LESSON MAKER PRO

When Sides Match

Find out what happens when x disappears.

HIGH SCHOOL · FA.A.11

FA.A.11 "Justify when linear equations in one variable will yield one solution, infinitely many solutions, or no solution. (8.EE.7a)"

NAME _____ DATE _____

THE BIG IDEA

Simplify both sides of a linear equation. If the x terms cancel, a true number statement means every value of x works, while a false statement means no value works. If the x terms do not cancel, isolate x to find the one solution.

WORKED EXAMPLE

How many solutions does $13(x + 9) = 13x + 117$ have?

1. Distribute: $13x + 117 = 13x + 117$.
2. Subtract $13x$ from both sides: $117 = 117$.
3. This statement is true for every value of x.

Answer: Infinitely many solutions.

PRACTICE 6 problems

1 Solve $4x + 6 = 2x + 18$. Show a step that supports your answer.

ANSWER _____

2 Classify the solutions to $3(x - 2) = 3x + 5$. Show a step that supports your answer.

ANSWER _____

3 Classify the solutions to $5(x + 2) = 5x + 10$. Show a step that supports your answer.

ANSWER _____

4 Solve $7x - 8 = 2(x + 6)$. Show a step that supports your answer.

ANSWER _____

5 Classify the solutions to $(x + 8)/2 = x/2 + 4$. Show a step that supports your answer.

ANSWER _____

6 Classify the solutions to $(3x - 4)/2 = (3x + 2)/2$. Show a step that supports your answer.

ANSWER _____

APPLY IT Show your work

1 You are comparing music plans for x months. Plan A costs $8 to start plus $5 per month. Plan B costs $2 to start plus $7 per month. Write and solve an equation to find when the total costs match. How many solutions does the equation have?

WORK SPACE

ANSWER _____

2 For x tickets, one club charges a $4 service fee plus $6 per ticket. Another club charges a $10 service fee plus $6 per ticket. Write an equation for equal total costs. Can the costs ever match? Justify your answer.

WORK SPACE

ANSWER _____

CHALLENGE One step up

Find the value of k that makes $4(x + 3) - 2x = 2(x + k)$ have infinitely many solutions. What happens for every other value of k? Explain.

WORK SPACE AND ANSWER

ANSWER KEY

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Solve 4x + 6 = 2x + 18. Show a step that supports your answer.	**One solution, x = 6. Subtracting 2x and 6 gives 2x = 12.**
2	Classify the solutions to 3(x - 2) = 3x + 5. Show a step that supports your answer.	**No solution. Simplifying and subtracting 3x gives -6 = 5, which is false.**
3	Classify the solutions to 5(x + 2) = 5x + 10. Show a step that supports your answer.	**Infinitely many solutions. Simplifying and subtracting 5x gives 10 = 10.**
4	Solve 7x - 8 = 2(x + 6). Show a step that supports your answer.	**One solution, x = 4. Simplifying gives 5x = 20.**
5	Classify the solutions to (x + 8)/2 = x/2 + 4. Show a step that supports your answer.	**Infinitely many solutions. Subtracting x/2 from both sides gives 4 = 4.**
6	Classify the solutions to (3x - 4)/2 = (3x + 2)/2. Show a step that supports your answer.	**No solution. Multiplying by 2 and subtracting 3x gives -4 = 2, which is false.**

PART 2 · APPLY IT

1. **8 + 5x = 2 + 7x; x = 3 months. The equation has one solution.** Set the two total costs equal. Subtract 5x and 2 to get 6 = 2x, so x = 3.
2. **4 + 6x = 10 + 6x. No, the equation has no solution because subtracting 6x gives 4 = 10.** Both clubs charge the same amount per ticket, but their service fees differ. The x terms cancel, leaving a false statement.

CHALLENGE

Simplifying gives 2x + 12 = 2x + 2k, so 12 = 2k. When k = 6, this is true for every x, giving infinitely many solutions. For every other value of k, the statement is false, so there is no solution.

Accept equivalent simplifying steps that correctly justify each classification. For one-solution equations, students should state the value of x.