

Algebra 1 · Systems of Linear Equations · Worksheet Answer Key

Common Core A-REI.C.5, A-REI.C.6, A-REI.D.11, A-CED.A.3 · mathovore.fr

Every solution below shows the setup, the algebra and a check in the original equations. Compare each step with your own work, and look at the graphs to see why the algebra and the picture agree. Mark an answer correct only when the whole pair matches.

Algebra 1 Common Core: A-REI.C.5 · A-REI.C.6 · A-REI.D.11 · A-CED.A.3

Problem 1: Check an ordered pair

Substitute $x=3$ and $y=2$ into each equation.

First equation: $3+2=5$. True.

Second equation: $2(3)-2=6-2=4$. True.

The pair makes both equations true, so **yes, $(3,2)$ is a solution.**

Problem 2: Test a second pair

First equation: $3(4)-1=12-1=11$. True.

Second equation: $4+2(1)=4+2=6$, and $6 \neq 7$. False.

The pair fails the second equation, so **no, $(4,1)$ is not a solution.**

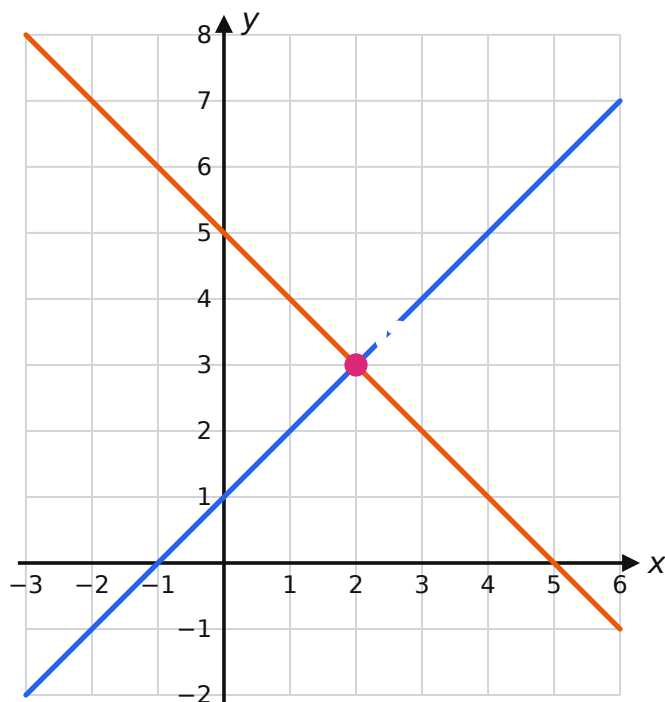
Problem 3: Read a graph

The lines cross at $(2,3)$.

Check in $y=x+1$: $3=2+1$. True.

Check in $y=-x+5$: $3=-2+5$. True.

The solution is $(2,3)$.



The crossing point is the solution.

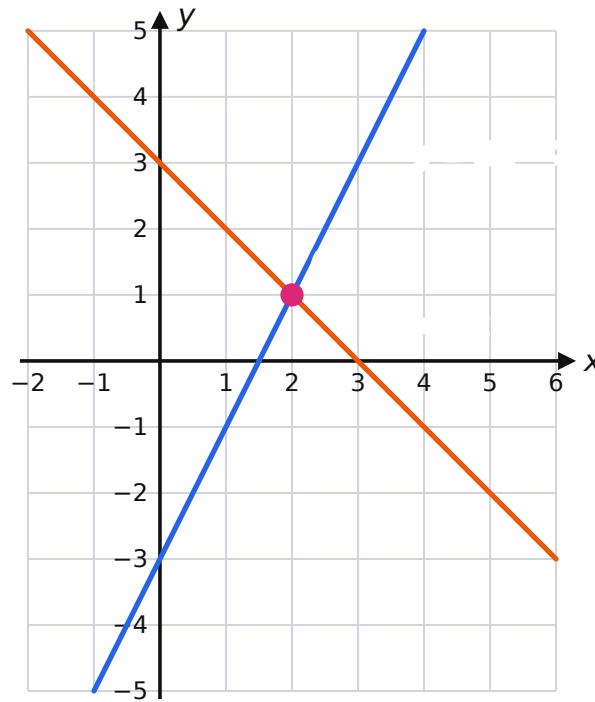
Problem 4: Solve by graphing

Line 1 has y-intercept -3 and slope 2 : it passes through $(0, -3)$, $(1, -1)$ and $(2, 1)$.

Line 2 has y-intercept 3 and slope -1 : it passes through $(0, 3)$, $(1, 2)$ and $(2, 1)$.

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

The solution is $(2, 1)$.



Both lines pass through $(2,1)$.

Problem 5: Substitute $y = 3x$

Replace y with $3x$: $x+3x=20$.

Combine: $4x=20$, so $x=5$.

Then $y=3(5)=15$.

Check: $5+15=20$. True.

The solution is $(5,15)$.

Problem 6: Substitute an expression

Replace y with $x+4$: $2x+(x+4)=19$.

Combine: $3x+4=19$, so $3x=15$ and $x=5$.

Then $y=5+4=9$.

Check: $2(5)+9=19$. True.

The solution is $(5,9)$.

Problem 7: Isolate a variable first

Solve the first equation for x : $x = 11 - 2y$.

Substitute into the second: $3(11 - 2y) - y = 12$.

Distribute: $33 - 6y - y = 12$, so $33 - 7y = 12$ and $7y = 21$. Then $y = 3$.

Then $x = 11 - 2(3) = 5$.

Check: $5 + 6 = 11$ and $15 - 3 = 12$.

The solution is $(5, 3)$.

Problem 8: Substitution with a fraction

Substitute: $3x + 2\left(\frac{1}{2}x + 3\right) = 18$.

Distribute: $3x + x + 6 = 18$, so $4x = 12$ and $x = 3$.

Then $y = \frac{1}{2}(3) + 3 = \frac{9}{2}$.

Check: $3(3) + 2\left(\frac{9}{2}\right) = 9 + 9 = 18$.

The solution is $\left(3, \frac{9}{2}\right)$.

Problem 9: Add the equations

The y -terms are opposites. Add the equations: $2x = 12$, so $x = 6$.

Substitute into $x + y = 9$: $6 + y = 9$, so $y = 3$.

Check: $6 - 3 = 3$. True.

The solution is $(6, 3)$.

Problem 10: Eliminate y

Add the equations: $8x = 32$, so $x = 4$.

Substitute into the first equation: $3(4) + 2y = 16$, so $2y = 4$ and $y = 2$.

Check the second equation: $5(4) - 2(2) = 20 - 4 = 16$.

The solution is $(4, 2)$.

Problem 11: Multiply one equation

Multiply the second equation by 3: $6x - 3y = 3$.

Add to the first equation: $10x = 20$, so $x = 2$.

Substitute into $2x - y = 1$: $4 - y = 1$, so $y = 3$.

Check the first equation: $4(2) + 3(3) = 8 + 9 = 17$.

The solution is $(2, 3)$.

Problem 12: Multiply both equations

Multiply the first equation by 2: $6x + 8y = 2$. Multiply the second by 3: $6x + 15y = 9$.

Subtract the first from the second: $7y = 7$, so $y = 1$.

Substitute into $3x + 4y = 1$: $3x + 4 = 1$, so $x = -1$.

Check the second equation: $2(-1) + 5(1) = 3$.

The solution is $(-1, 1)$.

Problem 13: Parallel lines

Both lines have slope 2, but the y-intercepts are 1 and -4 . The lines are parallel and never meet.

Setting the expressions equal gives $2x + 1 = 2x - 4$, which simplifies to $1 = -4$. That is false for every x .

The system has **no solution**.

Problem 14: Same line twice

Divide every term of the first equation by 2: $x + 2y = 4$.

This is exactly the second equation, so both equations describe the same line.

Every point on the line, such as $(0, 2)$ or $(4, 0)$, is a solution. The system has **infinitely many solutions**.

Problem 15: Classify three systems

- a. Rewrite $6x - 2y = 4$: $-2y = -6x + 4$, so $y = 3x - 2$. It is the same line: **infinitely many**

solutions.

- b. Rewrite $2x+2y=5$: $y=-x+\frac{5}{2}$. Same slope -1 , different intercepts 1 and $\frac{5}{2}$: **no solution**.
- c. The slopes 1 and 2 differ, so there is **one solution**. Setting $x+3=2x+3$ gives $x=0$, so the solution is $(0,3)$.

Problem 16: Why elimination works

- a. Adding left sides and right sides: $(x+y)+(x-y)=3+1$, which simplifies to $2x=4$.
- b. Substitute $x=2$: $2(2)=4$. True.
- c. If a pair makes $A=B$ true and $C=D$ true, then adding equal amounts to equal amounts gives $A+C=B+D$. The pair therefore makes the sum true too.

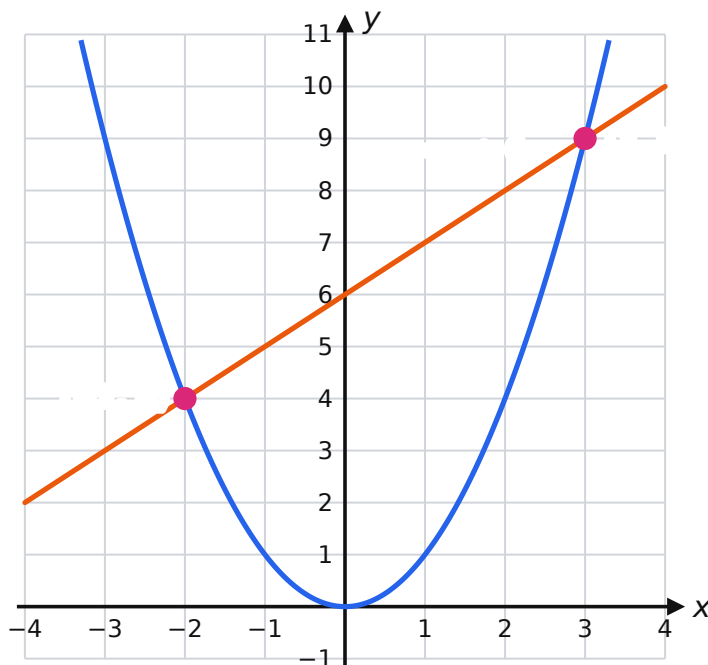
Problem 17: Line and parabola

The graphs meet at $(-2,4)$ and $(3,9)$, so the solutions are the x-coordinates $x=-2$ and $x=3$.

Verify $x=-2$: $(-2)^2=4$ and $-2+6=4$.

Verify $x=3$: $3^2=9$ and $3+6=9$.

The solutions are $x=-2$ **and** $x=3$.



The two intersection points.

Problem 18: Line and exponential

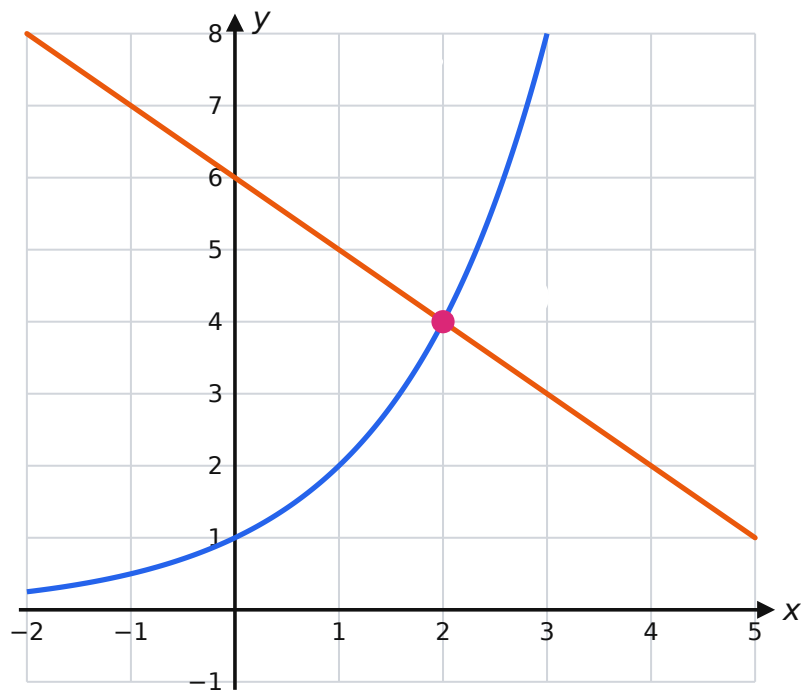
For 2^x : 1,2,4,8. For $6-x$: 6,5,4,3. The values match only at $x=2$, where both equal 4.

The function 2^x keeps increasing and $6-x$ keeps decreasing, so they can meet only once.

The solution is $x=2$.

x	0	1	2	3
2^x	1	2	4	8
$6-x$	6	5	4	3

Table of values.



The graphs meet at $(2,4)$.

Problem 19: Ticket sales

Let a be adult tickets and s student tickets: $a+s=120$ and $8a+5s=795$.

Substitute $s=120-a$: $8a+5(120-a)=795$, so $3a+600=795$ and $3a=195$. Then $a=65$.

Then $s=120-65=55$.

Check: $8(65)+5(55)=520+275=795$.

65 adult tickets and 55 student tickets.

Ticket	Price	Number	Sales
Adult	\$8	65	\$520
Student	\$5	55	\$275
Total		120	\$795

The totals match the problem.

Problem 20: Coffee blend

Let x be pounds at \$6 and y pounds at \$9. The blend costs $7 \times 30 = 210$ dollars.

$$x + y = 30 \text{ and } 6x + 9y = 210.$$

Substitute $y = 30 - x$: $6x + 9(30 - x) = 210$, so $270 - 3x = 210$ and $x = 20$. Then $y = 10$.

$$\text{Check: } 6(20) + 9(10) = 120 + 90 = 210.$$

20 pounds at \$6 and 10 pounds at \$9.

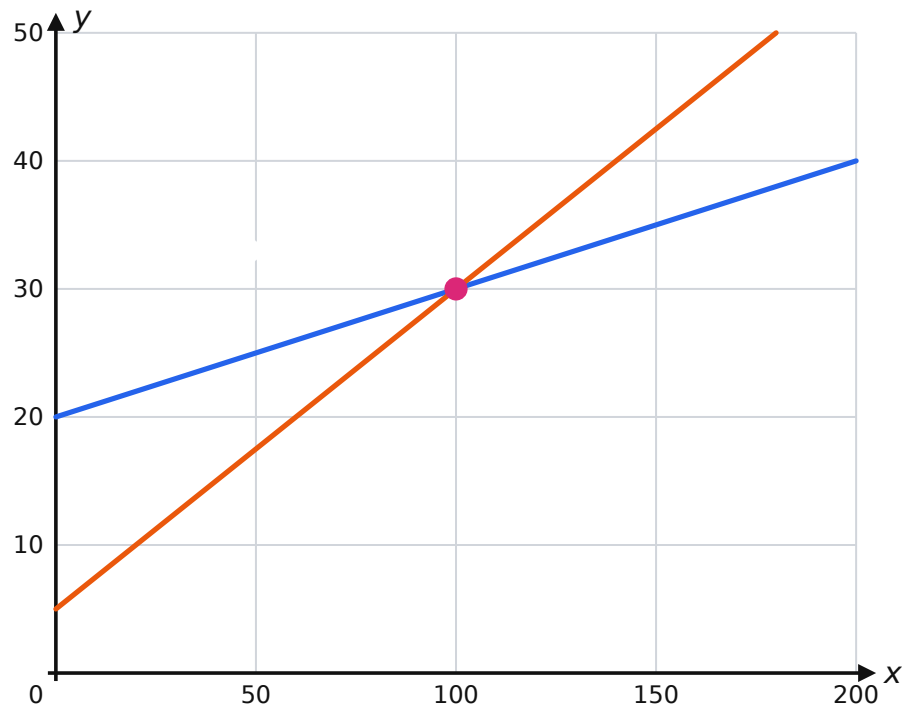
Problem 21: Phone plans

Set the costs equal: $20 + 0.10m = 5 + 0.25m$. Then $15 = 0.15m$, so $m = 100$.

Cost: $20 + 0.10(100) = 30$ dollars, and $5 + 0.25(100) = 30$ dollars.

At 150 minutes, Plan A costs $20 + 15 = 35$ dollars and Plan B costs $5 + 37.5 = 42.5$ dollars.

The plans match at 100 minutes for \$30; Plan A is cheaper at 150 minutes.



The lines cross at 100 minutes.

Problem 22: Animals on a farm

Let c be chickens and w cows: $c + w = 40$ and $2c + 4w = 110$.

Substitute $c = 40 - w$: $2(40 - w) + 4w = 110$, so $80 + 2w = 110$ and $w = 15$.

Then $c = 25$.

Check: $2(25) + 4(15) = 50 + 60 = 110$.

25 chickens and 15 cows.

Problem 23: Boat and current

Downstream speed: $24 \div 2 = 12$ mph. Upstream speed: $24 \div 3 = 8$ mph.

Let b be the boat speed and c the current: $b + c = 12$ and $b - c = 8$.

Add: $2b = 20$, so $b = 10$. Then $c = 2$.

Check: $10 + 2 = 12$ and $10 - 2 = 8$.

The boat goes 10 mph in still water and the current is 2 mph.

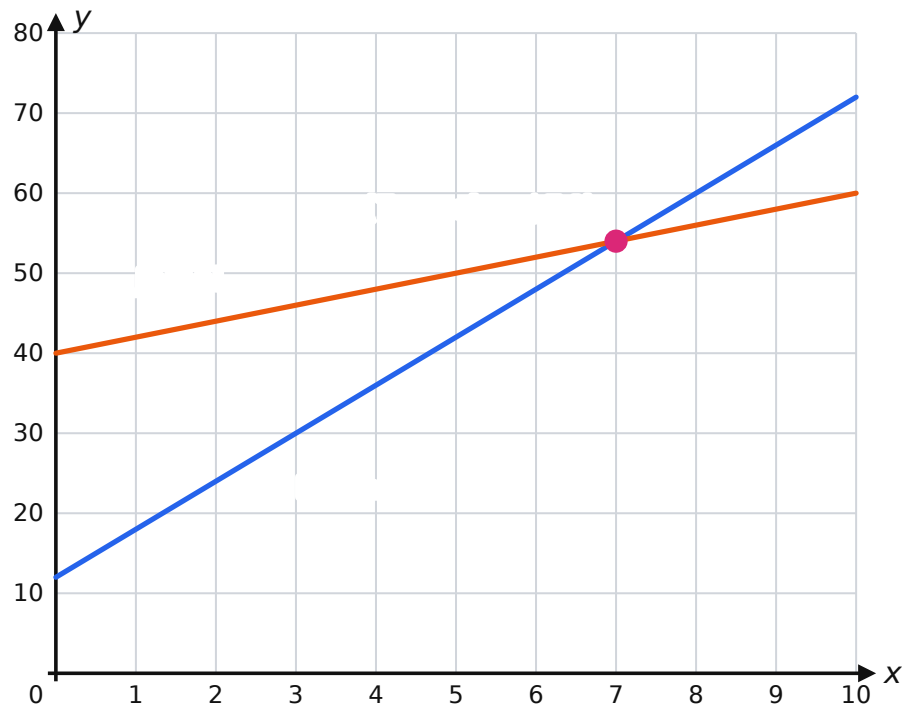
Problem 24: Saving for a bike

After w weeks: Maya has $12+6w$ and Jamal has $40+2w$.

Set equal: $12+6w=40+2w$, so $4w=28$ and $w=7$.

Amount: $12+6(7)=54$ and $40+2(7)=54$.

After 7 weeks, each has \$54.



The savings lines meet at 7 weeks.