

# Solving Linear Equations and Rearranging Formulas

Grade 9 – Algebra 1 math · Worksheet Answer Key · Standards: A-REI.A.1, A-REI.B.3, A-CED.A.1, A-CED.A.4

Each answer key shows every algebra step and a substitution check. When a step is justified by a property, the name of the property is given so you can compare it with your own reasoning.

**Standards:** A-REI.A.1, A-REI.B.3, A-CED.A.1, A-CED.A.4 · **Level:** Grade 9 Algebra 1

## Problem 1 One-step plus one

Add 4:  $7x = 42$ . Divide by 7:  $x = 6$ .

Check:  $7(6) - 4 = 38$ .

**$x = 6$**

## Problem 2 Distribute and solve

Divide both sides by 5:  $x - 3 = 7$ . Add 3:  $x = 10$ .

Check:  $5(10 - 3) = 35$ .

**$x = 10$**

## Problem 3 A fraction on the variable

Subtract 3:  $\frac{x}{4} = 5$ . Multiply by 4:  $x = 20$ .

Check:  $20/4 + 3 = 8$ .

**$x = 20$**

## Problem 4 Negative coefficient

Subtract 9:  $-2x = -16$ . Divide by  $-2$ :  $x = 8$ .

Check:  $9 - 16 = -7$ .

**$x = 8$**

### Problem 5 Justify each step

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Add 7 to both sides:  $4x = 28$ . Divide both sides by 4:  $x = 7$ .

$$4x - 7 = 21 \text{ given}$$

$$4x = 28 \text{ addition property of equality (add 7)}$$

$$x = 7 \text{ division property of equality (divide by 4)}$$

*Reasons filled in.*

Check:  $4(7) - 7 = 21$ .

$$\mathbf{x = 7}$$

### Problem 6 Variables on both sides

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Subtract  $2x$ :  $3x - 8 = 19$ . Add 8:  $3x = 27$ . Divide:  $x = 9$ .

Check:  $5(9) - 8 = 37$  and  $2(9) + 19 = 37$ .

$$\mathbf{x = 9}$$

### Problem 7 Distribute on the left

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Distribute:  $6x - 3 = 4x + 9$ . Subtract  $4x$ :  $2x - 3 = 9$ . Add 3:  $2x = 12$ , so  $x = 6$ .

Check:  $3(11) = 33$  and  $4(6) + 9 = 33$ .

$$\mathbf{x = 6}$$

### Problem 8 Fraction coefficient

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Add 4:  $(5/6)x = 25$ . Multiply by  $6/5$ :  $x = 30$ .

Check:  $(5/6)(30) - 4 = 25 - 4 = 21$ .

$$\mathbf{x = 30}$$

### Problem 9 Fractions on both sides

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Multiply both sides by 4:  $x + 5 = 2(x - 1) = 2x - 2$ . Subtract  $x$ :  $5 = x - 2$ , so  $x = 7$ .

Check:  $12/4 = 3$  and  $6/2 = 3$ .

$$\mathbf{x = 7}$$

### Problem 10 Decimal equation

Multiply by 100:  $40x + 150 = 15x + 400$ . Subtract  $15x$  and  $150$ :  $25x = 250$ , so  $x = 10$ .

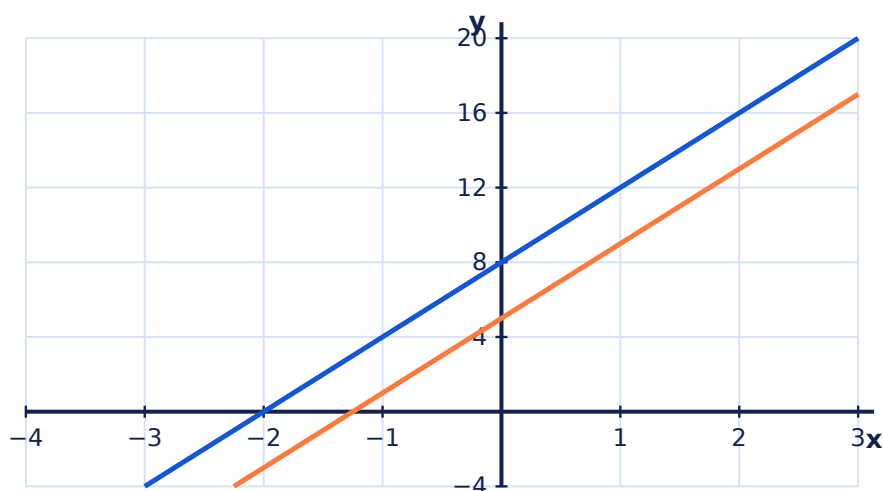
Check:  $4 + 1.5 = 5.5$  and  $1.5 + 4 = 5.5$ .

**$x = 10$**

### Problem 11 No solution

Distribute:  $4x + 8 = 4x + 5$ . Subtract  $4x$ :  $8 = 5$ , which is false.

The graph shows parallel lines, so they never meet.



*Left side  $y = 4(x + 2)$  in blue, right side  $y = 4x + 5$  in orange.*

**No solution**

### Problem 12 Every number works

Distribute:  $10x + 15 = 10x + 15$ . Both sides are identical, so the statement is always true.

**Infinitely many solutions (all real numbers)**

### Problem 13 Find the error

The 5 must multiply both terms:  $5(x - 2) = 5x - 10$ .

Then  $5x - 10 = 3x + 6$ , so  $2x = 16$  and  $x = 8$ .

Check:  $5(6) = 30$  and  $3(8) + 6 = 30$ .

$$x = 8$$

#### Problem 14 Triangle area formula

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Multiply both sides by 2:  $2A = bh$ . Divide both sides by  $b$ .

$$h = \frac{2A}{b}$$

#### Problem 15 Comparing gym plans

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Let  $m$  be months:  $25 + 12m = 40 + 9m$ . Subtract  $9m$ :  $25 + 3m = 40$ . Subtract 25:  $3m = 15$ , so  $m = 5$ .

Check:  $25 + 60 = 85$  and  $40 + 45 = 85$ .

**5 months**

#### Problem 16 Taxi fare

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$3.50 + 2.25m = 21.50$ . Subtract 3.50:  $2.25m = 18$ . Divide:  $m = 8$ .

Check:  $3.50 + 18 = 21.50$ .

**8 miles**

#### Problem 17 Temperature formula

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Subtract 32:  $F - 32 = (9/5)C$ . Multiply by  $5/9$ :  $C = (5/9)(F - 32)$ .

For  $F = 95$ :  $C = (5/9)(63) = 35$ .

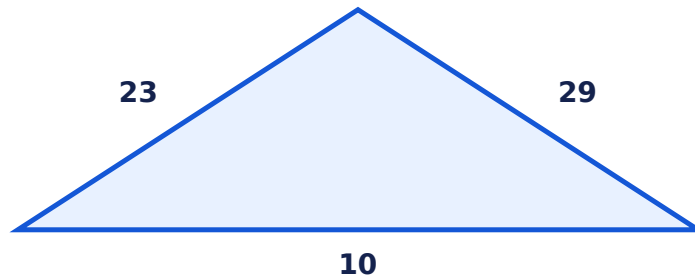
**$C = (5/9)(F - 32)$ ;  $C = 35$  when  $F = 95$**

#### Problem 18 Perimeter of a triangle

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$x + (2x + 3) + (3x - 1) = 62$ , so  $6x + 2 = 62$  and  $6x = 60$ , giving  $x = 10$ .

Sides: 10, 23 and 29.



*Sides 10, 23 and 29 add to 62.*

Check:  $10 + 23 + 29 = 62$ .

**$x = 10$ ; sides 10, 23, 29 inches**

### Problem 19 Missing base of a trapezoid

Multiply by 2 and divide by  $h$ :  $b_1 + b_2 = 2A/h$ , so  $b_2 = 2A/h - b_1$ .

Values:  $2(84)/7 - 9 = 24 - 9 = 15$ .

$$A = \frac{1}{2}h(b_1 + b_2)$$

$$2A \div h = b_1 + b_2$$

$$168 \div 7 = 24 = 9 + b_2$$

$$b_2 = 15$$

*Steps for the missing base.*

**$b_2 = 2A/h - b_1 = 15$  feet**

### Problem 20 Robotics fundraiser

$245 + 35k = 1,260$ . Subtract 245:  $35k = 1,015$ . Divide by 35:  $k = 29$ .

Check:  $35(29) = 1,015$  and  $1,015 + 245 = 1,260$ .

**29 kits**