

INDEPENDENT VARIABLE

IDV WORKSHEETS



SPECIAL CASES: NONE OR INFINITELY MANY

ALWAYS TRUE | NEVER TRUE | ONE SOLUTION

ANIMATED
POWERPOINT:
DOES THE WORK
FOR YOU!

FULL ANSWER
KEYS
INCLUDED

GUIDED PROBLEM 2 • PART 1: ALWAYS OR NEVER TRUE?
How Many Solutions?

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

$$-3x \quad -3x$$

$$7 = -2$$

No solution

INVERSE 1 Get rid of the smallest variable term, $3x$: subtract $3x$ from both sides.

REWRITE Rewrite: $7 = -2$. The x 's are gone and this is never true.

REWRITE No value of x works: no solution.

NO SOLUTION

what is left is never true.

PART 2 • GUIDED PROBLEM 11 • PART 2: ONE, NONE OR INFINITELY MANY

11. The first equation is $y = 3/4x - 4$. Write a second equation so the system has (a) no solution, (b) infinitely many solutions, (c) the solution $x = 0$.

a. $y = 3/4x - 20$ (same slope, new b)

b. $y = 3/4x - 4$ (the same line)

c. $y = -4$ (crosses at $(0, -4)$)

EQUATIONS +
SYSTEMS +
FIND THE
MISTAKE

12 EXAMPLE
PROBLEMS
3 PRACTICE
SHEETS

MORE PRACTICE. LESS PREP. BETTER OUTCOMES.

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Inside the Animated Lesson

INDEPENDENT VARIABLE

GRADE 8 • EQUATIONS AND SYSTEMS

SPECIAL CASES: NO SOLUTION AND INFINITELY MANY

ALWAYS TRUE | NEVER TRUE | ONE, NONE OR INFINITELY MANY

Animated PowerPoint lesson
12 guided problems: equations, then systems
Practice, Find the Mistake, exit tickets

MORE PRACTICE, LESS PREP. BETTER OUTCOMES.
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LESSON OVERVIEW

Today's Goals

I CAN...

- Tell when an equation is always true, never true, or true for one value.
- Explain someone's reasoning about no solution and all solutions.
- Tell if a system has one, no or infinitely many solutions from its slopes and y-intercepts.

KEY VOCABULARY

No solution never true: like $3 = 5$	All solutions always true: like $6 = 6$
Parallel same slope, different y-int	Same line same slope, same y-int
One solution different slopes	0 and ∞ no solution and infinitely many

STANDARDS

CCSS 8.EE.C.7a CCSS 8.EE.C.8d CCSS 8.EE.C.8c

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PART 1 • NOTES

When the x's Cancel

NOTES • PART 1: ALWAYS OR NEVER TRUE?

If the x's cancel and what is left is **TRUE** (like $6 = 6$), the equation is true for **all** values of x.

If the x's cancel and what is left is **FALSE** (like $3 = 5$), it has **no** solution.

If the x's do **NOT** cancel, there is exactly **one** solution.

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PART 1 • GUIDED PROBLEM 1 • PART 1: ALWAYS OR NEVER TRUE?

Solve: How Many Solutions?

Solve for x.

$$5x + 3 = 2x + 12$$

$$\begin{array}{r} -2x \quad -2x \\ 3x + 3 = 12 \\ -3 \quad -3 \\ 3x = 9 \\ \frac{3}{3} \quad \frac{3}{3} \\ x = 3 \end{array}$$

INVERSE 1 Get rid of the smallest variable term, 2x: subtract 2x from both sides.

REWRITE Rewrite the equation: $3x + 3 = 12$.

INVERSE 2 Get rid of the number by the variable, 3: subtract 3 from both sides.

REWRITE Rewrite the equation: $3x = 9$.

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

REWRITE Rewrite: $x = 3$.

CHECK Substitute 3 for x in the original equation. Both sides match ✓

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PART 1 • GUIDED PROBLEM 2 • PART 1: ALWAYS OR NEVER TRUE?

Solve: How Many Solutions?

Solve for x.

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

$$\begin{array}{r} -3x \quad -3x \\ 7 = -2 \end{array}$$

INVERSE 1 Get rid of the smallest variable term, 3x: subtract 3x from both sides.

REWRITE Rewrite: $7 = -2$. The x's are gone and this is never true.

No solution

REWRITE No value of x works: no solution.

NO SOLUTION
The x's cancel and what is left is never true.

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PART 1 • GUIDED PROBLEM 3 • PART 1: ALWAYS OR NEVER TRUE?

Solve: How Many Solutions?

Solve for x.

$$-2x + 9 = 9 - 2x$$

$$\begin{array}{r} +2x \quad +2x \\ 9 = 9 \end{array}$$

INVERSE 1 Get rid of the smallest variable term, -2x: add 2x to both sides.

REWRITE Rewrite: $9 = 9$. The x's are gone and this is always true.

All solutions

REWRITE Every value of x works: infinitely many solutions.

INFINITELY MANY SOLUTIONS
The x's cancel and what is left is always true.

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PART 2 • NOTES

Same Slope? Same y-Intercept?

NOTES • PART 2: ONE, NONE OR INFINITELY MANY

Same slope, different y-intercept: **no** solution. The lines are **parallel**: they will never be the same.

Same slope, same y-intercept: **infinitely many** solutions. It is the same line: always the same.

Different slopes: there will be only **one** solution.

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PART 2 • GUIDED PROBLEM 11 • PART 2: ONE, NONE OR INFINITELY MANY

GUIDED PROBLEMS

11. The first equation is $y = 3/4x - 4$. Write a second equation so the system has (a) no solution, (b) infinitely many solutions, (c) the solution $x = 0$.

a. $y = 3/4x - 20$ (same slope, new b)

b. $y = 3/4x - 4$ (the same line)

c. $y = -4$ (crosses at (0, -4))

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Directions: Fill in the notes. Then work each problem with the slides.

PART 1 • NOTES

If the x's cancel and what is left is TRUE (like $6 = 6$), the equation is true for _____ values of x.

If the x's cancel and what is left is FALSE (like $3 = 5$), it has _____ solution.

If the x's do NOT cancel, there is exactly _____ solution.

GUIDED PROBLEMS

1. Solve. How many solutions?	2. Solve. How many solutions?	3. Solve. How many solutions?
4. For each equation, decide if it is ALWAYS true or NEVER true. A) $x - 13 = x + 1$ B) $x + 1/2 = x - 1/2$ C) $2(x + 3) = 5x + 6 - 3x$ D) $x - 3 = 2x - 3 - x$ E) $3(x - 5) = 2(x - 5) + x$	5. Mac was looking at $6x - 4 + 2(5x + 2) = 16x$. Mac said, "I can tell right away there are no solutions: on the left you have $6x + 10x$ and a bunch of constants, but just $16x$ on the right." Do you agree? Explain. _____ _____ _____	
6. Write the other side so the equation is true for ALL values of u: $6(u - 2) + 2 = \underline{\hspace{2cm}}$. Then for NO values of u. All: _____ None: _____ _____ _____	7. Laurie was looking at $2x - 32 + 4(3x - 2462) = 14x$. She said, "I can tell right away there are no solutions: on the left you have $2x + 12x$ and a bunch of constants, but just $14x$ on the right." Do you agree? Explain. _____ _____ _____	
8. Jackson says $2x + 2 = x + 1$ has no solution because the left side is double the right side. Yair says $9x + 15 = 3x + 15$ has no solution because $9x$ is greater than $3x$. Do you agree with each? Explain. Jackson: _____ Yair: _____ _____	9. Complete each equation so it is true for NO values of x. A) $3x + 6 = 3(x + \underline{\hspace{1cm}})$ B) $x - 2 = -(\underline{\hspace{1cm}} - x)$ C) $(15x - 10)/5 = \underline{\hspace{1cm}} - 2$	

Directions: Fill in the notes. Then work each problem with the slides.**PART 2 • NOTES**

Same slope, different y-intercept: _____ solution. The lines are _____: they will never be the same.

Same slope, same y-intercept: _____ solutions. It is the same line: always the same.

Different slopes: there will be only _____ solution.

GUIDED PROBLEMS

10. Jared looked at the system $x + y = 5$ and $x + y = 7$. He said, "Just looking at it, I can see it has no solution. If you add two numbers, the sum can't be two different numbers." Do you agree?

11. The first equation is $y = \frac{3}{4}x - 4$. Write a second equation so the system has (a) no solution, (b) infinitely many solutions, (c) the solution $x = 0$.

a. _____

b. _____

c. _____

12. Identify each system as having 1 solution, no solution ($\emptyset$) or infinitely many solutions (∞).

A) $y = 2x + 1$; $y = -2x + 7$

B) $y = 5x + 1$; $y = x + 1$

C) $y = 1x + 1$; $y = x + 7$

D) $y = 2x + 0$; $2x = y$

E) $x + y = 10$; $x + y = 12$

F) $y = 3x + 1$; $y = 3x + 7$

G) $y = 3x + 1$; $y = x + 7$

H) $y = 1x + 1$; $y = x + 1$

I) $x + y = 10$; $2x + 2y = 20$

J) $y = -x + 4$; $2y = -2x + 8$

K) $y = x + 1$; $y = 3x + 7$

L) $y = 3x + 7$; $y = 6x + 7$

M) $y = 7x + 1$; $y = 1 + 7x$

N) $x + y = 20$; $2x + 2y = 20$

O) $2x + y = 12$; $x + y = 12$

Directions: One solution, no solution or all solutions? If one, find it. Show your work.

1. One solution, no solution or all solutions? If one, find it. $5(x - 3) = 4x + x - 16$ _____ _____ _____ _____ _____	2. One solution, no solution or all solutions? If one, find it. $3(x + 2) = x + 2x + 6$ _____ _____ _____ _____ _____	3. One solution, no solution or all solutions? If one, find it. $2(x + 2) = 3x + 2x + 7$ _____ _____ _____ _____ _____
4. One solution, no solution or all solutions? If one, find it. $2(x - 3) = -x + 2x + 4$ _____ _____ _____ _____ _____	5. One solution, no solution or all solutions? If one, find it. $4(x + 4) = x + 3x + 16$ _____ _____ _____ _____ _____	6. One solution, no solution or all solutions? If one, find it. $4(x - 3) = x + 3x - 10$ _____ _____ _____ _____ _____
7. One solution, no solution or all solutions? If one, find it. $6(x + 4) = 3x + 3x + 21$ _____ _____ _____ _____ _____	8. One solution, no solution or all solutions? If one, find it. $5(x - 4) = 3x + 2x - 20$ _____ _____ _____ _____ _____	9. One solution, no solution or all solutions? If one, find it. $2(x + 3) = x + 2x + 4$ _____ _____ _____ _____ _____
10. One solution, no solution or all solutions? If one, find it. $6(x - 4) = 3x + 3x - 24$ _____ _____ _____ _____ _____	11. One solution, no solution or all solutions? If one, find it. $6(x + 2) = 3x + x + 4$ _____ _____ _____ _____ _____	12. One solution, no solution or all solutions? If one, find it. $5(x + 2) = 2x + 3x + 9$ _____ _____ _____ _____ _____

Directions: 1 solution, no solution or infinitely many? If 1, find it. Show your work.

1. 1 solution, no solution or infinitely many? If 1, find it. $y = -3x - 1$ $3y = -9x - 9$ _____ _____ _____ _____	2. 1 solution, no solution or infinitely many? If 1, find it. $y = 2x - 1$ $2y = 10x + 10$ _____ _____ _____ _____	3. 1 solution, no solution or infinitely many? If 1, find it. $y = -3x + 6$ $3y = -9x + 27$ _____ _____ _____ _____
4. 1 solution, no solution or infinitely many? If 1, find it. $y = 3x - 3$ $3y = 9x + 6$ _____ _____ _____ _____	5. 1 solution, no solution or infinitely many? If 1, find it. $y = 2x - 3$ $3y = 9$ _____ _____ _____ _____	6. 1 solution, no solution or infinitely many? If 1, find it. $y = x - 3$ $3y = 3x - 9$ _____ _____ _____ _____
7. 1 solution, no solution or infinitely many? If 1, find it. $y = x - 1$ $2y = 2x - 14$ _____ _____ _____ _____	8. 1 solution, no solution or infinitely many? If 1, find it. $y = 2x + 6$ $2y = 4x + 12$ _____ _____ _____ _____	9. 1 solution, no solution or infinitely many? If 1, find it. $y = -3x - 3$ $3y = -9x - 9$ _____ _____ _____ _____
10. 1 solution, no solution or infinitely many? If 1, find it. $y = 1/2x + 2$ $2y = 3x$ _____ _____ _____ _____	11. 1 solution, no solution or infinitely many? If 1, find it. $y = -2x - 1$ $2y = -4x - 2$ _____ _____ _____ _____	12. 1 solution, no solution or infinitely many? If 1, find it. $y = 2x + 4$ $3y = 9x + 9$ _____ _____ _____ _____