$$

$$-2 = -2$$

This is always true!

Infinite solutions

What is the value of x if $-3 + 12x = 12x - 3$?

1. 0
2. 4
3. No solutions
4. Infinite solutions

Answer Now

Challenge! What is the value of x if $-8(x + 1) + 3(x - 2) = -3x + 2$?

★1. -8

2. -2

3. 2

4. 8

Answer Now