LESSON MAKER PRO

Where Lines Meet

Connect a graph's crossing point to an equation.

GRADE 7 · 7A.AF.D.24

7A.AF.D.24 "Explain why the x-coordinates of the points where the graphs of the equations y = f(x) and y = g(x) intersect are the solutions of the equation f(x) = g(x). Limit to linear equations."

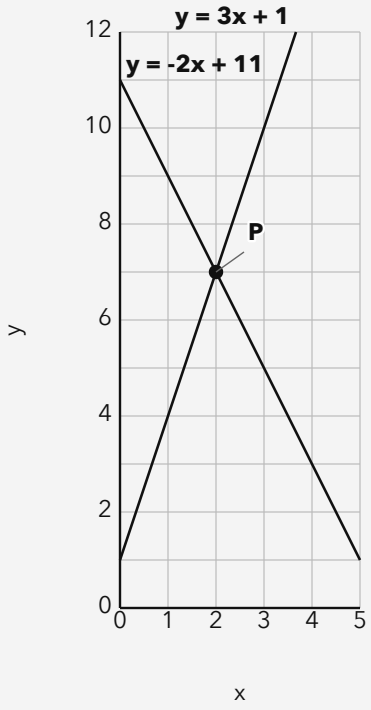
NAME _____ DATE _____

THE BIG IDEA

At a crossing point, both lines have the same x-coordinate and the same y-coordinate. Set their rules equal to find the x-coordinate of that point.

WORKED EXAMPLE

Use the graph to find where the lines cross. Show why the x-coordinate solves an equation.

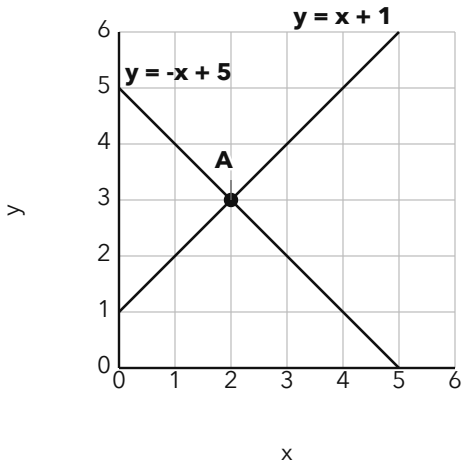


1. The lines cross at P, so their y-values are equal there.
2. Set 3x + 1 = -2x + 11.
3. Add 2x and subtract 1: 5x = 10, so x = 2.
4. Substitute x = 2: y = 3(2) + 1 = 7.

Answer: The lines cross at (2, 7). The x-coordinate, 2, solves 3x + 1 = -2x + 11.

PRACTICE 6 problems

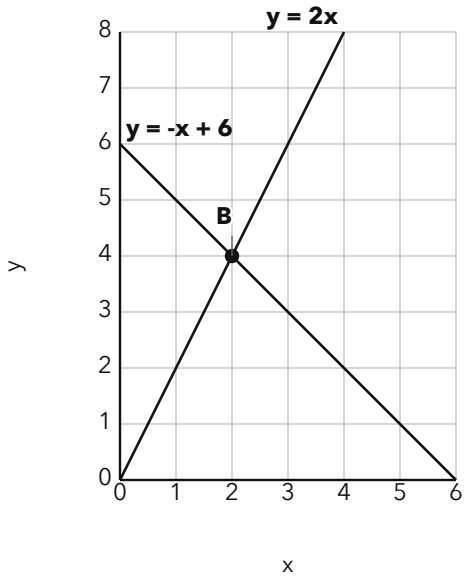
1 At what point do the graphed lines cross? Write the equation their rules satisfy at that point.



ANSWER _____

_____

2 What x-value makes the two graphed rules equal? What is their common y-value?



ANSWER _____

_____

3 The lines are y = 4x + 2 and y = 2x + 8. Find the x-coordinate where they cross and the full crossing point.

ANSWER _____

_____

4 Find the x-coordinate where y = 5x - 4 and y = 2x + 5 cross. Explain in one sentence why that x-value solves 5x - 4 = 2x + 5.

ANSWER _____

_____

5 Do the lines y = 2x + 1 and y = 2x - 3 cross? Explain using an equation.

ANSWER _____

_____

6 A student says y = 4x - 1 and y = x + 5 cross when x = 1. Is that correct? Find the correct x-value and explain using equal y-values.

ANSWER _____

_____

APPLY IT Show your work

1 At a school fair, Booth A charges $4 to enter plus $3 per game. Booth B charges $10 to enter plus $1 per game. Let x be the number of games. After how many games will the total costs be equal? What will each booth cost then, and what does that point mean on a graph of the costs?

WORK SPACE

ANSWER _____

2 Two music apps charge for one month of downloads. App A costs $5 plus $2 per song. App B costs $11 plus $1 per song. Let x be the number of songs. At how many songs do the total costs match, and what is that cost?

WORK SPACE

ANSWER _____

CHALLENGE One step up

The lines y = 2x + 1 and y = 5x - 8 cross. A third line, y = x + b, passes through the same crossing point. Find b. Explain why the crossing point's x-coordinate makes all three rules equal.

WORK SPACE AND ANSWER

ANSWER KEY

Where Lines Meet

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	At what point do the graphed lines cross? Write the equation their rules satisfy at that point.	**(2, 3); x + 1 = -x + 5.**
2	What x-value makes the two graphed rules equal? What is their common y-value?	**x = 2; the common y-value is 4.**
3	The lines are y = 4x + 2 and y = 2x + 8. Find the x-coordinate where they cross and the full crossing point.	**x = 3; the crossing point is (3, 14).**
4	Find the x-coordinate where y = 5x - 4 and y = 2x + 5 cross. Explain in one sentence why that x-value solves 5x - 4 = 2x + 5.	**x = 3. At x = 3, both rules give y = 11, so their expressions are equal.**
5	Do the lines y = 2x + 1 and y = 2x - 3 cross? Explain using an equation.	**No. Setting the rules equal gives 2x + 1 = 2x - 3, which would mean 1 = -3.**
6	A student says y = 4x - 1 and y = x + 5 cross when x = 1. Is that correct? Find the correct x-value and explain using equal y-values.	**No. At x = 1, the y-values are 3 and 6; at x = 2, both y-values are 7.**

PART 2 · APPLY IT

1. **After 3 games, each booth costs $13. The cost graphs cross at (3, 13), where both booths have the same cost.** Set 4 + 3x = 10 + x to get x = 3. Substitute to find a cost of $13.
2. **At 6 songs, both apps cost $17.** Set 5 + 2x = 11 + x to get x = 6. Both rules then give $17.

CHALLENGE

b = 4. The first two rules are equal when x = 3, and each gives y = 7. Since 3 + 4 = 7, all three rules give 7 at x = 3.

Accept equivalent equations and explanations that show both rules give the same y-value at the stated x-coordinate. In problem 5, students should identify that the equal slopes and different intercepts give no solution.