MATHEMATICS · GRADES 10-12

Solving systems by elimination

Difficulty level: Advanced

Mathematics: Grades 10-12

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Overview of the concept

This is how you work out two unknowns at once, like the price of a burger and the price of a drink from two different orders, by cancelling one of them out. Two orders give you two facts, and each fact involves both prices, so neither price can be found on its own. Adding or subtracting the two facts in the right way makes one price disappear, leaving the other in plain sight. Once you know one price, the other follows straight away from either order.



Rule

Solving systems by elimination: add or subtract the two equations so that one unknown disappears, solve for the other, then put it back into either equation to find the first.

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Worked examples

EXAMPLE 1

Q Solve $x + y = 7$ and $x - y = 1$ by elimination.

SOLUTION

Add the equations: the y terms cancel, giving $2x = 8$.

So $x = 4$

Put $x = 4$ into $x + y = 7$:

$4 + y = 7$

$y = 3$

Answer: (4, 3)

EXAMPLE 2

Q Solve $2x + y = 10$ and $x + y = 6$ by elimination.

SOLUTION

Subtract the second equation from the first: $x = 4$

Put $x = 4$ into $x + y = 6$:

$4 + y = 6$

$y = 2$

So the answer is (4, 2).

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Practice questions

1 At a cafe, 2 burgers and 1 drink cost $13, and 1 burger and 1 drink cost $8. Use elimination to find the price of a burger and a drink.

- **A** Burger $4, drink $4
- **B** Burger $5, drink $3
- **C** Burger $6, drink $2
- **D** Burger $3, drink $5

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2 2 notebooks and 1 pen cost $11. 1 notebook and 2 pens cost $10. Find the price of a notebook and a pen.

- **A** Notebook $3, pen $4
- **B** Notebook $5, pen $2
- **C** Notebook $4, pen $3
- **D** Notebook $3, pen $5

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3 If you add $x + y = 9$ and $x - y = 3$, what is the solution?

- **A** (3, 6)
- **B** (6, 3)
- **C** (9, 0)
- **D** (3, 9)

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4 Solve $x + y = 10$ and $x - y = 2$ by elimination. What is the solution?

- **A** (4, 6)
- **B** (2, 8)
- **C** (6, 4)
- **D** (8, 2)

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5 A family buys 2 adult tickets and 2 child tickets for $36. Another family buys 1 adult ticket and 2 child tickets for $24. What is the price of an adult ticket and a child ticket?

- **A** Adult $10, child $8
- **B** Adult $12, child $6
- **C** Adult $9, child $9
- **D** Adult $15, child $3

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6 Solve $2x + 3y = 16$ and $2x + y = 8$ by elimination.

- **A** (4, 2)
- **B** (2, 4)
- **C** (0, 4)
- **D** (4, 0)

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7 A gym charges a joining fee plus a monthly fee. 3 months costs $75 and 6 months costs $120. Use elimination to find the joining fee and the monthly fee.

- **A** Joining fee $15, monthly $30
- **B** Joining fee $45, monthly $10
- **C** Joining fee $30, monthly $15
- **D** Joining fee $20, monthly $25

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8 Solve $x + y = 9$ and $2x + y = 14$ by elimination. What is the solution?

- **A** (4, 5)
- **B** (9, 0)
- **C** (5, 4)
- **D** (0, 9)

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9 Use elimination on $5x + y = 20$ and $3x + y = 12$. What is the solution?

- **A** (0, 4)
- **B** (4, 0)
- **C** (3, 5)
- **D** (5, -5)

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10 Subtract $x + y = 7$ from $x + 2y = 11$. What single equation is left?

- **A** $y = 4$
- **B** $y = 5$
- **C** $y = 3$
- **D** $y = -4$

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ANSWER KEY

1. Burger $5, drink $3

2. Notebook $4, pen $3

3. (6, 3)

4. (6, 4)

5. Adult $12, child $6

6. (2, 4)

7. Joining fee $30, monthly $15

8. (5, 4)

9. (4, 0)

10. y = 4

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