MATHEMATICS · GRADES 7-9

Equations with variables on both sides

Difficulty level: Intermediate

Mathematics: Grades 7-9

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Overview of the concept

This is how you solve for an unknown that appears on both sides. Comparing two phone plans to find where they cost exactly the same means the unknown sits on both sides of the equation. Bringing them together lets you find the exact point where the two plans tie. That is the point that tells you which plan is cheaper for you.



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Worked examples

EXAMPLE 1

Q Solve $5x + 3 = 3x + 11$.

SOLUTION

This is an equation with x on both sides, so collect the x terms on one side first: take 3x off both sides.

That gives $2x + 3 = 11$, so $2x = 8$

Divide by 2: $x = 4$

EXAMPLE 2

Q Solve $4x - 2 = x + 10$.

SOLUTION

Again, take the smaller x term off both sides: take x off both sides.

That gives $3x - 2 = 10$, so $3x = 12$

Divide by 3: $x = 4$

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Practice questions

1 Solve $3x + 5 = x + 13$

- **A** $x = 2$
- **B** $x = 4$
- **C** $x = 6$
- **D** $x = 9$

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2 Solve $0.5x + 3 = 0.2x + 9$

- **A** $x = 10$
- **B** $x = 20$
- **C** $x = 30$
- **D** $x = 15$

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3 Solve $\frac{x}{2} + 3 = \frac{x}{4} + 5$

- **A** x = 4
- **B** x = 8
- **C** x = 12
- **D** x = 16

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4 Two phone plans cost the same: Plan A charges $3x + 6$ dollars and Plan B charges $5x + 2$ dollars, where x is the number of months. After how many months do they cost the same?

- **A** 1 month
- **B** 2 months
- **C** 3 months
- **D** 4 months

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5 The solution is $x = 3$. Which equation has this solution?

- **A** $2x + 5 = x + 8$
- **B** $3x + 2 = x + 9$
- **C** $5x - 1 = 2x + 7$
- **D** $4x - 3 = 2x + 5$

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6 Two phone plans cost the same: Plan A charges $5x + 10$ dollars and Plan B charges $2x + 25$ dollars, where x is the number of months. After how many months do they cost the same?

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7 Solve $2(x + 3) = 3x + 1$

- **A** $x = 1$
- **B** $x = 5$
- **C** $x = 6$
- **D** $x = 7$

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8 Solve $3x + 4 = 3x + 9$

- **A** $x = 0$
- **B** $x = 5$
- **C** No solution
- **D** Infinitely many solutions

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9 Solve $2(x + 3) = 2x + 6$

- **A** No solution
- **B** $x = 0$
- **C** $x = 6$
- **D** Infinitely many solutions

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10 Zoe solves $3x + 4 = x + 10$ by moving the x to the left as $3x + x = 10 - 4$, giving $4x = 6$ and $x = 1.5$. What is Zoe's mistake?

- **A** She multiplied by x instead of adding it; $x = 6$
- **B** She added x instead of taking it off; $x = 3$
- **C** She took 4 off the wrong side; $x = 7$
- **D** She divided both sides by 3 first; $x = 0.5$

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ANSWER KEY

1. x = 4

2. x = 20

3. x = 8

4. 2 months

5. 2x + 5 = x + 8

6. 5 months

7. x = 5

8. No solution

9. Infinitely many solutions

10. She added x instead of taking it off; x = 3

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