GRADE 7 ACCELERATED · UNIT 11 · LESSONS 5–6

Systems: Which Points Are Solutions; How Many Solutions

MA.8.AR.4.1

I can decide whether an ordered pair is a solution of a system, and read from a graph how many solutions a system has.

Warm-Up

1. Solve: $\frac{1}{2}(4x + 6) = x + 8$
2. How many solutions does $3x + 4 = 3x - 4$ have?
3. Two angles are vertical angles. One is 72°. Find the other.
4. $y = 2x + 1$. Find y when $x = 3$.

Warm-Up

1. Solve: $\frac{1}{2}(4x + 6) = x + 8$ **x = 5**

2. How many solutions does $3x + 4 = 3x - 4$ have?

   No solution

3. Two angles are vertical angles. One is 72°. Find the other.

   72°

4. $y = 2x + 1$. Find y when $x = 3$. **y = 7**

Vocabulary

system of equations

two equations taken together, like $y = x + 2$ and $y = -2x + 8$

solution of a system

an ordered pair (x, y) that makes BOTH equations true

intersect; point of intersection

cross; the point where two lines cross

parallel lines

lines that never meet: the same number multiplies x (the same coefficient of x) and the numbers added are different

the same line

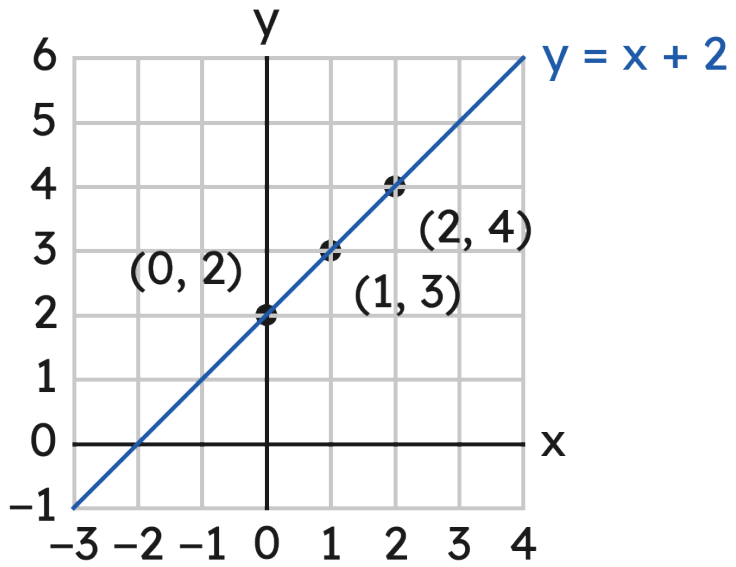
two equations written two ways that graph as one line

Notes

I. One equation in x and y: its solutions make a line

$y = x + 2$

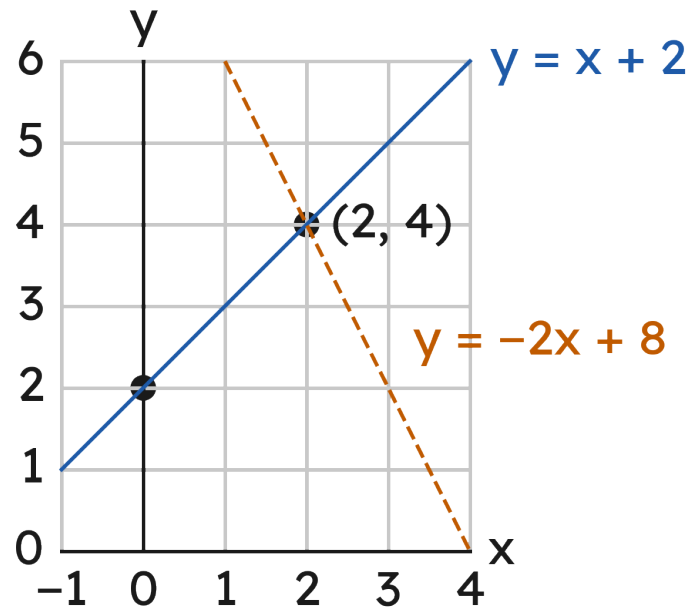
x	0	1	2
y	2	3	4



$(1, 3)$ is a solution: $1 + 2 = 3$. So is every point on the line.

Notes

II. A system's solution makes both equations true

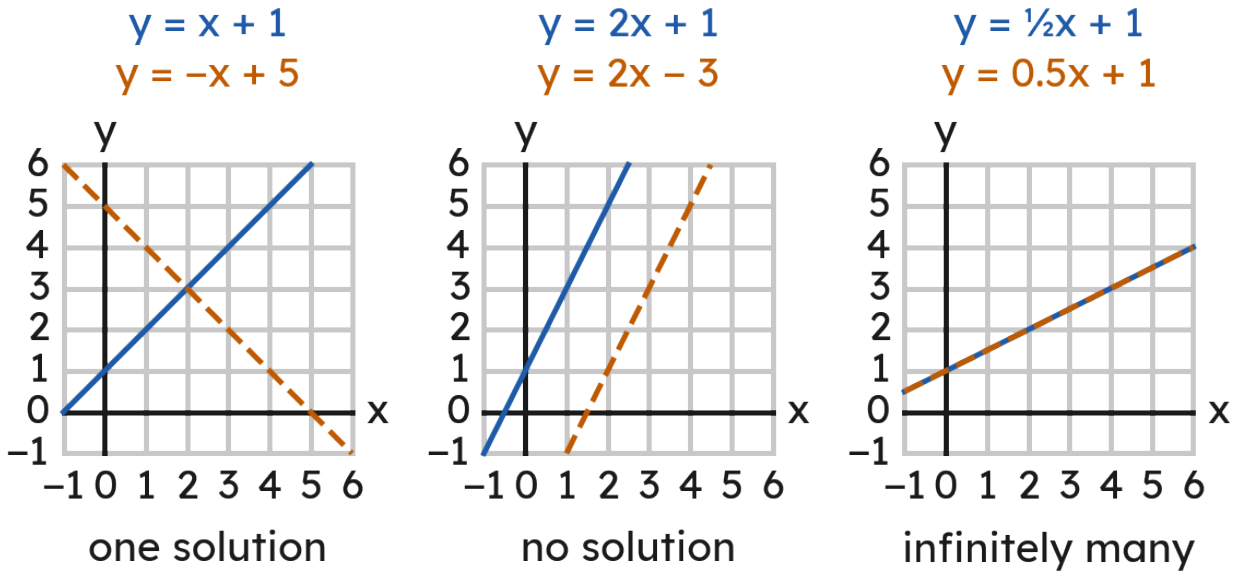


(2, 4): $2 + 2 = 4$ and $-2(2) + 8 = 4$. A solution.

(0, 2): $0 + 2 = 2$, but $-2(0) + 8 = 8$, not 2. Not a solution.

Notes

III. How many solutions? Read the graph



Cross once: one. Never meet: none. The same line: infinitely many.

$y = 3$ is a line too: every x gives 3.

Example 1

$$y = 3x - 1 \quad \text{and} \quad y = x + 5$$

$$(3, 8) \qquad (1, 2) \qquad (2, 7)$$

Which ordered pair is a solution of the system?

Example 1

$(3, 8)$: $3(3) - 1 = 8$ and $3 + 5 = 8$

$(1, 2)$: $3(1) - 1 = 2$ but $1 + 5 = 6$

$(2, 7)$: $3(2) - 1 = 5$

Answer: (3, 8)

Your Turn

$$y = 2x + 3 \quad \text{and} \quad y = -x + 9$$

$$(2, 7) \qquad (0, 3) \qquad (4, 5)$$

Which ordered pair is a solution of the system?

Your Turn

$$y = 2x + 3 \quad \text{and} \quad y = -x + 9$$

$$(2, 7) \qquad (0, 3) \qquad (4, 5)$$

Which ordered pair is a solution of the system?

$(2, 7)$: $2(2) + 3 = 7$ and $-2 + 9 = 7$

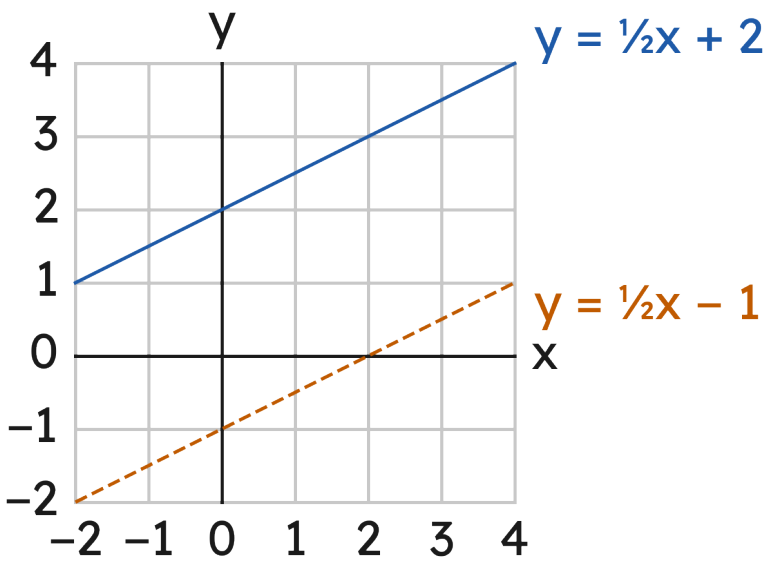
$(0, 3)$: $2(0) + 3 = 3$, but $-(0) + 9 = 9$

$(4, 5)$: $2(4) + 3 = 11$, not 5

Answer: (2, 7)

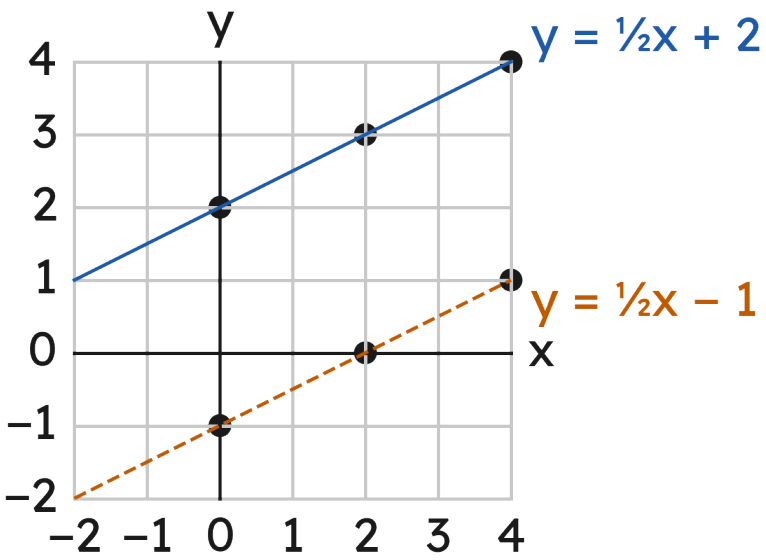
Example 2

The graphs of $y = \frac{1}{2}x + 2$ and $y = \frac{1}{2}x - 1$ are shown.



How many solutions does the system have?

Example 2



$x = 0$: 2 and -1

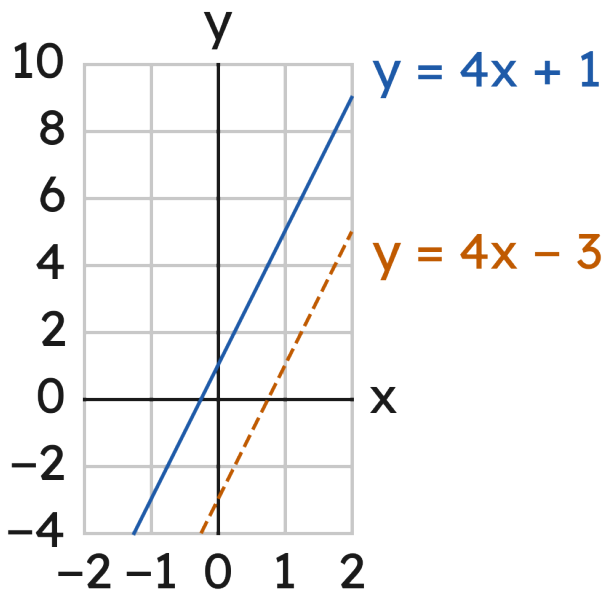
$x = 2$: 3 and 0

$x = 4$: 4 and 1

Answer: No solution

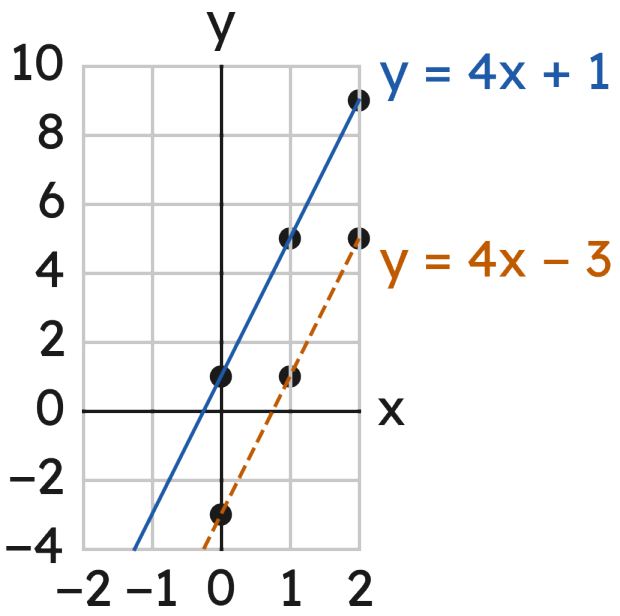
Your Turn

$y = 4x + 1$ and $y = 4x - 3$ are graphed. How many solutions?



Your Turn

$y = 4x + 1$ and $y = 4x - 3$ are graphed. How many solutions?



$x = 0$: 1 and −3

$x = 1$: 5 and 1

always 4 apart: parallel, they never meet

Answer: No solution

Whiteboards · Question 1 of 9

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

Is $(4, 1)$ a solution of the system?

Answer it.

Whiteboards · Question 1 of 9

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

Is $(4, 1)$ a solution of the system?

$4 - 3 = 1$ and $-4 + 5 = 1$

true in both equations

Answer: Yes: it makes both equations true

Whiteboards · Question 2 of 9

$y = 2x + 1$ and $y = 3x - 2$

Is $(2, 5)$ a solution of the system?

Answer it.

Whiteboards · Question 2 of 9

$y = 2x + 1$ and $y = 3x - 2$

Is $(2, 5)$ a solution of the system?

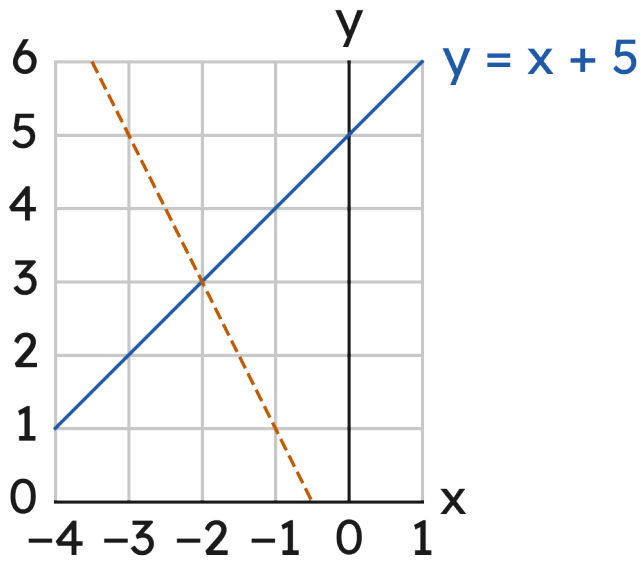
$2(2) + 1 = 5$, but $3(2) - 2 = 4$, not 5

Answer: No: 3(2) – 2 = 4, not 5

Whiteboards · Question 3 of 9

Ty drew this system on a grid 6 units tall. What is its solution?

$y = -2x - 1$

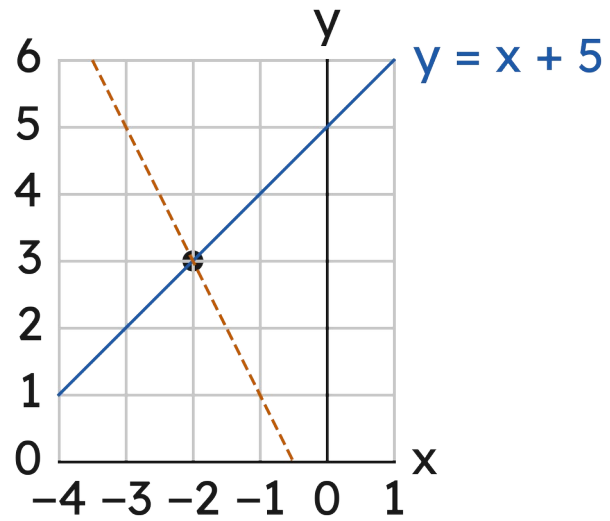


Answer it.

Whiteboards · Question 3 of 9

Ty drew this system on a grid 6 units tall. What is its solution?

$y = -2x - 1$



the lines cross once, at $(-2, 3)$

$-2 + 5 = 3$ and $-2(-2) - 1 = 3$

Answer: (−2, 3) — one solution

Whiteboards · Question 4 of 9

$y = 2x - 4$ and $y = -x + 5$

Which ordered pair is a solution of the system?

A. (0, 5)

B. (2, 3)

C. (2, 0)

D. (3, 2)

Answer it.

Whiteboards · Question 4 of 9

$y = 2x - 4$ and $y = -x + 5$

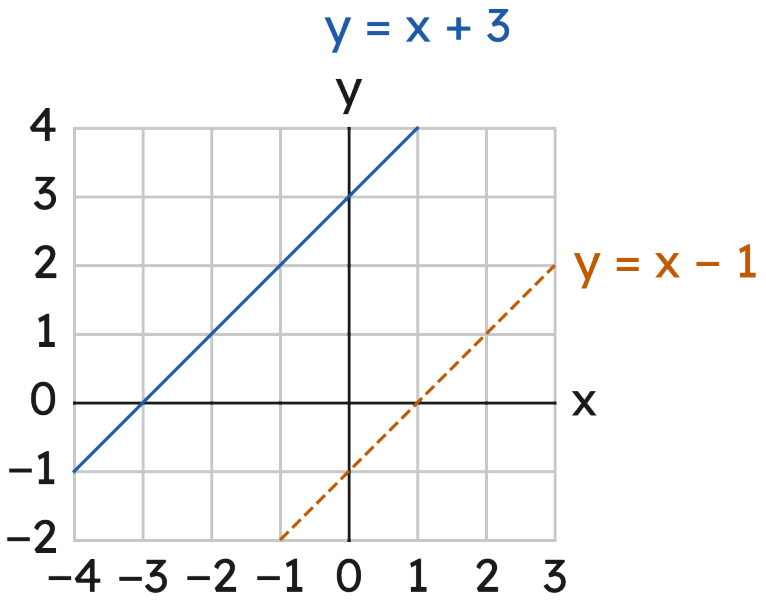
Which ordered pair is a solution of the system?

$(3, 2)$: $2(3) - 4 = 2$ and $-3 + 5 = 2$

Answer: D — (3, 2)

Whiteboards · Question 5 of 9

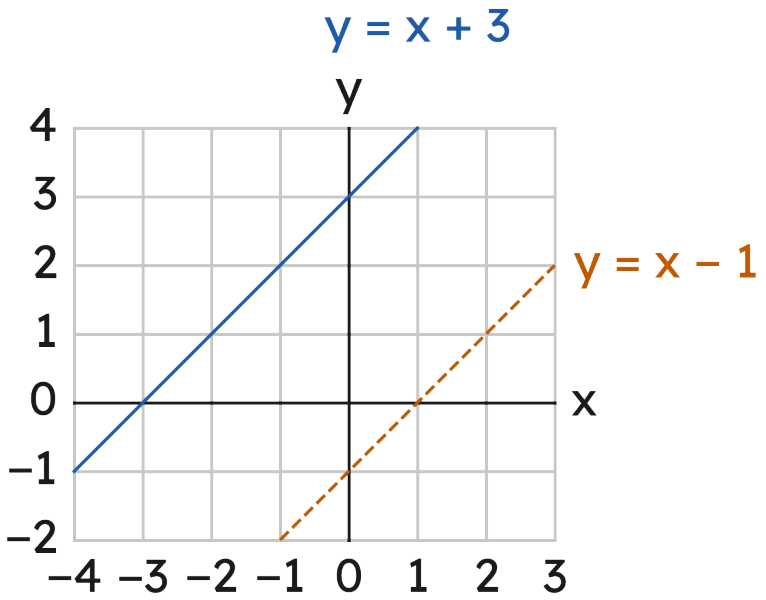
The system is graphed. How many solutions does it have?



Answer it.

Whiteboards · Question 5 of 9

The system is graphed. How many solutions does it have?



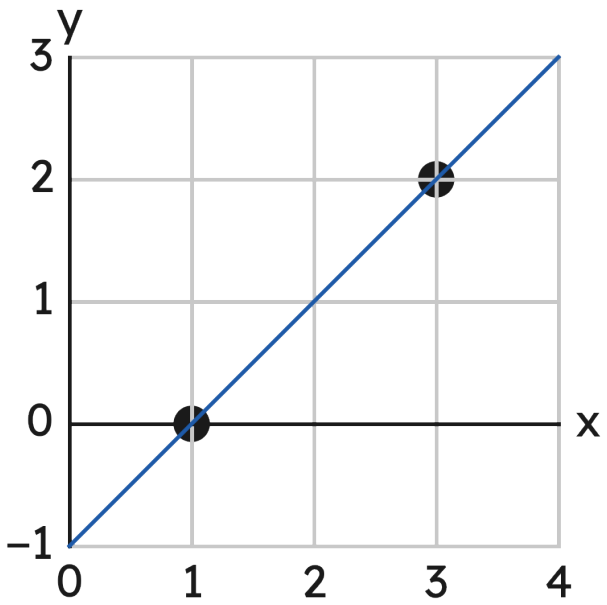
$x + 3$ and $x - 1$: 1 multiplies x in both

parallel: they never meet

Answer: No solution — the lines are parallel

Whiteboards · Question 6 of 9

$y = x - 1$ **and** $y = -1 + x$ **graph as one line. How many solutions?**



A. one

B. infinitely many

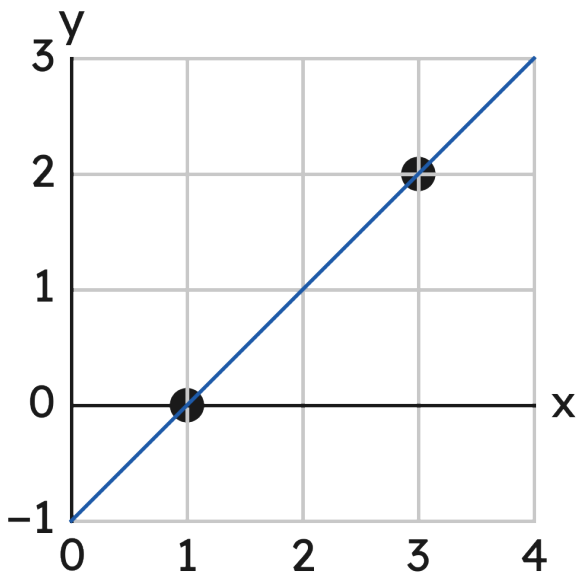
C. none

D. two

Answer it.

Whiteboards · Question 6 of 9

$y = x - 1$ **and** $y = -1 + x$ **graph as one line. How many solutions?**

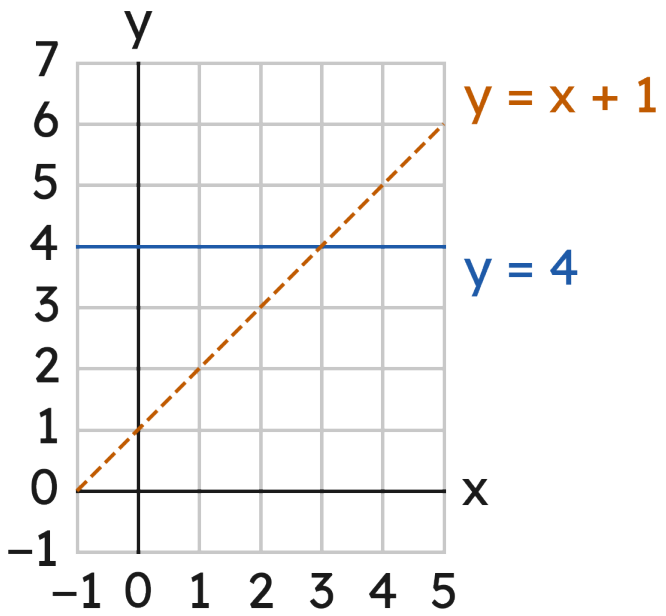


$10 - 1 = 9$ and $-1 + 10 = 9$

Answer: B — infinitely many

Whiteboards · Question 7 of 9

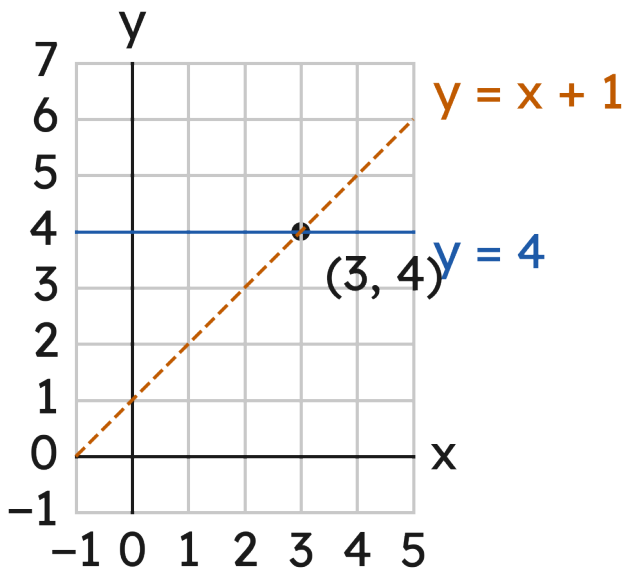
$y = 4$ **and** $y = x + 1$ **are graphed. How many solutions?**



Answer it.

Whiteboards · Question 7 of 9

$y = 4$ **and** $y = x + 1$ **are graphed. How many solutions?**



the lines cross once, at $(3, 4)$

$y = 4$ for every x, and $3 + 1 = 4$

Answer: One solution: (3, 4)

Whiteboards · Question 8 of 9

$(2, \square)$ is a solution of $y = 3x + 1$ and $y = x + 5$.

What number goes in the box?

Answer it.

Whiteboards · Question 8 of 9

$(2, \square)$ is a solution of $y = 3x + 1$ and $y = x + 5$.

What number goes in the box?

$$3(2) + 1 = 7 \quad \text{and} \quad 2 + 5 = 7$$

Answer: 7

Whiteboards · Question 9 of 9

Leo says $(1, 4)$ is a solution of $y = 3x + 1$ and $y = 2x + 3$,

because it makes the first equation true.

Is Leo right? Explain.

Write your answer in sentences.

Whiteboards · Question 9 of 9

Leo says $(1, 4)$ is a solution of $y = 3x + 1$ and $y = 2x + 3$,

because it makes the first equation true.

Is Leo right? Explain.

first: $3(1) + 1 = 4$

second: $2(1) + 3 = 5$, not 4

a solution makes both true: $(2, 7)$ does

Answer: No: 2(1) + 3 = 5, not 4.

Independent Set

1. Is $(3, -1)$ a solution of the system $y = 2x - 7$ and $y = -x + 2$?
2. $(-1, 4)$ makes one equation of the system $y = -3x + 1$ and $y = x + 6$ false. Which one?
3. Select all the systems that have $(2, 5)$ as a solution.
4. The graphs of $y = 3x + 2$ and $y = 3x - 4$ are shown. How many solutions does the system have?
5. The graphs of $y = x - 1$ and $y = -3x + 7$ are shown. How many solutions does the system have, and what is it?
6. Both equations of the system $y = \frac{3}{2}x - 2$ and $y = 1.5x - 2$ graph as the line shown. How many solutions does the system have?

IXL

1. Open IXL and start today's skills.
2. Work on paper where the question needs work. The answer box does not show it.
3. Every skill listed is required, to a SmartScore of 67. Due by the Unit 11 test.

Today's skills — all required

Is (x, y) a solution to the system of equations? — N46
Find the number of solutions to a system of equations by graphing — AGZ
Solve a system of equations in slope-intercept form — 9Z8