LESSON MAKER PRO

Balance Both Sides

Solve, check, and explain equations and inequalities.

HIGH SCHOOL · FA.A.7

FA.A.7 "Fluently solve and check multi-step equations and inequalities with an emphasis on the distributive property, variables on both sides, and rational coefficients. Explain each step when solving a multi-step equation and inequality..."

NAME _____ DATE _____

KEEP IT BALANCED

Use the distributive property to remove parentheses, then collect variable terms on one side. Do the same operation to both sides to keep an equation or inequality true. When you multiply or divide an inequality by a negative number, reverse its sign.

WORKED EXAMPLE

Solve 3/5(x + 15) = 1/5x + 13. Name the property used at each step.

1. 3/5x + 9 = 1/5x + 13. Distributive property.
2. 2/5x + 9 = 13. Subtract 1/5x from both sides.
3. 2/5x = 4. Subtract 9 from both sides.
4. x = 10. Multiply both sides by 5/2.

Answer: x = 10. Check: 3/5(10 + 15) = 15 and 1/5(10) + 13 = 15.

PRACTICE 6 problems

1 Solve 2(x - 7) = x + 1.

ANSWER _____

2 Solve 1/2(x + 8) = 3/4x - 2.

ANSWER _____

3 Solve 4(x - 2) > 2x + 6.

ANSWER _____

4 Solve 2/3(x + 6) <= 1/6x + 7.

ANSWER _____

5 Solve -1/2(x - 4) >= 1/4x + 5. Explain why you reverse the inequality sign.

ANSWER _____

6 Solve 3/4(x - 8) = 1/2(x + 2). Check your answer by substituting it into both sides.

ANSWER _____

APPLY IT Show your work

1 A game rental plan costs $8 per month plus $2 per game. Another plan costs $20 per month plus $1/2 per game. What is the fewest number of games you must rent in a month for the second plan to cost no more than the first?

WORK SPACE

ANSWER _____

2 You and a friend each buy x shirts. Store A charges $2 per shirt and $10 shipping for the whole order, and you split the bill equally. Store B charges $3 per shirt and $1 shipping per person. For how many shirts per person do the stores cost the same?

WORK SPACE

ANSWER _____

CHALLENGE One step up

A student solves -3/4(2x - 8) >= 1/2(x + 6) - 1. The student reaches -2x >= -4, then writes x >= 2. Correct the solution, explain the error, and check whether x = 2 satisfies the original inequality.

WORK SPACE AND ANSWER

Balance Both Sides

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Solve 2(x - 7) = x + 1.	**x = 15**
2	Solve 1/2(x + 8) = 3/4x - 2.	**x = 24**
3	Solve 4(x - 2) > 2x + 6.	**x > 7**
4	Solve 2/3(x + 6) <= 1/6x + 7.	**x <= 6**
5	Solve -1/2(x - 4) >= 1/4x + 5. Explain why you reverse the inequality sign.	**x <= -4. Dividing both sides of -3/4x >= 3 by the negative number -3/4 reverses the inequality sign.**
6	Solve 3/4(x - 8) = 1/2(x + 2). Check your answer by substituting it into both sides.	**x = 28. Check: 3/4(28 - 8) = 15 and 1/2(28 + 2) = 15.**

PART 2 · APPLY IT

1. **8 games** Let x be the number of games. Solve 20 + 1/2x <= 8 + 2x to get x >= 8.
2. **4 shirts per person** Store A charges each person 1/2(4x + 10), and Store B charges each person 3x + 1. Solving 1/2(4x + 10) = 3x + 1 gives x = 4.

CHALLENGE

x <= 2. Dividing -2x >= -4 by -2 requires reversing the inequality sign. At x = 2, both sides of the original inequality equal 3, so the boundary value is included.

Accept equivalent explanations that identify the distributive property or the same operation on both sides. For inequalities, require a reversed sign when students divide or multiply by a negative number.