LESSON MAKER PRO

Where Lines Meet

Find solutions that make two equations true.

GRADE 8 · MT.8.EE.8

MT.8.EE.8 "Analyze and solve pairs of simultaneous linear equations by: Understanding that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs..."

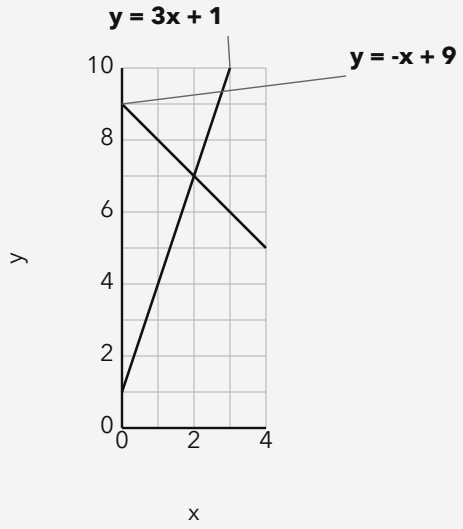
NAME _____ DATE _____

ONE POINT, TWO EQUATIONS

A point where two lines cross lies on both lines, so its coordinates make both equations true. You can find that point by setting two expressions for y equal or by adding or subtracting equations to remove a variable. Parallel lines have no common point, while lines that lie on top of each other have infinitely many.

WORKED EXAMPLE

Use the graph to find where the two lines meet. Check that the point satisfies both equations.

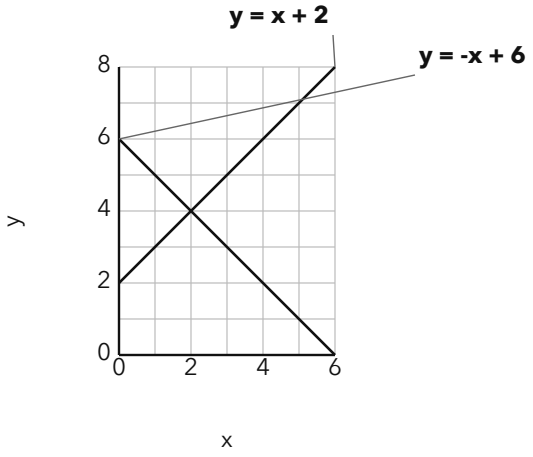


1. Set the expressions for y equal: 3x + 1 = -x + 9.
2. Add x and subtract 1: 4x = 8, so x = 2.
3. Substitute x = 2: y = 3(2) + 1 = 7.
4. Check both equations: 7 = 3(2) + 1 and 7 = -2 + 9.

Answer: (2, 7)

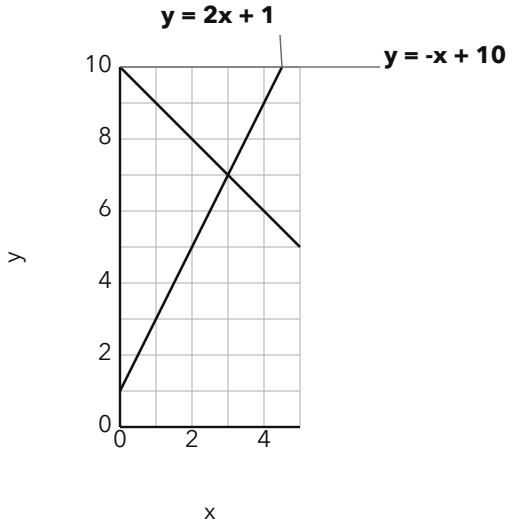
PRACTICE 6 problems

1 Find the intersection of the two lines on the graph. Show that its coordinates satisfy both equations.



ANSWER _____

2 Estimate the intersection from the graph. Then solve the system algebraically to check your estimate.



ANSWER _____

3 Solve the system: x + y = 12 and x - y = 4.

ANSWER _____

4 Solve the system: 2x + y = 17 and x + y = 11.

ANSWER _____

5 Solve the system: y = 3x - 4 and y = x + 2.

ANSWER _____

6 How many solutions does the system y = 2x + 3 and y = 2x - 5 have? Explain.

ANSWER _____

APPLY IT Show your work

1 At a Montana school fundraiser supporting an Indigenous language program, students sell notebooks for $4 each and pencils for $2 each. They sell 18 items and collect $52. How many notebooks and pencils do they sell?

WORK SPACE

ANSWER _____

2 At a community basketball game hosted by a Montana tribal college, student tickets cost $3 and adult tickets cost $7. The game sells 26 tickets and collects $118. How many of each ticket are sold?

WORK SPACE

ANSWER _____

CHALLENGE One step up

A student says the system $2x + 3y = 18$ and $4x + 6y = 36$ has exactly one solution, (3, 4). Is the student correct? Explain how many solutions the system has.

WORK SPACE AND ANSWER

ANSWER KEY

Where Lines Meet

GRADE 8 · MT.8.EE.8

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Find the intersection of the two lines on the graph. Show that its coordinates satisfy both equations.	**(2, 4). For y = x + 2, 4 = 2 + 2. For y = -x + 6, 4 = -2 + 6.**
2	Estimate the intersection from the graph. Then solve the system algebraically to check your estimate.	**Estimate: (3, 7). Algebra: 2x + 1 = -x + 10, so 3x = 9, x = 3, and y = 7.**
3	Solve the system: x + y = 12 and x - y = 4.	**(8, 4)**
4	Solve the system: 2x + y = 17 and x + y = 11.	**(6, 5)**
5	Solve the system: y = 3x - 4 and y = x + 2.	**(3, 5)**
6	How many solutions does the system y = 2x + 3 and y = 2x - 5 have? Explain.	**No solutions. The lines have the same slope but different y-intercepts, so they never meet.**

PART 2 · APPLY IT

1. **8 notebooks and 10 pencils** Let n be notebooks and p be pencils. Solve n + p = 18 and 4n + 2p = 52 to get n = 8 and p = 10.
2. **16 student tickets and 10 adult tickets** Let s be student tickets and a be adult tickets. Solve s + a = 26 and 3s + 7a = 118 to get s = 16 and a = 10.

CHALLENGE

No. (3, 4) satisfies both equations, but doubling the first equation gives the second. The graphs are the same line, so the system has infinitely many solutions.

Accept equivalent algebraic checks for the graph problems. For the challenge, students should distinguish a point that satisfies both equations from a system with exactly one solution.