MATHEMATICS · GRADES 7-9

Two-step equations

Difficulty level: Intermediate

Mathematics: Grades 7-9

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Overview of the concept

This is how you undo a two step calculation to find the unknown, like working out the original price of a shirt after a discount, or how many items you bought from a total. A two step equation has two operations wrapped around the unknown, so you undo them one at a time, in reverse order. Peeling them off in the right order leaves the unknown on its own, and that is your answer. That is how you work backwards from a total to the starting number, whether it is a price, a count, or a measurement.



Rule

Two-step equations: undo the operations in reverse order, one at a time, doing the same thing to both sides.

Undo the addition or subtraction first, then undo the multiplication or division.

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Worked examples

EXAMPLE 1

Q Solve $2x + 5 = 17$.

SOLUTION

This is a two-step equation, so work backwards through the operations, doing the same thing to both sides. Undo the +5 first, then undo the ×2.

Take 5 from both sides: $2x = 17 - 5 = 12$

Then divide both sides by 2: $x = 12 \div 2 = 6$. Check it: $2 \times 6 + 5 = 17$.

EXAMPLE 2

Q Solve $x \div 4 - 3 = 2$.

SOLUTION

This is the same question type with a division instead of a multiplication, so undo the −3 first, then undo the ÷4. Working the operations in the wrong order is what makes this one go wrong.

Add 3 to both sides: $x \div 4 = 2 + 3 = 5$

Then multiply both sides by 4: $x = 5 \times 4 = 20$. Check it: $20 \div 4 - 3 = 2$.

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Practice questions

1 Solve $3x + 7 = 22$

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2 Solve $4x - 9 = 15$

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3 Solve $x \div 3 + 2 = 9$

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4 Solve $-2x + 5 = 1$

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5 A taxi charges $3 plus $2 per km. A ride costs $11. How many km was the ride?

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6 Sara buys 4 notebooks and pays a $3 fee. Her total is $19. What is the price of one notebook?

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7 **Fay is solving $4x - 3 = 13$. She adds 3 to get $4x = 16$, then writes $x = 12$. What is Fay's mistake, and what is x?**

- **A** She multiplied instead of dividing; x = 4
- **B** She subtracted 4 instead of dividing by 4; x = 4
- **C** She added 4 instead of dividing by 4; x = 4

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8 **Which of these equations has $x = 6$?**

- **A** $3x + 4 = 22$
- **B** $3x + 4 = 20$
- **C** $2x + 5 = 22$

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9 **Write the equation for this sentence, then solve it: a number multiplied by 6, then 5 subtracted, gives 25**

- **A** $6x - 5 = 25, x = 5$
- **B** $6x - 5 = 25, x = 4$
- **C** $6x + 5 = 25, x = 5$

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10 **Four equations are listed below. Three have the same solution and one is different. Which one is different?**

- **A** $2x + 3 = 11$
- **B** $3x - 1 = 11$
- **C** $4x + 2 = 18$
- **D** $5x - 5 = 20$

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ANSWER KEY

1. 5

2. 6

3. 21

4. 2

5. 4

6. 4

7. She subtracted 4 instead of dividing by 4; $x = 4$

8. $3x + 4 = 22$

9. $6x - 5 = 25$, $x = 5$

10. $5x - 5 = 20$

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