Will x Stay?

Sort equations by what happens when the variable terms simplify.

8.EE.7 "Extend concepts of linear equations and inequalities in one variable to more complex multi-step equations and inequalities in real-world and mathematical situations..."

NAME _____ DATE _____

ONE SOLUTION

If the variable terms do not cancel when you simplify and solve, exactly one value makes the equation true.

$9(t + 8) = 6t + 78$; $3t = 6$, so $t = 2$.

NOT ONE SOLUTION

If the variable terms cancel, compare the numbers left behind. Equal numbers mean infinitely many solutions; unequal numbers mean no solutions.

$11(t - 9) = 11t - 99$; $-99 = -99$, so every value of t works.

1 SORT

8 items

For Part 1, circle ONE or OTHER for each equation; for Part 2, choose one item from each category and explain how you know.

1. 1. $2(x - 3) = x + 1$ ONE OTHER

2. 2. $(1/2)(x + 4) = x - 1$ ONE OTHER

3. 3. $3(x - 2) = 3x + 1$ ONE OTHER

4. 4. $(2/3)(x + 6) = (1/3)x + 5$ ONE OTHER

5. 5. $4(x + 1) - x = 3x + 4$ ONE OTHER

6. 6. $(1/2)(2x - 6) = x + 2$ ONE OTHER

7. 7. $5 - 2(x + 1) = x - 3$ ONE OTHER

8. 8. $(3/4)(4x + 8) = 3x + 6$ ONE OTHER

2 PROVE IT

Explain your thinking

Pick two items from Part 1. For each one, tell how you knew where it belonged.

ITEM # _____ **HOW I KNEW** _____

ITEM # _____ **HOW I KNEW** _____

3 MAKE YOUR OWN

One of each

For Part 3, write one new equation with ONE solution and one new equation that belongs in OTHER.

ONE _____

OTHER _____

CHALLENGE

Write an equation with a fraction and variable terms on both sides that has no solution, then show how you know.

ANSWER KEY # Will x Stay?

GRADE 8 · 8.EE.7

PART 1 · SORT

#	ITEM	CATEGORY	WHY
1	1. 2(x - 3) = x + 1	**ONE**	Simplifying gives 2x - 6 = x + 1, so x = 7.
2	2. (1/2)(x + 4) = x - 1	**ONE**	Simplifying gives x/2 + 2 = x - 1, so x = 6.
3	3. 3(x - 2) = 3x + 1	**OTHER**	The variable terms cancel, leaving -6 = 1. There is no solution.
4	4. (2/3)(x + 6) = (1/3)x + 5	**ONE**	Simplifying gives (2/3)x + 4 = (1/3)x + 5, so x = 3.
5	5. 4(x + 1) - x = 3x + 4	**OTHER**	Both sides simplify to 3x + 4. Every value of x works.
6	6. (1/2)(2x - 6) = x + 2	**OTHER**	The variable terms cancel, leaving -3 = 2. There is no solution.
7	7. 5 - 2(x + 1) = x - 3	**ONE**	Simplifying gives 3 - 2x = x - 3, so x = 2.
8	8. (3/4)(4x + 8) = 3x + 6	**OTHER**	Both sides simplify to 3x + 6. Every value of x works.

PART 2 · PROVE IT

Accept any explanation that names the deciding feature from the rule box for the chosen item.

PART 3 · MAKE YOUR OWN (SAMPLE ANSWERS)

- **ONE**: 6(x - 1) = 4x + 2
- **OTHER**: 8(x + 2) = 8x + 16

Challenge: (2/3)(3x - 6) = 2x + 5; simplifying gives 2x - 4 = 2x + 5, then -4 = 5. This is false, so there is no solution.

For Part 2, explanations should show whether the variable terms cancel and, if they do, whether the remaining numbers are equal. The Part 3 samples give x = 4 for ONE and infinitely many solutions for OTHER.