

Line Crossing Quest

Graph systems, spot intersections, and compare real choices.

GRADE 8 • 8.FGR.7.3

8.FGR.7.3 "Approximate solutions of two linear equations in two variables by graphing the equations and solving simple cases by inspection"

NAME _____

DATE _____

FIND THE MEETING POINT

A solution to two linear equations is the point where both graphs cross. Graph both lines on the same coordinate grid, then read the x- and y-coordinates of the intersection. If the lines never cross, there is no solution. If they are the same line, there are infinitely many solutions.

WORKED EXAMPLE

Graph $y = 7x + 13$ and $y = 4x + 25$.
Find their intersection.

1. Graph both lines on the same coordinate grid.
2. At the intersection, the y-values are equal: $7x + 13 = 4x + 25$.
3. Subtract $4x$ and 13 : $3x = 12$, so $x = 4$.
4. Substitute $x = 4$: $y = 7(4) + 13 = 41$.

Answer: (4, 41)

PRACTICE 6 problems

- 1** 1. Graph $y = x + 3$ and $y = 2x$. What is the intersection?

ANSWER _____

- 2** 2. Graph $y = -x + 8$ and $y = x + 2$. What is the intersection?

ANSWER _____

- 3** 3. Graph $y = 3x - 6$ and $y = -x + 6$. What is the intersection?

ANSWER _____

- 4** 4. Graph $y = 2x + 9$ and $y = 2x - 3$. How many solutions does the system have?

ANSWER _____

- 5** 5. Graph $y = 3x + 12$ and $y = x + 18$. What is the intersection?

ANSWER _____

- 6** 6. Graph $y = -2x + 10$ and $y = -2x + 10$. How many solutions does the system have?

ANSWER _____

APPLY IT Show your work

- 1** APPLY 1. A skate park has two pass plans. Plan A costs \$14 to join plus \$2 per visit. Plan B costs \$5 to join plus \$5 per visit. Let x be the number of visits and y be the total cost. Graph $y = 2x + 14$ and $y = 5x + 5$. About how many visits make the plans cost the same, and what is that cost?

WORK SPACE

ANSWER _____

- 2** APPLY 2. Two phone data plans have monthly costs. Plan A costs \$18 plus \$3 per GB. Plan B costs \$30 plus \$2 per GB. Let x be the number of GB and y be the monthly cost. Graph $y = 3x + 18$ and $y = 2x + 30$. About how many GB make the plans cost the same, and what is that cost?

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

CHALLENGE. Graph $y = 3x + 1$ and $y = -2x + 9$. Estimate the intersection to the nearest tenth. Explain how you can check that your point is on both lines.

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	1. Graph $y = x + 3$ and $y = 2x$. What is the intersection?	(3, 6)
2	2. Graph $y = -x + 8$ and $y = x + 2$. What is the intersection?	(3, 5)
3	3. Graph $y = 3x - 6$ and $y = -x + 6$. What is the intersection?	(3, 3)
4	4. Graph $y = 2x + 9$ and $y = 2x - 3$. How many solutions does the system have?	No solution
5	5. Graph $y = 3x + 12$ and $y = x + 18$. What is the intersection?	(3, 21)
6	6. Graph $y = -2x + 10$ and $y = -2x + 10$. How many solutions does the system have?	Infinitely many solutions

PART 2 • APPLY IT

- 3 visits; \$20** Set the costs equal: $2x + 14 = 5x + 5$. The lines intersect at (3, 20), so both plans cost \$20 after 3 visits.
- 12 GB; \$54** Set the costs equal: $3x + 18 = 2x + 30$, so $x = 12$. Substituting gives $y = 54$, so the graphs intersect at (12, 54).

CHALLENGE

About (1.6, 5.8). At $x = 1.6$, both equations give $y = 5.8$, so the point is on both lines.

Accept equivalent coordinate notation, such as $x = 3$ and $y = 6$. For graphing answers, accept reasonable estimates when the plotted intersection is close to the exact point.