

INDEPENDENT VARIABLE

IDV WORKSHEETS



SOLVING SYSTEMS BY SUBSTITUTION

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ANIMATED
POWERPOINT:
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6 EXAMPLE
PROBLEMS
4 PRACTICE
SHEETS

LEVELED
PRACTICE +
FIND THE
MISTAKE

PROBLEM 2 • GUIDED PROBLEMS: SUBSTITUTION • TRY IT ON YOUR OWN

Solve by Substitution

6 and $y = x$

Substitute for y : $4x - x = 6$

$$4x - x = 6$$

COMBINE

Distribute, then combine like terms. Left: $4x - x = 3x$. Right: nothing to combine.

$$\frac{3x}{3} = \frac{6}{3}$$

REWRITE

Rewrite: $3x = 6$. Now it is a one-step equation.

INVERSE 1

Isolate x : it is multiplied by 3, so divide both sides by 3.

$$x = 2$$

REWRITE

Rewrite: $x = 2$.

GUIDED PROBLEM 5 • GUIDED PROBLEMS: SUBSTITUTION

Solve by Substitution

$4x - y = 6$ and $y = 2x - 2$

Substitute for y : $4x - (2x - 2) = 6$

$$4x - 2x + 2 = 6$$

$$2x + 2 = 6$$

$$\frac{-2}{2} \quad \frac{-2}{2}$$

$$2x = 4$$

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

$$x = 2$$

COMBINE

Distribute, then combine like terms. Left: $4x - 2x = 2x$. Right: nothing to combine.

REWRITE

Rewrite: $2x + 2 = 6$. Now it is a two-step equation.

INVERSE 1

Get rid of the number by the 2 from both sides.

REWRITE

Rewrite the equation: $2x = 4$.

INVERSE 2

Isolate x : it is multiplied by 2, so divide both sides by 2.

REWRITE

Rewrite: $x = 2$.

MORE PRACTICE. LESS PREP. BETTER OUTCOMES.

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Inside the Animated Lesson

INDEPENDENT VARIABLE

GRADE 8 • SYSTEMS OF EQUATIONS

SOLVING SYSTEMS BY SUBSTITUTION

NOTICE $y = \underline{\hspace{1cm}}$ | SUBSTITUTE | SOLVE | FIND y

Animated PowerPoint lesson
6 animated systems, every step
Practice A, B, C • Find the Mistake

MORE PRACTICE, LESS PREP, BETTER OUTCOMES.
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$$y = 2x - 2$$

$$4x - y = 6$$

$$4x - (2x - 2) = 6$$

$$(2, 2)$$

LESSON OVERVIEW

Today's Goals

I CAN...

- 1 Notice when one equation already says what y (or x) equals.
- 2 Substitute it into the other equation and solve for x .
- 3 Substitute x back in to find y , and write the solution (x, y) .

KEY VOCABULARY

Substitute put in a value or expression in place of a variable	Distribute multiply each term in the ()
Like terms $4x - 2x = 2x$	System two equations, same x and y
Solution the point (x, y) that works in both	Check the point works in BOTH equations

STANDARDS

CCSS 8.EE.C.8b CCSS 8.EE.C.7d

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GUIDED PROBLEM 2 • GUIDED PROBLEMS: SUBSTITUTION • TRY IT ON YOUR OWN

Solve by Substitution

$4x - y = 6$ and $y = x$

YOUR TURN FIRST

GUIDED PROBLEM 2 • GUIDED PROBLEMS: SUBSTITUTION • TRY IT ON YOUR OWN

Solve by Substitution

$4x - y = 6$ and $y = x$

Substitute for y : $4x - x = 6$

$4x - x = 6$ → **COMBINE** Distribute, then combine like terms. Left: $4x - x = 3x$. Right: nothing to combine.

$3x = 6$ → **REWRITE** Rewrite: $3x = 6$. Now it is a one-step equation.

$\frac{3x}{3} = \frac{6}{3}$ → **INVERSE 1** Isolate x : it is multiplied by 3, so divide both sides by 3.

$x = 2$ → **REWRITE** Rewrite: $x = 2$.

GUIDED PROBLEM 2 • GUIDED PROBLEMS: SUBSTITUTION • TRY IT ON YOUR OWN

Solve by Substitution

$4x - y = 6$ and $y = x$

Substitute for y : $4x - x = 6$ **FIND y**

$4x - x = 6$ → **COMBINE** Distribute, then combine like terms. Left: $4x - x = 3x$. Right: nothing to combine.

$3x = 6$ → **REWRITE** Rewrite: $3x = 6$. Now it is a one-step equation.

$\frac{3x}{3} = \frac{6}{3}$ → **INVERSE 1** Isolate x : it is multiplied by 3, so divide both sides by 3.

$x = 2$ → **REWRITE** Rewrite: $x = 2$.

FIND y Find y : put $x = 2$ into $y = \dots$ and write the point (x, y) .

$y = 2$

Solution: (2, 2)

GUIDED PROBLEM 4 • GUIDED PROBLEMS: SUBSTITUTION • TRY IT ON YOUR OWN

Solve by Substitution

$y = -2x$ and $4x - y = 6$

Substitute for y : $4x - (-2x) = 6$ **REWRITE**

$4x + 2x = 6$ → **COMBINE** Distribute, then combine like terms. Left: $4x + 2x = 6x$. Right: nothing to combine.

$6x = 6$ → **REWRITE** Rewrite: $6x = 6$. Now it is a one-step equation.

$\frac{6x}{6} = \frac{6}{6}$ → **INVERSE 1** Isolate x : it is multiplied by 6, so divide both sides by 6.

$x = 1$ → **REWRITE** Rewrite: $x = 1$.

GUIDED PROBLEM 5 • GUIDED PROBLEMS: SUBSTITUTION

Solve by Substitution

$4x - y = 6$ and $y = 2x - 2$

Substitute for y : $4x - (2x - 2) = 6$ **REWRITE**

$4x - 2x + 2 = 6$ → **COMBINE** Distribute, then combine like terms. Left: $4x - 2x = 2x$. Right: nothing to combine.

$2x + 2 = 6$ → **REWRITE** Rewrite: $2x + 2 = 6$. Now it is a two-step equation.

$-2 -2$ → **INVERSE 1** Get rid of the number by the variable, 2: subtract 2 from both sides.

$2x = 4$ → **REWRITE** Rewrite the equation: $2x = 4$.

$\frac{2x}{2} = \frac{4}{2}$ → **INVERSE 2** Isolate x : it is multiplied by 2, so divide both sides by 2.

$x = 2$ → **REWRITE** Rewrite: $x = 2$.

GUIDED PROBLEM 6 • GUIDED PROBLEMS: SUBSTITUTION • CHALLENGE

Solve by Substitution

$2x - 1/2y = 12$ and $y = 2x + 2$

Substitute for y : $2x - 1/2(2x + 2) = 12$ **REWRITE**

$2x - x - 1 = 12$ → **COMBINE** Distribute, then combine like terms. Left: $2x - x = x$. Right: nothing to combine.

$x - 1 = 12$ → **REWRITE** Rewrite: $x - 1 = 12$. Now it is a one-step equation.

$+1 +1$ → **INVERSE 1** Get rid of the number by the variable, -1: add 1 to both sides.

$x = 13$ → **REWRITE** Rewrite the equation: $x = 13$.

Directions: Fill in the notes. Copy each system into its box when it is shown, and solve it.

NOTES

Notice that one equation says $y = \underline{\hspace{1cm}}$. $\underline{\hspace{1cm}}$ it for y in the other equation, in $(\)$.

$\underline{\hspace{1cm}}$ and combine like terms, then solve for $\underline{\hspace{1cm}}$.

Substitute x to find $\underline{\hspace{1cm}}$. Now we have a solution: the point $\underline{\hspace{1cm}}$.

GUIDED PROBLEMS

1.	2.	3.
4.	5.	6. CHALLENGE

Directions: Solve each system by substitution. Write the solution as (x, y).

1. $\begin{cases} y = 5x - 13 \\ x + 3y = 9 \end{cases}$	2. $\begin{cases} x + 5y = 12 \\ y = x - 6 \end{cases}$	3. $\begin{cases} y = 4x - 16 \\ x + y = 14 \end{cases}$
4. $\begin{cases} x + 3y = 16 \\ y = 3x - 8 \end{cases}$	5. $\begin{cases} 2x + 5y = 19 \\ y = 2x - 1 \end{cases}$	6. $\begin{cases} 3x + y = 15 \\ y = 2x + 10 \end{cases}$
7. $\begin{cases} y = 3x - 13 \\ 3x + y = 17 \end{cases}$	8. $\begin{cases} 3x + y = 18 \\ y = 2x + 3 \end{cases}$	9. $\begin{cases} y = 5x - 15 \\ x + 3y = 19 \end{cases}$
10. $\begin{cases} x + y = 6 \\ y = 3x - 2 \end{cases}$	11. $\begin{cases} x + 2y = 15 \\ y = 5x + 2 \end{cases}$	12. $\begin{cases} x + y = 6 \\ y = x - 4 \end{cases}$

Directions: Solve each system by substitution. Write the solution as (x, y).

1. $\begin{cases} -5x + 3y = -17 \\ y = -4x + 17 \end{cases}$	2. $\begin{cases} x + 2y = 19 \\ y = 5x - 18 \end{cases}$	3. $\begin{cases} -3x - 2y = 2 \\ y = 4x - 12 \end{cases}$
4. $\begin{cases} 2x + 2y = 10 \\ y = -3x + 5 \end{cases}$	5. $\begin{cases} 3x - 3y = -3 \\ y = 2x + 2 \end{cases}$	6. $\begin{cases} -3x + 4y = -2 \\ y = 2x + 2 \end{cases}$
7. $\begin{cases} y = 2x + 7 \\ -4x + y = 19 \end{cases}$	8. $\begin{cases} -3x + y = -5 \\ y = -2x + 15 \end{cases}$	9. $\begin{cases} y = 4x - 5 \\ 2x - 4y = 6 \end{cases}$
10. $\begin{cases} y = 3x + 14 \\ -5x + y = 18 \end{cases}$	11. $\begin{cases} y = -4x - 7 \\ -x - 4y = -17 \end{cases}$	12. $\begin{cases} -3x - 5y = 7 \\ y = 2x + 9 \end{cases}$

Directions: Each student made ONE mistake. Circle the first wrong line, explain it, and fix it.

1. Kai's work: $\begin{cases} y = 3x - 1 \\ 2x + y = 9 \end{cases}$ $2x + (3x - 1) = 9$ $5x - 1 = 9$ $5x = 10$ $x = 2$ Solution: $x = 2$	2. Rosa's work: $\begin{cases} y = 2x + 1 \\ 5x - y = 8 \end{cases}$ $5x - (2x + 1) = 8$ $5x - 2x + 1 = 8$ $3x + 1 = 8$ $x = 7/3$
3. Theo's work: $\begin{cases} y = -x + 4 \\ 3x + 2y = 10 \end{cases}$ $3x + 2(-x + 4) = 10$ $3x - 2x + 4 = 10$ $x + 4 = 10$ $x = 6$ $(6, -2)$	4. Mia's work: $\begin{cases} y = 2x \\ 3x + y = 15 \end{cases}$ $3x + 2x = 15$ $5x = 15$ $x = 3$ $(6, 3)$
5. Owen's work: $\begin{cases} y = 3x + 2 \\ x - 2y = 6 \end{cases}$ $x - 2(3x + 2) = 6$ $x - 6x - 4 = 6$ $-5x - 4 = 6$ $-5x = 2$ $x = -2/5$	6. Ana's work: $\begin{cases} y = x - 3 \\ 2x + 3y = 6 \end{cases}$ $2x + 3(x - 3) = 6$ $2x + 3x - 9 = 6$ $5x - 9 = 6$ $5x = 15$ $x = 3$ $y = 3 - 3 = 3$