

Systems of Linear Equations: practice solutions, Grade 8 – download the PDF

Written solutions to the chapter problems. Check each step, then correct yourself.

1 Is it a solution?



First equation: $3 + 1 = 4$, true. Second equation: $2(3) - 1 = 5$, true. Both are satisfied, so $(3, 1)$ is a solution.

2 One equation is not enough



First equation: $3(2) - 1 = 5 = y$, true. Second: $2 + 5 = 7 \neq 8$, false. The pair fails the second equation, so it is **not** a solution of the system.

3 Read the graph



The lines cross at $(1, 3)$. Check in p : $1 + 2 = 3$. Check in q : $-1 + 4 = 3$. Both true, so the solution is $(1, 3)$.

4 A first substitution



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

5 A first elimination



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

6 Count the solutions



- a. Same slope 4, different intercepts: parallel lines, **no solution**.
- b. Slopes -2 and 1 are different: **one solution** (the lines meet at $(0, 3)$).
- c. Solving $6x - 2y = 4$ for y gives $y = 3x - 2$: same line, **infinitely many solutions**.

7 Two numbers



Let x be the larger and y the smaller: $x + y = 25$ and $x - y = 7$. Adding gives $2x = 32$, so $x = 16$, then $y = 9$. The numbers are 16 and 9. Check: $16 + 9 = 25$ and $16 - 9 = 7$.

8 Substitute and simplify



Substitute: $3x + 2(x - 3) = 9$, so $5x - 6 = 9$, $5x = 15$, $x = 3$. Then $y = 3 - 3 = 0$.
Solution: $(3, 0)$. Check: $3(3) + 2(0) = 9$.

9 Isolate first



In the second equation, $y = 3x - 5$. Substitute: $x + 2(3x - 5) = 11$, so $7x - 10 = 11$, $7x = 21$, $x = 3$. Then $y = 3(3) - 5 = 4$. Solution: $(3, 4)$. Check: $3 + 2(4) = 11$.

10 Opposite coefficients



The y terms are opposites. Add: $6x = 18$, so $x = 3$. Then $2(3) - 3y = 0$ gives $y = 2$.
Solution: $(3, 2)$. Check: $4(3) + 3(2) = 18$.

11 Subtract to eliminate



Multiply the second equation by 2: $2x + 2y = 6$. Subtract it from the first: $x = 1$. Then $1 + y = 3$ gives $y = 2$. Solution: $(1, 2)$. Check: $3(1) + 2(2) = 7$.

12 At the fruit stand



Let a and o be the prices in dollars: $3a + 2o = 6.50$ and $2a + o = 4.00$. From the second, $o = 4 - 2a$. Substitute: $3a + 8 - 4a = 6.5$, so $-a = -1.5$ and $a = 1.5$. Then $o = 4 - 3 = 1$. An apple costs 1.50 dollars and an orange 1.00 dollar. Check: $3(1.5) + 2(1) = 6.5$.

13 True or false?

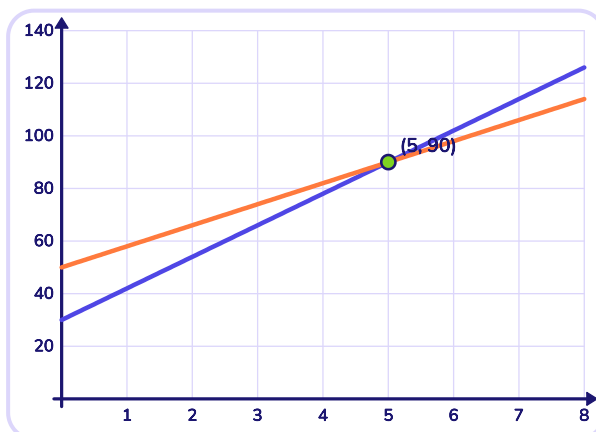


False. Divide the second equation by 2: $x + y = 5$, so $y = -x + 5$. Both lines have slope -1 but y-intercepts 4 and 5. They are parallel, so there is **no** solution. Algebraically, substituting gives $2x + 2(-x + 4) = 8 \neq 10$.

14 Choosing a gym



With x months, the costs are $y = 30 + 12x$ and $y = 50 + 8x$. Set them equal: $30 + 12x = 50 + 8x$, so $4x = 20$ and $x = 5$. Then $y = 30 + 60 = 90$. After 5 months both gyms cost 90 dollars in total. The graph confirms the crossing at $(5, 90)$; before month 5, Gym A is cheaper.



15 Multiply both equations



Multiply the first by 3 and the second by 2: $6x + 9y = 3$ and $6x + 8y = 4$. Subtract: $y = -1$. Then $2x - 3 = 1$, so $x = 2$. Solution: $(2, -1)$. Check: $3(2) + 4(-1) = 2$.

16 Parameters



- a. No solution needs parallel lines: the same slope and a different intercept. So $k = 3$ (and $b = -5 \neq 2$ works).
- b. Infinitely many solutions needs the same line: $k = 3$ and $b = 2$.

17 Boat and current



Let b be the boat speed and c the current, in mph. Downstream: $2(b + c) = 24$, so $b + c = 12$. Upstream: $3(b - c) = 24$, so $b - c = 8$. Adding gives $2b = 20$, so $b = 10$, then $c = 2$. The boat travels at 10 mph and the current flows at 2 mph.

18 Nickels and dimes



Work in cents. With n nickels and d dimes: $n + d = 30$ and $5n + 10d = 240$. Then $n = 30 - d$ and $5(30 - d) + 10d = 240$, so $150 + 5d = 240$ and $d = 18$, $n = 12$. Check: $60 + 180 = 240$. The jar has 12 nickels and 18 dimes.

19 The garden bed



Let w be the width and ℓ the length: $\ell = 2w + 3$ and $2\ell + 2w = 36$, i.e. $\ell + w = 18$. Substitute: $2w + 3 + w = 18$, so $w = 5$ and $\ell = 13$. The bed is 5 ft by 13 ft, with area $5 \times 13 = 65$ square feet.

20 Trail mix



Total value: $12 \times 8 = 96$ dollars. With c pounds of cashews and m of almonds:
 $c + m = 12$ and $6c + 9m = 96$. Then $c = 12 - m$ and $72 - 6m + 9m = 96$, so
 $3m = 24$, $m = 8$, $c = 4$. Use 4 pounds of cashews and 8 pounds of almonds. Check:
 $24 + 72 = 96$.

21 Find the error



- The y coefficients are both $+2$, not opposites, so adding does not eliminate y ; it just creates another equation with two unknowns.
- Subtract the second equation from the first: $2x = 8$, so $x = 4$. Then $4 + 2y = 6$ gives $y = 1$. Solution: $(4, 1)$. Check: $3(4) + 2(1) = 14$.



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