

HAPPY HOME EDUCATION

Solving two-step equations

Maths

KS3

Prepared for: Student

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Learning Objectives

By the end of this lesson, you will be able to:

1. To understand what two-step equations are and why they are used.
2. To learn how to solve a two-step equation using inverse operations.
3. To practise solving two-step equations with a variety of examples.
4. To explore how two-step equations can be applied to real-world scenarios.
5. To consolidate understanding by discussing common mistakes and how to avoid them.



Introduction

Hello Student! Today, we're diving into the world of two-step equations. Imagine you're solving a mystery where each clue leads you closer to the final answer. A two-step equation is like that – it involves two 'clues' or steps that you need to solve before you can find out the value of the unknown variable. For example, this is what detectives use for calculations or scientists when they're working on experiments!

Equations are found everywhere in real life – from calculating your shopping budget to figuring out how many slices of pizza everyone can eat at a party. By the end of this lesson, you'll be solving two-step equations confidently and understanding how they help us organise numbers and solve problems in our daily lives. Let's get started on this mathematical adventure!





What You Need to Know

Two-step equations are equations that take two operations to solve. They often look like: $3x + 4 = 16$. To find out the value of 'x', we need to 'undo' the equation step by step using inverse operations. Inverse operations are the opposite actions – for example, subtraction undoes addition, and division undoes multiplication.

To solve $3x + 4 = 16$, we start by undoing the addition of 4. This involves subtraction, so we subtract 4 from both sides, leaving us with $3x = 12$. Next, we undo the multiplication by dividing both sides by 3, leaving us with $x = 4$. Always remember: whatever operation you perform on one side of the equation, you must perform it on the other side too!

Real-world examples include calculating how much money you have left after a day of shopping (adding and subtracting costs), and dividing quantities like food or supplies among a group of people. Knowing how to solve equations quickly can help you make decisions confidently.

In the UK, understanding equations is an essential skill not only in maths but also in science, technology, engineering, and even economics! Many professionals use equations to find answers, test ideas, and solve problems. For instance, an engineer might use equations to design a bridge, while a business manager uses equations to calculate profits.

One important tip is to double-check your solution by substituting the value of the variable back into the original equation. If both sides match, then your solution is correct. As you practise, you'll get faster and more accurate at solving these puzzles – and who knows, you might even start enjoying the challenge of cracking a tricky equation!





Key Facts to Remember

- A two-step equation requires two inverse operations to solve.
- Inverse operations undo each other, e.g., addition and subtraction or multiplication and division.
- To maintain balance, the same operation must be applied to both sides of the equation.
- Solving equations involves isolating the variable (e.g., solving for 'x').
- Revisiting your solution by substitution confirms its correctness.
- Two-step equations often appear in real-world calculations like budgeting or dividing quantities.
- A common mistake is forgetting to apply the operation to both sides of the equation.
- Practising a variety of equations reinforces your problem-solving skills.



Key Vocabulary

Equation

A mathematical statement that shows two expressions are equal.

Inverse operations

Operations that undo each other, like addition and subtraction.

Solve

Find the value of the variable in the equation.

Expression

A mathematical combination of numbers, variables, or operations.

Variable

A symbol, often a letter, that represents an unknown number.

Balance

Ensuring both sides of an equation are treated equally when solving.

Substitute

Replace the variable with its value to check correctness.

Multiplication

An operation that adds a number to itself multiple times.





Activities

Activity 1: Step-by-Step Solving Practice

Type: Written | Duration: 20 minutes

Solve the two-step equations provided.

Materials needed:

- Worksheet with equations (attached below)
- Pencil
- Calculator (optional)

Steps:

1. Step 1: Read the equation.
2. Step 2: Identify the inverse operations needed.
3. Step 3: Solve step by step, writing each step down.
4. Step 4: Check your work by substituting the solution into the original equation.

Activity 2: Real-world Equations Challenge

Type: Creative | Duration: 25 minutes

Create your own real-world two-step equations based on examples like budgeting or sharing.

Materials needed:

- Paper
- Pens or pencils

Steps:

1. Step 1: Think of a real-world scenario (e.g., dividing costs between friends).
2. Step 2: Create two-step equation examples related to your scenario.
3. Step 3: Solve your equations and discuss them with an adult or sibling.

Activity 3: Two-Step Equation Bingo

Type: Hands-on | Duration: 30 minutes

Play a bingo game where solving equations earns you a square.

Materials needed:

- Printed or drawn Bingo cards (include equations)
- Pens or markers

Steps:

1. Step 1: Choose a Bingo card with equations.
2. Step 2: Solve each equation to earn a square.
3. Step 3: Keep playing until you get Bingo!

Activity 4: Equation Sorting Game

Type: Discussion | Duration: 15 minutes

Sort a mix of one-step and two-step equations into categories.

Materials needed:

- Cards with written equations (one-step and two-step)
- Counters for grouping

Steps:

1. Step 1: Lay out the equation cards.
2. Step 2: Sort them into 'one-step' and 'two-step' categories.
3. Step 3: Discuss the differences with an adult or sibling.





Quiz: Solving two-step equations

Circle the correct answer for each question.



1 What is the first step in solving the equation $5x + 3 = 18$?

- A) Subtract 3 from both sides
- B) Divide both sides by 5
- C) Add 3 to both sides
- D) Multiply both sides by 5

2 If $2x - 4 = 10$, what is the value of x ?

- A) 3
- B) 5
- C) 7
- D) 8

3 Which of the following is a common mistake when solving two-step equations?

- A) Applying an operation to both sides of the equation
- B) Rearranging the equation in the wrong order
- C) Forgetting to revisit and check the solution by substitution
- D) Using inverse operations

4 What happens if you only subtract 4 from one side of the equation $3x + 4 = 19$ instead of both?

- A) The equation remains balanced
- B) The equation becomes imbalanced
- C) The x value doesn't change
- D) You solve the equation faster

5 Solve the equation $8x / 2 - 1 = 7$. What is x ?

- A) 2
- B) 3
- C) 4
- D) 5

6 Why is isolating the variable important in solving equations?

- A) To make the equation look simpler
- B) To find the value of the variable
- C) To apply the same operation to both sides
- D) To use inverse operations easily

7 A person spends £5 on a meal and then splits the remaining £15 between 3 friends. How can you represent this as an equation to find the amount each friend gets?

- A) $x = 15 - 5$
- B) $(15 - 5) / 3 = x$
- C) $x + 5 = 15$
- D) $3x = 15 - 5$

8 After solving $4(x + 2) = 20$, you find $x = 3$. Which of these checks the solution is correct?

- A) Substituting $x = 3$ into the equation to see if both sides are equal
- B) Guessing another value of x to see if it works
- C) Adding 2 to 3 and checking if it's less than 20
- D) Multiplying 4 by 20 to confirm your result





Extension Ideas

Want to learn more? Try these ideas:

- Research how equations are used in engineering or designing structures.
- Explore how equations are essential in creating computer programs or apps.
- Invent a game where solving equations plays a key role in winning.
- Try solving word problems that involve two-step equations to improve your skills.



Helpful Resources

- <https://www.bbc.co.uk/bitesize/topics/zachq6f>
- <https://nrich.maths.org/secondary>
- <https://www.khanacademy.org/math/cc-eighth-grade-math>
- Visit a science museum in the UK to see equations in engineering, e.g., The Science Museum in London.
- Explore educational Youtube channels like Numberphile for fun maths lessons.





Answer Key - For Parents

Quiz Answers:

1. **A** - The first step is to undo the addition of 3 by subtracting 3 from both sides.
2. **C** - Adding 4 to both sides gives $2x = 14$, then dividing both sides by 2 gives $x = 7$.
3. **C** - Forgetting to check by substituting your solution back into the equation can lead to unnoticed errors.
4. **B** - The equation becomes imbalanced because operations must be applied to both sides to maintain equality.
5. **B** - First, add 1 to both sides to get $8x / 2 = 8$, then multiply through by 2 to isolate $8x = 16$. Finally, divide by 8 to get $x = 3$.
6. **B** - Isolating the variable helps identify its value by removing other terms from both sides of the equation.
7. **B** - The amount spent (£5) is subtracted from the total (£15), and the rest is divided equally among 3 friends: $(15 - 5) / 3 = x$.
8. **A** - Substituting $x = 3$ into the original equation ensures the solution satisfies both sides, proving it's correct.

