

Solving Multi-Step Linear Equations

Grade 8 math · Worksheet · Standards: 8.EE.C.7a, 8.EE.C.7b

Name: _____ Date: _____ Class: _____

These 20 problems follow Standards 8.EE.C.7a and 8.EE.C.7b. They cover multi-step linear equations with rational coefficients, parentheses, variables on both sides, and equations with one, none or infinitely many solutions.

Work from easy equations to modeling problems. Show each balance step, check your answers by substituting, and explain when a variable disappears.

Standards: 8.EE.C.7a, 8.EE.C.7b · **Level:** Grade 8

Problem 1 One-variable equations (easy)

Solve: (a) $5x - 8 = 27$ (b) $\frac{x}{4} + 3 = 9$

Problem 2 Variable on both sides (easy)

Solve $3x + 7 = 2x + 15$.

Problem 3 Distribute first (easy)

Solve $4(x + 3) = 32$.

Problem 4 Combine like terms (easy)

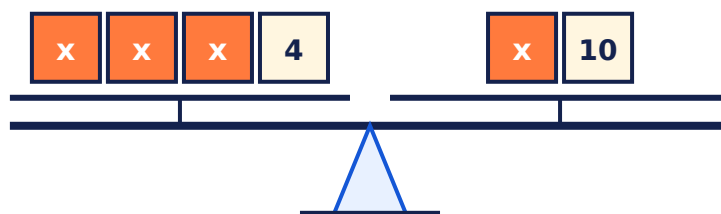
Solve $6x - 2x + 9 = 25$.

Problem 5 Fraction coefficient (easy)

Solve $\frac{2}{3}x = 18$.

Problem 6 Balance scale (easy)

The scale is balanced. Write the equation it shows and find the weight of one x tile.



Balanced scale.

Problem 7 Both sides variable (medium)

Solve: (a) $7x - 5 = 3x + 19$ (b) $9 - 2x = 5x - 12$

Problem 8 Distribute on both sides (medium)

Solve $3(2x - 5) = 2(x + 7)$.

Problem 9 Clear the fractions (medium)

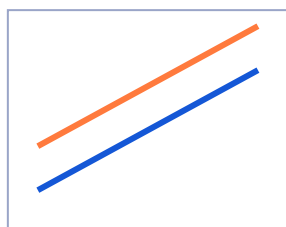
Solve $\frac{x}{2} + \frac{x}{5} = 14$.

Problem 10 Decimal coefficients (medium)

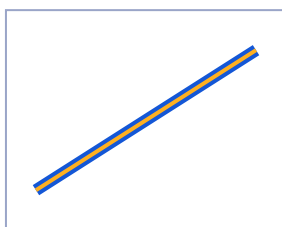
Solve $0.5x + 3.2 = 1.3x - 0.8$.

Problem 11 How many solutions? (medium)

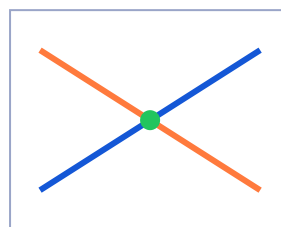
Decide whether each equation has one solution, no solution or infinitely many solutions: (a) $4x + 6 = 4x + 9$ (b) $3(x + 2) = 3x + 6$ (c) $5x - 1 = 2x + 8$



A



B



C

Panels A, B and C.

Problem 12 Choosing k (medium)

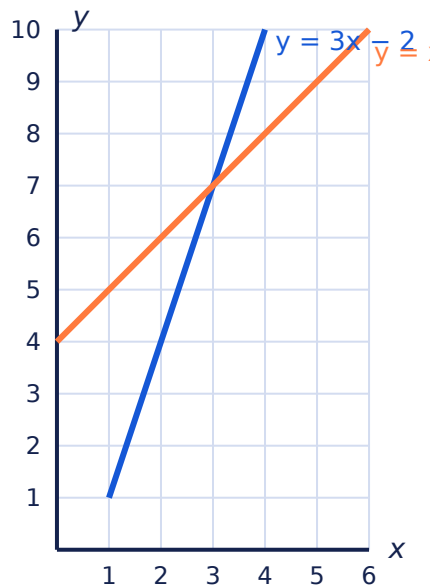
Find the value of k that makes (a) $6x + 5 = kx - 3$ have no solution, and (b) $4x + 7 = kx + 7$ have infinitely many solutions.

Problem 13 Rational coefficient (medium)

Solve $\frac{7}{8}(x + 4) = 14$.

Problem 14 Graph and equation (medium)

The two lines drawn below stand for the sides of $3x - 2 = x + 4$. Read the x -coordinate where they meet, then confirm it by solving the equation.



Two lines.

Problem 15 Gym membership (hard)

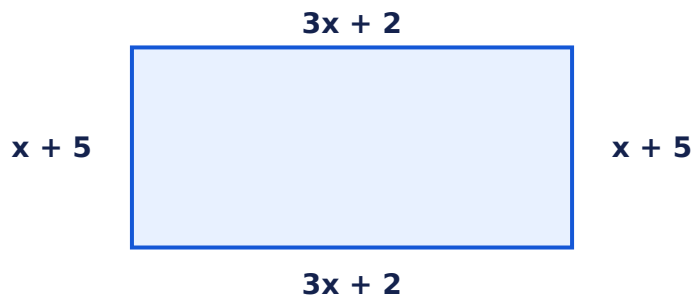
Gym A charges a \$25 sign-up fee plus \$18 per month. Gym B has no sign-up fee and charges \$23 per month. After how many months do the two gyms cost the same? What is that cost?

Problem 16 Two taxi companies (hard)

Company A charges \$4 plus \$2.50 per mile. Company B charges \$1.60 plus \$3.10 per mile. For what distance do both charge the same, and what is that charge?

Problem 17 Garden rectangle (hard)

A rectangular garden has length $3x + 2$ feet and width $x + 5$ feet. Its perimeter is 62 feet. Find x and the garden's length and width.



Garden with perimeter 62 ft.

Problem 18 Consecutive odd integers (hard)

The sum of three consecutive odd integers is 87. Write an equation and find the integers.

Problem 19 What does $8 = 8$ mean? (hard)

Kai solved $2(x + 4) = 2x + 8$ and got $8 = 8$, so he wrote $x = 8$. Explain his mistake, state the correct conclusion, and write one equation of your own that has no solution.

Problem 20 Fractions on both sides (hard)

Solve $\frac{(3x - 2)}{4} + 1 = \frac{(x + 7)}{2}$.