

Solving Systems of Linear Equations

Grade 8 math · Worksheet Answer Key · Standards: 8.EE.C.8a, 8.EE.C.8b, 8.EE.C.8c

Each solution shows the substitution or elimination steps, the value of both variables and a check in the original equations. Graph figures are repeated with the intersection marked. Final answers are in bold.

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

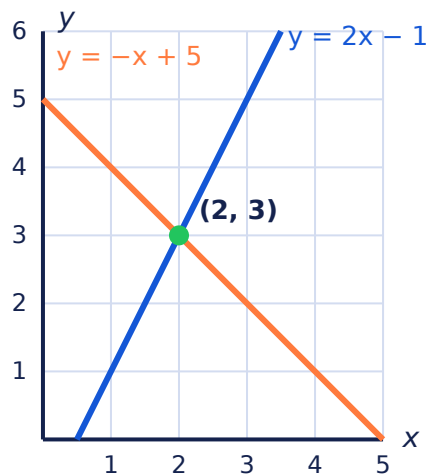
Problem 1 Is it a solution?

(a) $3 + 2 = 5$ and $2(3) - 2 = 4$: both true. (b) $4 + 1 = 5$, but $2(4) - 1 = 7$, not 4.

(a) Yes (b) No

Problem 2 Read the intersection

The lines cross where $x = 2$ and $y = 3$. Check: $2(2) - 1 = 3$ and $-2 + 5 = 3$.



Intersection at (2, 3).

(2, 3)

Problem 3 Substitution, warm-up

Replace y by $2x$: $x + 2x = 12$, so $3x = 12$ and $x = 4$. Then $y = 2(4) = 8$. Check: $4 + 8 = 12$.

(4, 8)

Problem 4 Elimination, warm-up

Add the equations: $2x = 12$, so $x = 6$. Then $6 + y = 9$ gives $y = 3$. Check: $6 - 3 = 3$.

(6, 3)

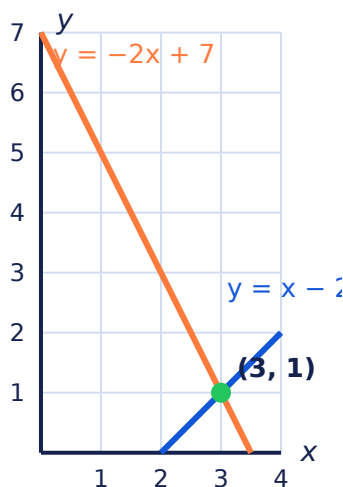
Problem 5 Equal expressions

Both expressions equal y , so $x + 6 = 4x - 3$. Then $9 = 3x$ and $x = 3$. So $y = 3 + 6 = 9$. Check: $4(3) - 3 = 9$.

(3, 9)

Problem 6 Estimate and verify

The lines cross at $(3, 1)$. Check: $3 - 2 = 1$ and $-2(3) + 7 = 1$.



Intersection at $(3, 1)$.

(3, 1)

Problem 7 Substitute an expression

Replace x : $(3y - 4) + 2y = 11$, so $5y - 4 = 11$ and $5y = 15$. Then $y = 3$ and $x = 3(3) - 4 = 5$. Check: $5 + 6 = 11$.

(5, 3)

Problem 8 Add to eliminate

Add: $4x = 16$, so $x = 4$. From the second equation, $4 - 2y = 0$, so $y = 2$. Check: $12 + 4 = 16$.

(4, 2)

Problem 9 Multiply, then eliminate

Multiply the second equation by 3: $12x - 3y = 15$. Add to the first: $14x = 28$, so $x = 2$. Then $4(2) - y = 5$, so $y = 3$. Check: $4 + 9 = 13$.

(2, 3)

Problem 10 Scale one equation

Multiply the second equation by 2: $6x + 4y = 26$. Subtract the first: $5x = 5$, so $x = 1$. Then $1 + 4y = 21$ gives $y = 5$. Check: $3 + 10 = 13$.

(1, 5)

Problem 11 Parallel lines

Solve each for y : $y = -\frac{2}{3}x + 2$ and $y = -\frac{2}{3}x + 4$. The slopes match and the intercepts differ, so the lines are parallel. Also, $2x + 3y$ cannot equal both 6 and 12.

No solution

Problem 12 Same line

Rewrite the second equation: $-2y = -10x + 8$, so $y = 5x - 4$. It is the same line as the first equation, so every point on it is a solution.

Infinitely many solutions

Problem 13 Classify without solving

(a) Same slope 3, different intercepts: parallel. (b) Slopes -1 and 2 differ, so the lines cross once. (c) Doubling the first equation gives the second: same line.

(a) none (b) one (c) infinitely many

Problem 14 Two lines, one point

Set the expressions equal: $-2x + 9 = 3x - 6$. Then $15 = 5x$ and $x = 3$. So $y = -2(3) + 9 = 3$. Check: $3(3) - 6 = 3$.

(3, 3)

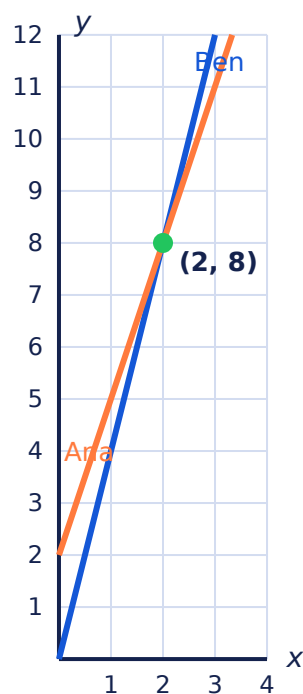
Problem 15 Bake sale

Equations: $x + y = 40$ and $2x + 3.5y = 95$. From the first, $x = 40 - y$. Substitute: $2(40 - y) + 3.5y = 95$, so $80 + 1.5y = 95$ and $y = 10$. Then $x = 30$. Check: $60 + 35 = 95$.

30 muffins and 10 brownies

Problem 16 Trail meet-up

Ana: $y = 3x + 2$. Ben: $y = 4x$. Set $4x = 3x + 2$, so $x = 2$ and $y = 8$. Check: $3(2) + 2 = 8$.



Meeting point.

After 2 hours, 8 miles from the trailhead

Problem 17 Concert tickets

Let x = adult tickets and y = child tickets. $x + y = 150$ and $12x + 7y = 1,330$. Substitute $x = 150 - y$: $1,800 - 12y + 7y = 1,330$, so $-5y = -470$ and $y = 94$. Then $x = 56$. Check: $672 + 658 = 1,330$.

56 adult and 94 child tickets

Problem 18 Rectangle dimensions

Let y = length and x = width. Then $2y + 2x = 56$, which gives $y + x = 28$, and $y = 2x + 1$. Substitute: $2x + 1 + x = 28$, so $3x = 27$ and $x = 9$. Then $y = 19$.

Width 9 ft; length 19 ft

Problem 19 Build a system

One choice: $x + y = 3$ and $x - y = 5$. Check $(4, -1)$: $4 + (-1) = 3$ and $4 - (-1) = 5$. The slopes -1 and 1 differ, so the lines cross exactly once.

Example: $x + y = 3$ and $x - y = 5$

Problem 20 Car rental

A: $y = 0.20x + 35$. B: $y = 0.35x + 20$. Set them equal: $15 = 0.15x$, so $x = 100$ and the cost is \$55. At 250 miles: A costs $35 + 50 = \$85$ and B costs $20 + 87.50 = \$107.50$.

100 miles (\$55); Company A is cheaper at 250 miles