LESSON MAKER PRO

Where Lines Meet

Classify systems and explain why.

GRADE 8 · 8A.AF.B.9.b

8A.AF.B.9.b "Interpret and justify the results of systems of two linear equations in two variables (one solution, no solution, or infinitely many solutions) when applied to real-world and mathematical problems."

NAME _____ DATE _____

THREE POSSIBLE RESULTS

A solution makes both equations true. Lines with different slopes meet once. Lines with the same slope never meet if they have different starting values, but share every point if they are the same line.

WORKED EXAMPLE

For y = 4x + 11 and y = -5x + 20, find the solution and justify it.

VALUES FOR BOTH EQUATIONS

x	4x + 11	-5x + 20
0	11	20
1	15	15

1. Set the expressions equal: 4x + 11 = -5x + 20.
2. Solve: 9x = 9, so x = 1.
3. Substitute: y = 4(1) + 11 = 15.

Answer: One solution, (1, 15). Both equations give y = 15 when x = 1.

PRACTICE 4 problems

1 Classify and justify: y = 6x + 8 and y = 10x + 8.

ANSWER _____

2 Classify and justify: y = 6x + 8 and y = 6x + 12.

ANSWER _____

3 Classify and justify: 8x + 12y = 24 and 16x + 24y = 48.

ANSWER _____

4 Find the solution and justify: y = 8x + 6 and y = 12x - 18.

ANSWER _____

APPLY IT Show your work

1 Music app A costs $22 to join plus $6 per month. App B costs $10 to join plus $8 per month. When will their total costs match? Justify.

WORK SPACE

ANSWER _____

2 Two arcades each charge $6 per game. One adds an $8 entry fee; the other adds a $12 entry fee. Can their total costs match? Justify.

WORK SPACE

ANSWER _____

CHALLENGE One step up

Consider $6x + 8y = 24$ and $12x + by = c$. Find b, then give one value of c for no solution and one for infinitely many solutions. Explain.

WORK SPACE AND ANSWER

ANSWER KEY

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Classify and justify: y = 6x + 8 and y = 10x + 8.	**One solution, (0, 8). The slopes differ, and both equations give y = 8 when x = 0.**
2	Classify and justify: y = 6x + 8 and y = 6x + 12.	**No solution. The lines have the same slope but different starting values.**
3	Classify and justify: 8x + 12y = 24 and 16x + 24y = 48.	**Infinitely many solutions. The second equation is twice the first.**
4	Find the solution and justify: y = 8x + 6 and y = 12x - 18.	**One solution, (6, 54). Both equations give y = 54 when x = 6.**

PART 2 · APPLY IT

1. **After 6 months, both cost $58. The costs match once because the monthly rates differ.** Solve 22 + 6x = 10 + 8x to get x = 6. Substitute to find a cost of $58.
2. **No. The cost is always $4 more at the arcade with the $12 entry fee.** The costs are 6x + 8 and 6x + 12. Equal per-game charges keep the $4 difference constant.

CHALLENGE

b = 16. For example, c = 40 gives no solution, while c = 48 gives infinitely many. Doubling the first equation gives 12x + 16y = 48, so c = 48 makes the equations identical; any other c makes them inconsistent.

Accept any c other than 48 for the challenge's no-solution case. A justification may use slopes, matching values, or equivalent equations.