

System Solver

Connect algebra, graph estimates, and inspection.

GRADE 8 • 8.EE.C.8b

CCSS.Math.Content.8.EE.C.8b "Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection. For example..."

NAME _____

DATE _____

ONE PAIR MUST SATISFY BOTH EQUATIONS

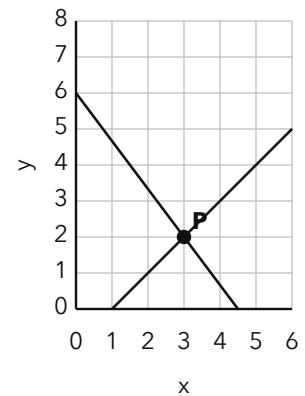
Substitution replaces a variable using the other equation. Elimination adds or subtracts equations to remove a variable. A graph gives an estimate of the shared point; algebra can give an exact pair. Check both equations. Equivalent equations share a line; contradictory equations have no shared point.

WORKED EXAMPLE

Solve $4x + 3y = 18$ and $x - y = 1$ by substitution. Connect the result to the graph.

1. From $x - y = 1$, $x = y + 1$. Substitute: $4(y + 1) + 3y = 18$.
2. $7y = 14$, so $y = 2$ and $x = 3$. Check: $12 + 6 = 18$; $3 - 2 = 1$.

Answer: (3, 2), the shared point P on both lines.



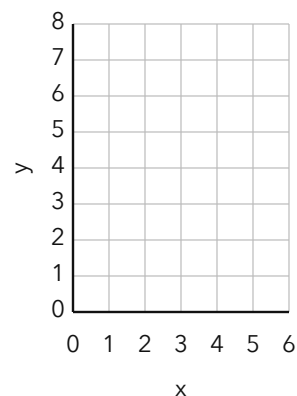
PRACTICE 4 problems

- 1** Solve $x + y = 9$ and $x - y = 5$ by elimination. Show the steps and check both equations.

ANSWER _____

- 2** Graph $y = 2x + 1$ and $y = -x + 5$. Estimate the shared point to the nearest tenth; then solve algebraically for the exact pair.

ANSWER _____



- 3** By inspection, how many solutions do $6x + 2y = 20$ and $3x + y = 10$ have? Explain the relationship and give one shared pair.

ANSWER _____

- 4** By inspection, explain why $8x + 5y = 12$ and $8x + 5y = 15$ have no solution. What would their graphs look like?

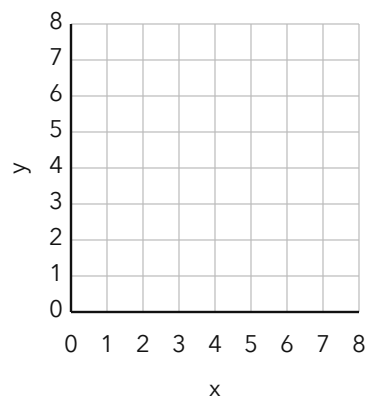
ANSWER _____

APPLY IT Show your work

- 1** At an event, 2 day passes and 1 guest pass cost \$12; 1 day pass and 2 guest passes cost \$9. Let x and y be their prices. Write and solve a system; check the prices in both purchases.

ANSWER _____

- 2** Bracelets cost \$1 each and stickers \$2 each. You buy 8 items for \$12. Let x = bracelets and y = stickers. Graph $x + y = 8$ and $x + 2y = 12$. Solve algebraically and interpret the shared point.

**CHALLENGE** One step up

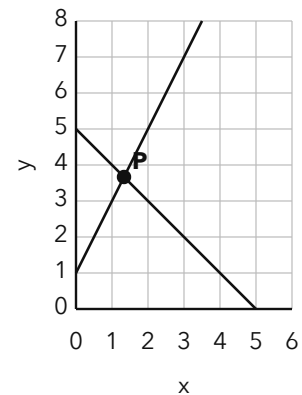
Solve $7x + 4y = 31$ and $3x - 4y = 9$. Show why your exact ordered pair satisfies BOTH equations; a graph estimate alone is insufficient.

PRACTICE 1

Add: $2x = 14$, $x = 7$; $y = 2$. **Checks:** $7 + 2 = 9$ and $7 - 2 = 5$.

PRACTICE 2

Estimate (1.3, 3.7). Solve $2x + 1 = -x + 5$: $x = 4/3$, $y = 11/3$. Both expressions equal $11/3$.

**PRACTICE 3**

Infinitely many: the first is twice the second. Example (0,10): both equations hold.

PRACTICE 4

The same expression cannot equal both 12 and 15. Their lines have equal slope $-8/5$ and different intercepts $12/5$ and 3 , so they are parallel.

APPLY IT 1

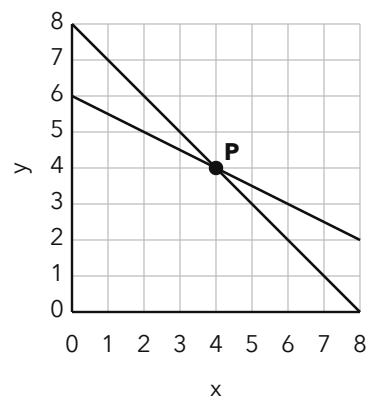
Day pass \$5; guest pass \$2.

$2x + y = 12$ and $x + 2y = 9$. Double the first and subtract the second: $3x = 15$. Then $y = 2$. Checks: $10 + 2 = 12$ and $5 + 4 = 9$.

APPLY IT 2

4 bracelets and 4 stickers.

Subtract the first equation from the second: $y = 4$, so $x = 4$. The shared point (4,4) satisfies $4 + 4 = 8$ and $4 + 8 = 12$.

**CHALLENGE**

Add: $10x = 40$, so $x = 4$. Then $12 - 4y = 9$, $y = 3/4$. Checks: $28 + 3 = 31$; $12 - 3 = 9$.

Practice 2 estimates may vary slightly with hand drawing; exact values must be $4/3$ and $11/3$. Require two labeled lines on each student graph and a shared ordered pair. The key graphs show complete lines within the windows. Pass prices and item counts must be nonnegative. Ruler optional.