

Algebra 2 - Systems of Linear and Quadratic Equations - Answer Key

Common Core A-REI.C.7 · maths-pdf.fr/en/

Every worksheet problem on systems of linear and quadratic equations is solved here, one step at a time. Compare your method as well as your final answer, because the steps show where forgetting to find the y-values can go wrong. Final answers appear in bold so you can find them quickly when you only need a check.

Algebra 2 · Common Core State Standards: **A-REI.C.7**

Exercise 1 - Check a point

First equation: $2^2+1=5$, true. Second: $3(2)-1=5$, true.

Yes, (2, 5) satisfies both equations

Exercise 2 - Substitution

Substitute $y = x+6$ into $y = x^2$: $x^2 = x+6$.

Move everything to one side: $x^2 - x - 6 = 0$.

Solve: $x = -2$ or $x = 3$.

Find each y with the linear equation: $y = x+6 = 4$ when $x = -2$; $y = x+6 = 9$ when $x = 3$.

Solutions: $(-2, 4), (3, 9)$

Exercise 3 - Parabola and line

Substitute $y = x-1$ into $y = x^2-4x+3$: $x^2-4x+3 = x-1$.

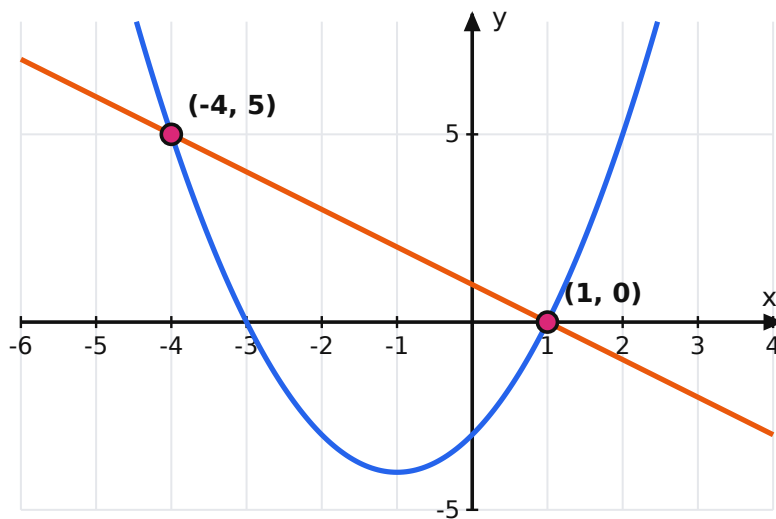
Move everything to one side: $x^2-5x+4 = 0$.

Solve: $x = 1$ or $x = 4$.

Find each y with the linear equation: $y = x-1 = 0$ when $x = 1$; $y = x-1 = 3$ when $x = 4$.

Solutions: $(1,0), (4,3)$

Exercise 4 - Read the graph



Intersections $(-4, 5)$ and $(1, 0)$.

Substitute $y = -x + 1$ into $y = x^2 + 2x - 3$: $x^2 + 2x - 3 = -x + 1$.

Move everything to one side: $x^2 + 3x - 4 = 0$.

Solve: $x = -4$ or $x = 1$.

Find each y with the linear equation: $y = -x + 1 = 5$ when $x = -4$; $y = -x + 1 = 0$ when $x = 1$.

Solutions: $(-4, 5), (1, 0)$

Exercise 5 - Tangent line

Substitute $y = 2x$ into $y = x^2 + 1$: $x^2 + 1 = 2x$.

Move everything to one side: $x^2 - 2x + 1 = 0$.

The equation has one repeated solution: $x = 1$.

Find each y with the linear equation: $y = 2x = 2$ when $x = 1$.

Solutions: $(1, 2)$

Because there is exactly one point of intersection, the line is tangent to the parabola.

Exercise 6 - No real solution

$$x^2+3=2x \text{ gives } x^2-2x+3=0.$$

$$D=(-2)^2-4(1)(3)=-8<0.$$

No real solutions: the line does not meet the parabola

Exercise 7 - Line in standard form

Rewrite the line as $y = -x + 5$.

Substitute $y = -x + 5$ into $y = x^2 - 1$: $x^2 - 1 = -x + 5$.

Move everything to one side: $x^2 + x - 6 = 0$.

Solve: $x = -3$ or $x = 2$.

Find each y with the linear equation: $y = -x + 5 = 8$ when $x = -3$; $y = -x + 5 = 3$ when $x = 2$.

Solutions: $(-3, 8), (2, 3)$

Exercise 8 - Irrational solutions

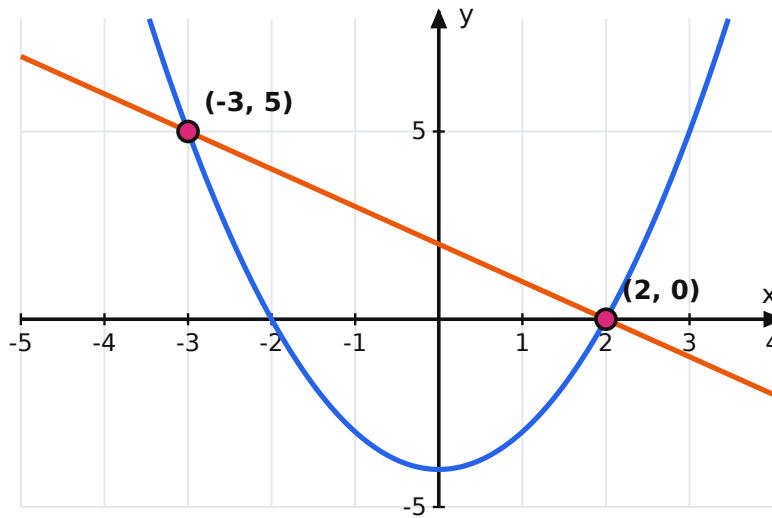
$$2x^2 - 3x - 5 = x + 3 \text{ gives } 2x^2 - 4x - 8 = 0, \text{ so } x^2 - 2x - 4 = 0.$$

$$x = \frac{2 \pm \sqrt{4 + 16}}{2} = \frac{2 \pm 2\sqrt{5}}{2} = 1 \pm \sqrt{5}.$$

Then $y = x + 3 = 4 \pm \sqrt{5}$.

$(1 + \sqrt{5}, 4 + \sqrt{5})$ and $(1 - \sqrt{5}, 4 - \sqrt{5})$

Exercise 9 - Solve and graph



Intersections $(-3, 5)$ and $(2, 0)$.

Substitute $y = -x + 2$ into $y = x^2 - 4$: $x^2 - 4 = -x + 2$.

Move everything to one side: $x^2 + x - 6 = 0$.

Solve: $x = -3$ or $x = 2$.

Find each y with the linear equation: $y = -x + 2 = 5$ when $x = -3$; $y = -x + 2 = 0$ when $x = 2$.

Solutions: $(-3, 5), (2, 0)$

Exercise 10 - Circle and line

$x^2 + (x+1)^2 = 25$ gives $2x^2 + 2x - 24 = 0$, so $x^2 + x - 12 = 0$.

$(x+4)(x-3) = 0$. $y = x+1$: $y = -3$ or $y = 4$.

(3, 4) and $(-4, -3)$

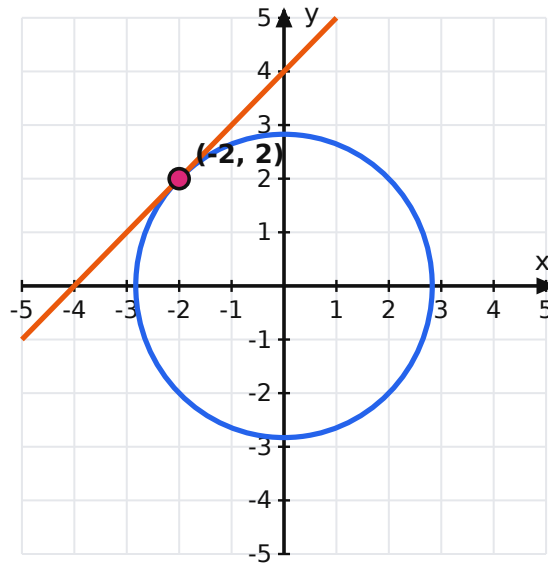
Exercise 11 - Circle and line through the origin

$x^2 + 9x^2 = 10$, so $x^2 = 1$ and $x = \pm 1$.

$y = 3x = \pm 3$.

(1, 3) and $(-1, -3)$

Exercise 12 - Tangent to a circle



Tangent at $(-2, 2)$.

$x^2 + (x+4)^2 = 8$ gives $2x^2 + 8x + 8 = 0$, so $x^2 + 4x + 4 = 0$.

$(x+2)^2 = 0$, so $x = -2$ only and $y = 2$.

One intersection point $(-2, 2)$, so the line is tangent

Exercise 13 - Count the intersections

System	D	Points
$y = x^2, y = 4x - 4$	0	1
$y = x^2, y = 2x - 5$	-16	0
$y = x^2, y = x + 2$	9	2

Completed table.

$x^2 - 4x + 4 = 0$: $D = 0$. $x^2 - 2x + 5 = 0$: $D = 4 - 20 = -16$. $x^2 - x - 2 = 0$: $D = 1 + 8 = 9$.

1, 0, and 2 intersection points

Exercise 14 - Find the parameter

$x^2 = 2x + k$ gives $x^2 - 2x - k = 0$ with $D = 4 + 4k$.

One point when $D=0$: $k=-1$. Two points when $D>0$: $k>-1$. None when $k<-1$.

One: $k = -1$; two: $k > -1$; none: $k < -1$

Exercise 15 - Perimeter and area

$y=15-x$, so $x(15-x)=56$ and $x^2-15x+56=0$.

$(x-7)(x-8)=0$, so $x=7$ or 8 , and $y=8$ or 7 .

7 meters by 8 meters

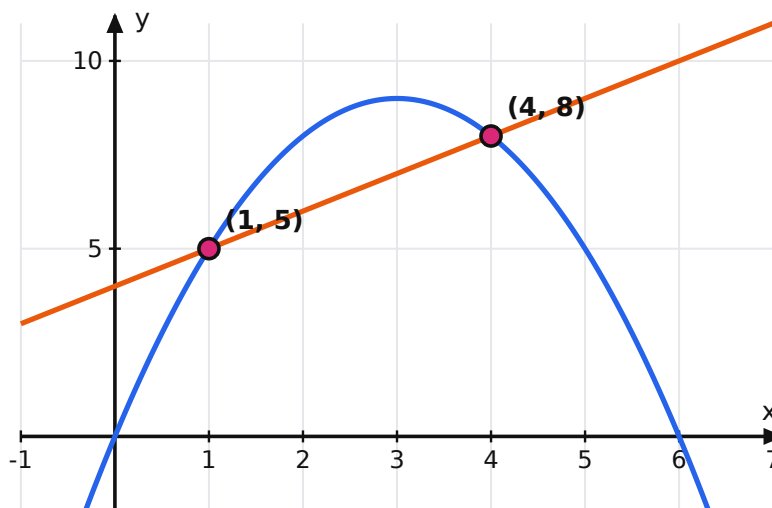
Exercise 16 - Two numbers

$x+y=12$, $xy=32$: $x(12-x)=32$ gives $x^2-12x+32=0$.

$(x-4)(x-8)=0$.

4 and 8

Exercise 17 - Ball and ramp



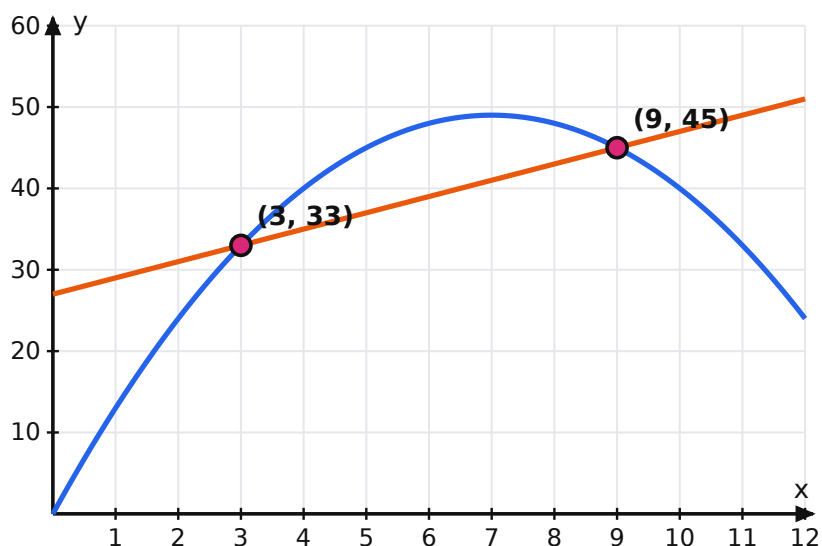
Meeting points (1, 5) and (4, 8).

$-x^2+6x=x+4$ gives $x^2-5x+4=0$, so $(x-1)(x-4)=0$.

$y=x+4$: 5 and 8.

At (1, 5) and (4, 8)

Exercise 18 - Break-even



Break-even at $x = 3$ and $x = 9$.

$-x^2 + 14x = 2x + 27$ gives $x^2 - 12x + 27 = 0$, so $(x-3)(x-9) = 0$.

At $x=3$: $R=C=33$. At $x=9$: $R=C=45$.

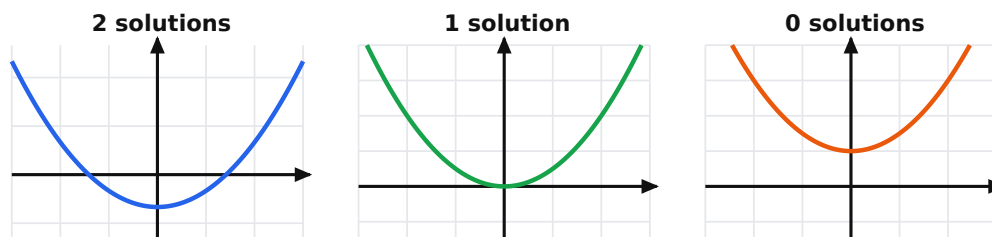
300 items and 900 items (\$3,300 and \$4,500)

Exercise 19 - Find the error

A solution of a system is an ordered pair. He must find each y : $y = 3+6 = 9$ and $y = -2+6 = 4$.

(3,9) and (-2,4)

Exercise 20 - Write a system



A line and a parabola can meet in 2, 1, or 0 points.

$(1,0)$: $1-4+3=0$ and $1-1=0$. $(4,3)$: $16-16+3=3$ and $4-1=3$.

Both points satisfy both equations, so the line crosses the parabola twice.

Two solutions, like the left panel