LESSON MAKER PRO

Balance Equation Quest

Use balance thinking to solve multistep equations.

GRADE 8 · 8.PFA.4.a

8.PFA.4.a "Represent and solve multistep linear equations in one variable with the variable on one or both sides of the equation (up to four steps) using a variety of concrete materials and pictorial representations."

NAME _____ DATE _____

KEEP BOTH SIDES EQUAL

Treat an equation like a balanced scale. Whatever you add, subtract, multiply, or divide on one side, do the same to the other side. A sketch of matching boxes can show equal groups before you write each algebra step.

WORKED EXAMPLE

Balance sketch: [x + 4] [x + 4] [x + 4] = [x] [x] [17]. Solve 3(x + 4) = 2x + 17.

1. Expand the left side: 3x + 12 = 2x + 17.
2. Remove 2x from both sides: x + 12 = 17.
3. Remove 12 from both sides: x = 5.

Answer: x = 5

PRACTICE 6 problems

1 Solve: 6x + 9 = 45

ANSWER _____

2 Solve: 8x + 1 = 6x + 15

ANSWER _____

3 Solve: 9(x + 1) = 7x + 21

ANSWER _____

4 Solve: 11x - 8 = 9x + 18

ANSWER _____

5 Solve: 7(x - 8) = x + 16

ANSWER _____

6 Solve: 12x - 9 = 8x + 23

ANSWER _____

APPLY IT Show your work

1 A music club charges $7 each month plus a $9 sign-up fee. Jordan paid $51 in all. For how many months did Jordan belong to the club?

WORK SPACE

ANSWER _____

2 Maya saves $11 each week and already has $18. Leo saves $7 each week and already has $42. After how many weeks will they have the same amount saved?

WORK SPACE

ANSWER _____

3 Draw an actual balance model for 2x + 3 = 11 here or on extra paper. Use two rectangles labeled x and three small squares labeled +1 on the left; draw eleven +1 squares on the right. Draw a second model after removing three +1 squares from EACH side. Draw a third model after dividing the remaining pieces into two equal groups on EACH side. Label every model with its matching equation, find x and substitute to check. Show your drawings to the teacher.

WORK SPACE

ANSWER _____

CHALLENGE One step up

Solve: x/6 + 8 = x/9 + 15

WORK SPACE AND ANSWER

ANSWER KEY

Balance Equation Quest

GRADE 8 · 8.PFA.4.a

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Solve: 6x + 9 = 45	**x=6**
2	Solve: 8x + 1 = 6x + 15	**x=7**
3	Solve: 9(x + 1) = 7x + 21	**x=6**
4	Solve: 11x - 8 = 9x + 18	**x = 13**
5	Solve: 7(x - 8) = x + 16	**x = 12**
6	Solve: 12x - 9 = 8x + 23	**x=8**

PART 2 · APPLY IT

1. **6 months** Write 7m + 9 = 51. Subtract 9, then divide by 7 to get m = 6.
2. **6 weeks** Write 11w + 18 = 7w + 42. Subtract 7w and 18, then divide by 4 to get w = 6.
3. **x = 4; models show 2x + 3 = 11, then 2x = 8, then x = 4; check 2(4) + 3 = 11.** Require three actual labeled drawings. Initially two x rectangles and three +1 squares balance eleven +1 squares. Remove three +1 squares from both sides, leaving two x rectangles balanced by eight +1 squares. Divide each side into two equal groups: each x rectangle balances four +1 squares. Check corresponding equations and substitution; algebra alone does not complete this modeling task.

CHALLENGE

x = 126

Accept any algebraic steps or valid balance-model sketch that keeps both sides equal. For word problems, accept the numerical answer when the correct unit is clear. For Apply 3, require the three actual pictorial models and their matching balanced moves and equations; extra paper is permitted. All original problems may still be solved algebraically. Check that a learner removes equal amounts and divides both sides into the same number of equal groups.