LESSON MAKER PRO

Intersection Investigators

Solve linear and nonlinear systems with algebra.

HIGH SCHOOL · MA.912.AR.9.3

MA.912.AR.9.3 "Given a mathematical or real-world context, solve a system consisting of two-variable linear or non-linear equations algebraically or graphically."

NAME _____ DATE _____

FIND EVERY INTERSECTION

A solution to a system is an ordered pair that makes both equations true. Use substitution when one equation is solved for a variable: replace that variable in the other equation, solve, and then substitute back. A nonlinear system can have more than one solution.

WORKED EXAMPLE

Solve the system: $y = 3x + 4$ and $x + y = 20$.

1. Substitute y: $x + (3x + 4) = 20$.
2. Combine like terms: $4x + 4 = 20$.
3. Subtract 4 and divide by 4: $x = 4$.
4. Substitute $x = 4$ into $y = 3x + 4$: $y = 16$.

Answer: (4, 16)

PRACTICE 6 problems

1 Solve the system: $x + y = 14$ and $x - y = 2$.

ANSWER _____

2 Solve the system: $y = x^2$ and $x + y = 30$.

ANSWER _____

3 Solve the system: $y = 2x - 5$ and $y = x + 1$.

ANSWER _____

4 Solve the system: $x^2 + y^2 = 85$ and $y = 6$.

ANSWER _____

5 Solve the system: $xy = 14$ and $y = x + 5$.

ANSWER _____

6 Solve the system: $y = x^2$ and $x + y = 42$.

ANSWER _____

APPLY IT Show your work

1 A student-run merch table sells T-shirts and sticker packs. It sells 16 items total. T-shirts cost $11 each, sticker packs cost $5 each, and the total sales are $122. How many T-shirts and sticker packs did it sell?

WORK SPACE

ANSWER _____

2 An art club is painting a rectangular backdrop for a school concert. The length is 5 feet greater than the width, and the area is 66 square feet. What are the dimensions?

WORK SPACE

ANSWER _____

CHALLENGE One step up

Solve the system algebraically: $y = 35/x$ and $y = x + 2$. Then explain in one sentence why $x = 0$ cannot be a solution.

WORK SPACE AND ANSWER

ANSWER KEY

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Solve the system: x + y = 14 and x - y = 2.	**(8, 6)**
2	Solve the system: $y = x^2$ and x + y = 30.	**(5, 25) and (-6, 36)**
3	Solve the system: y = 2x - 5 and y = x + 1.	**(6, 7)**
4	Solve the system: $x^2 + y^2 = 85$ and y = 6.	**(7, 6) and (-7, 6)**
5	Solve the system: xy = 14 and y = x + 5.	**(2, 7) and (-7, -2)**
6	Solve the system: $y = x^2$ and x + y = 42.	**(6, 36) and (-7, 49)**

PART 2 · APPLY IT

1. **7 T-shirts and 9 sticker packs** Let t be T-shirts and s be sticker packs. Solve t + s = 16 and 11t + 5s = 122 to get t = 7 and s = 9.
2. **Width = 6 feet, length = 11 feet** Let w be the width, so the length is w + 5. Solve w(w + 5) = 66; the positive solution is w = 6, so the length is 11.

CHALLENGE

Solutions: (5, 7) and (-7, -5). x = 0 cannot be a solution because 35/0 is undefined.

Accept ordered pairs in either order and equivalent algebraic work. For the area context, accept only the positive dimensions.