MATHEMATICS · GRADES 7-9

Multi-step linear equations

Difficulty level: Intermediate

Mathematics: Grades 7-9

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Overview of the concept

This is how you solve an equation that needs a few steps to untangle, like working out the original price of a jacket after a discount and tax. Real life rarely gives you a one step problem, because a price has tax on top of a discount, or a bill has a fee plus a charge per use. Knowing how to undo the steps in the right order means you can work back to the starting number, whether it is the price before a sale, the hours you worked, or the amount you started with.



Rule

Combine like terms first, then undo addition and subtraction, then undo multiplication and division.

Work backwards through the operations until x is alone, and check by putting the answer back in.

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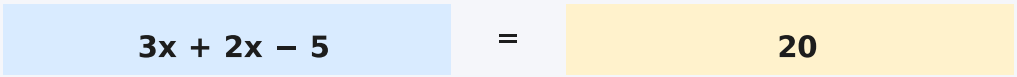
Worked examples

EXAMPLE 1

Q Solve $3x + 2x - 5 = 20$

Picture it



SOLUTION

$3x + 2x - 5 = 20$

Combine like terms on the left: $3x + 2x = 5x$, so $5x - 5 = 20$

$5x - 5 + 5 = 20 + 5$

$5x = 25$

$5x \div 5 = 25 \div 5$

$x = 5$. Check: $15 + 10 - 5 = 20$

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EXAMPLE 2

Q Solve $4x - 3 + 2x = 15$

Picture it



SOLUTION

$4x - 3 + 2x = 15$

Combine like terms on the left: $4x + 2x = 6x$, so $6x - 3 = 15$

$6x - 3 + 3 = 15 + 3$

$6x = 18$

$6x \div 6 = 18 \div 6$

$x = 3$

Practice questions

1 Solve $2x + 3x = 25$

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2 Solve $3(x + 2) = 21$

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3 Solve $2x - 6 = 10$

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4 Solve $3x + 4 = 2x + 9$

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5 Solve $x + 2x + 3x = 36$

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6 A taxi charges 3 dollars per kilometre plus a 5 dollar fee. A ride costs 29 dollars. How many kilometres was the ride?

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7 The solution is $x = 7$. Which equation has this solution?

A. $3x + 2x = 35$

B. $3x + 2x = 30$

C. $4x + x = 30$

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8 **Sam solves $4x + x - 2 = 13$ by writing $5x = 13$, then $x = 2.6$. What is Sam's mistake?**

- **A** He left out the -2: 5x - 2 = 13, so 5x = 15, not 5x = 13
- **B** He added 4x and x wrong: 4x + x = 6x
- **C** He should have divided 13 by 2, not by 5
- **D** He wrote 5x = 13 instead of 5x = 11

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9 **A number is doubled, then 4 is added, giving 18. What is the number?**

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10 **Which one does not have $x = 5$ as its solution?**

A $x + 4x = 25$

B $6x - x = 25$

C $4x + x = 25$

D $3x + x = 16$

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ANSWER KEY

1. 5

2. 5

3. 8

4. 5

5. 6

6. 8

7. $3x + 2x = 35$

8. He left out the -2: $5x - 2 = 13$, so $5x = 15$, not $5x = 13$

9. 7

10. $3x + x = 16$

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