TOP SECRET: AGENT TRAINING MANUAL

CASE FILE OPEN

Solving Two-Step Equations

A KS3 Maths Guide for Happy Home Education

Date: 29 January 2026
Prepared for: Student
Clearance: Level 1

Welcome, Agent. Your mission today is to unlock the mystery of the Two-Step Equation. Just like a detective solving a crime, you will need to follow the clues, use specific tools, and uncover the truth behind the unknown variable.

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MISSION OBJECTIVES: AGENT COMPETENCIES

Before taking the field, all agents must demonstrate proficiency in the following areas:

- [ ] **Understand the Target:** Define what two-step equations are and why we use them.
- [ ] **Master the Tools:** Learn to use Inverse Operations to dismantle equations.
- [ ] **Field Practice:** Solve a variety of equations using the two-step method.
- [ ] **Real-World Application:** Apply logic to scenarios like budgeting and engineering.
- [ ] **Risk Avoidance:** Identify and avoid common rookie mistakes.

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THE NATURE OF THE MYSTERY

What is a Two-Step Equation?

Step 1:
The Constant

Step 2:
The Variable



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Definition: A mathematical statement that takes two distinct operations to solve.

$$3x + 4 = 16$$

Two Clues to crack the code.

Imagine a mystery where you cannot solve it in one jump. You must unlock the tumblers in the correct order to open the door.

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EQUIPMENT CHECK: KEY VOCABULARY



The Variable (The Suspect)

A symbol (usually *x*) representing the unknown number we need to find.



The Equation (The Case)

A mathematical statement showing two expressions are equal.



Inverse Operations (The Tools)

Operations that 'undo' each other (like addition vs. subtraction).



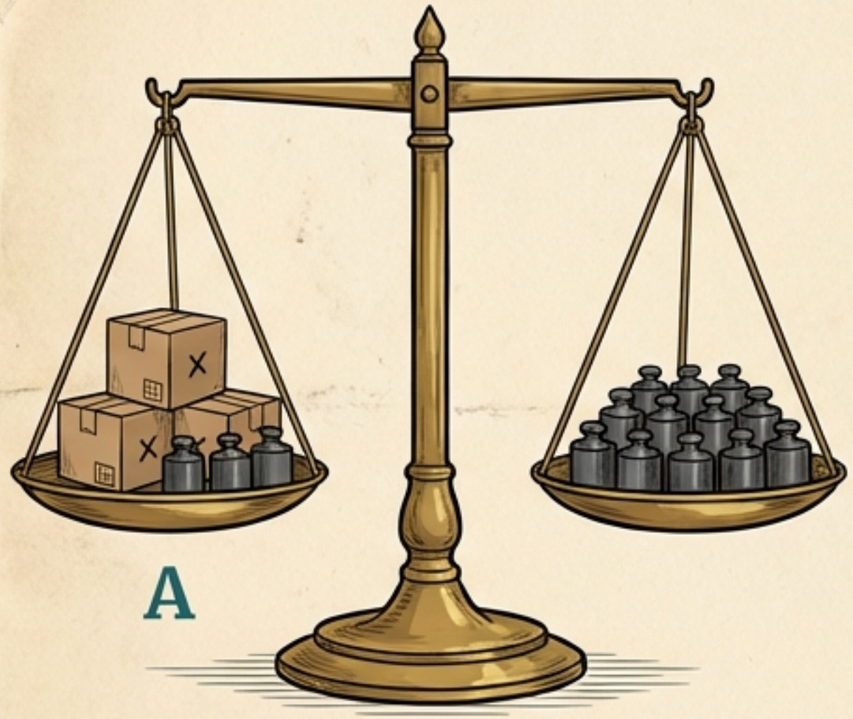
Balance (The Law)

Ensuring both sides of the equation are treated exactly equally.

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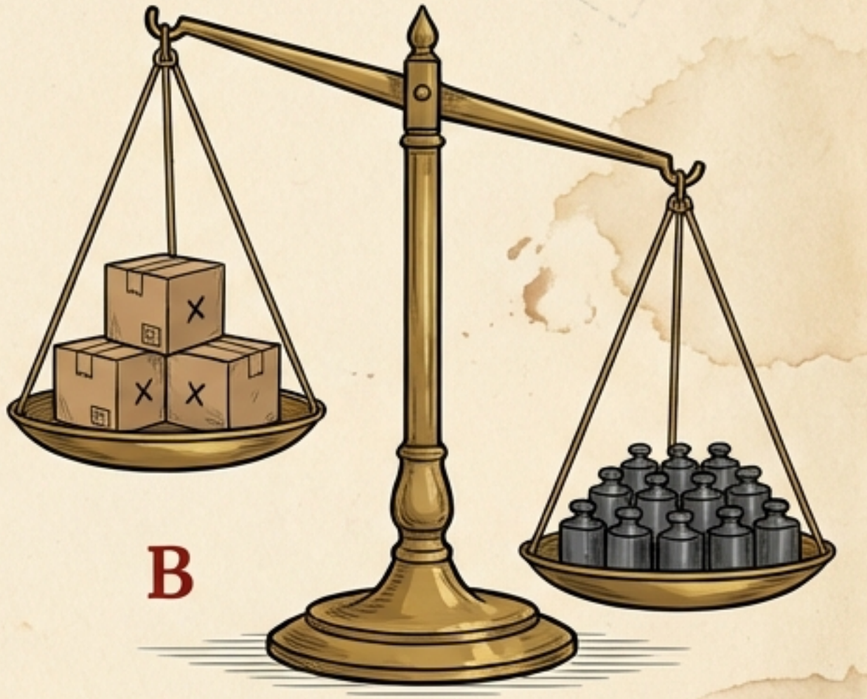
THE GOLDEN RULE: MAINTAIN BALANCE



A

Whatever operation you perform on one side of the equation, you MUST perform on the other side.

Justice must remain balanced.



B

Correct: Subtract 4 from left, Subtract 4 from right. Still Balanced.

Error: Subtract 4 from left only = IMBALANCE.

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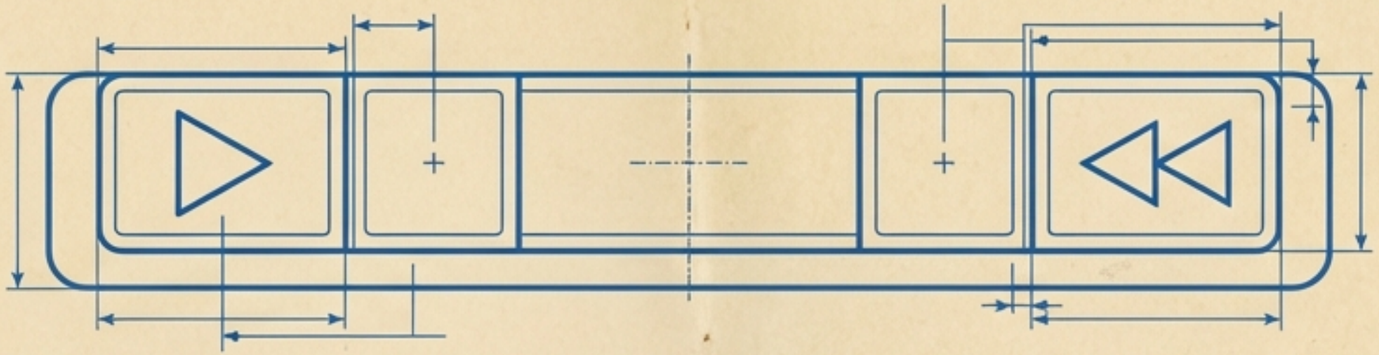
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THE METHODOLOGY: INVERSE OPERATIONS

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How do we catch the suspect? We work backward. We “undo” their tracks.

Play
The Equation



Rewind
The Solution

Addition is undone by Subtraction

REVERSE THE PROCESS

Multiplication is undone by Division

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CASE FILE #001: THE WALKTHROUGH (STEP 1)

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The Mission: Solve for x in $3x + 4 = 16$

Analysis	Action
Objective: Isolate the x. Obstacle: The constant (+4). Tool: Inverse Operation (Subtraction).	$3x + 4 = 16$ $-4 \quad -4$ ← Balance maintained on both sides. $3x = 12$

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CASE FILE #001: THE WALKTHROUGH (STEP 2)

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Current Status: $3x = 12$

Analysis

Objective: Isolate x completely.

Obstacle: Multiplication by 3.

Tool: Inverse Operation (Division).

Action

$$3x = 12$$

$$\div 3 \quad \div 3$$

$$x = 4$$

CASE SOLVED

The suspect (x) is identified as 4.

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VERIFICATION: THE DOUBLE CHECK

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Good detectives never guess. They prove.

FORENSIC LAB REPORT

Method: Substitution. Replace the variable with your solution in the original equation.

Original Equation: $3x + 4 = 16$

Suspect Identity: $x = 4$

$$3(4) + 4 = 16$$
$$12 + 4 = 16$$
$$16 = 16$$



It matches. The solution is undeniably correct.

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HAZARD WARNING: ROOKIE MISTAKES

Don’t let your investigation get derailed. Avoid these traps.



Hazard 1: The One-Sided Error

Forgetting to apply the operation to BOTH sides of the equation.



Hazard 2: Order of Operations

Undoing multiplication before addition. (Always remove the stand-alone numbers first!).



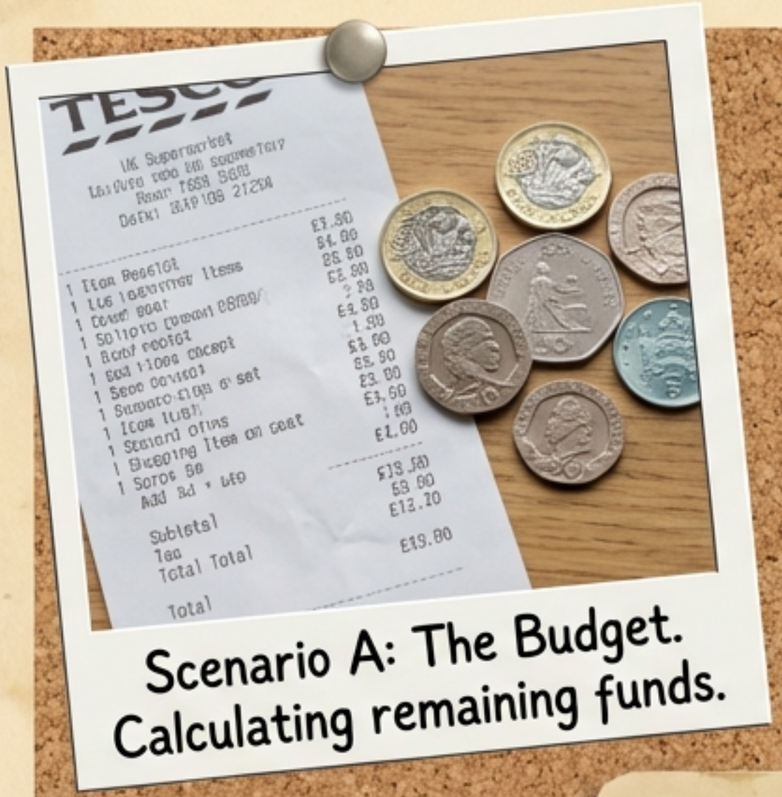
Hazard 3: The Assumption

Forgetting to check the work with substitution.

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FIELD WORK: REAL-WORLD SCENARIOS

Equations are everywhere—from the high street to the science lab.



Scenario A: The Budget.
Calculating remaining funds.



Scenario B: The Party.
Dividing food equally.



Scenario C: Professional Ops.
Engineers designing structures.

"In the UK, understanding equations is essential to test ideas and solve problems."

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TRAINING SIMULATION: CRACK THE CODE

Your mission, should you choose to accept it, is to solve the equation.

Mission Card

CLASSIFIED

INSTRUCTION: Apply the two-step method to solve this equation.

$$5x + 3 = 18$$

Clue Box

HINTS:

- **Hint 1:** What is the inverse of +3?
- **Hint 2:** What is the inverse of multiplying by 5?

AGENT WORKSPACE

ANSWER KEY: Subtract 3 (5x=15), then Divide by 5 (x=3).

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THE INTERROGATION: TEST YOUR SKILLS

Q1: What is the first step in solving $5x + 3 = 18$?

A) Subtract 3 | B) Divide by 5 | C) Add 3

EVIDENCE

Q2: If $2x - 4 = 10$, what is the value of x?

A) 3 | B) 5 | C) 7

SUSPECT DATA

Q3: You spend £5 and split the remaining £15 among 3 friends. Which equation fits?

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

FINANCIAL RECORD

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DECODED ANSWERS

1:A, 2:C, 3:B

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CLEARANCE LEVEL: ADVANCED

Ready for the next level? Try these special assignments.



EXTENSION TASKS

- **Task 1: Engineering Research:** Investigate how equations are used in designing structures.
- **Task 2: Coding:** Explore how equations create logic in computer programs and apps.
- **Task 3: Gamification:** Invent a game where solving equations is key to winning.

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INTEL SOURCES

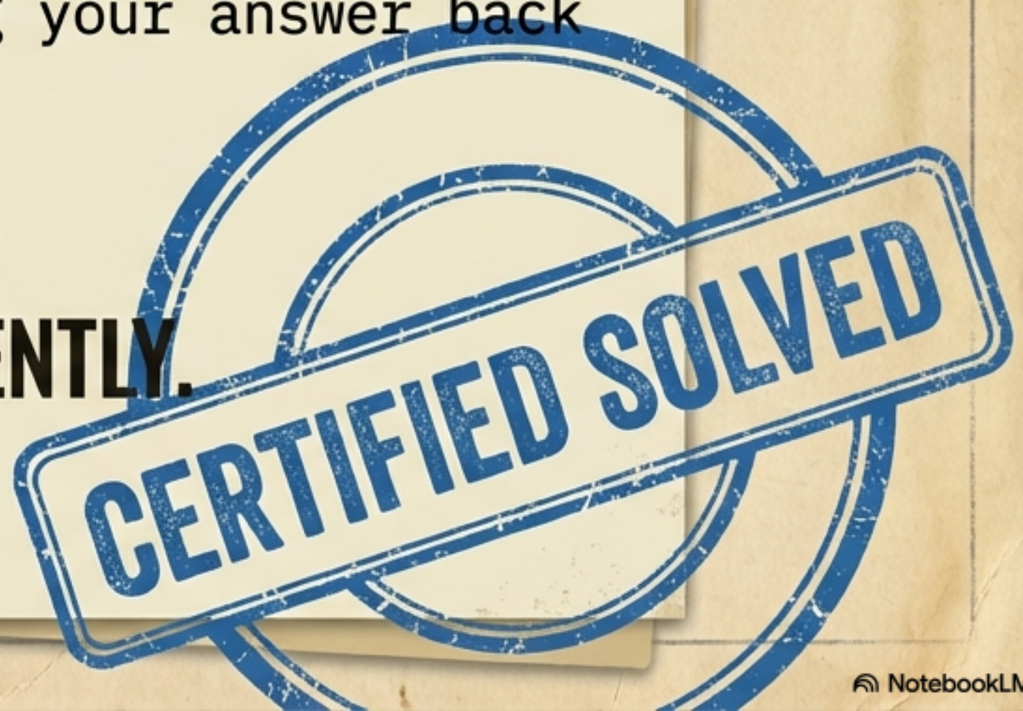
BBC Bitesize, Khan Academy, Nrich Maths, Numberphile (YouTube)

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MISSION DEBRIEF: KEY INTEL

1. A two-step equation requires two inverse operations to solve.
2. Balance is key: Do to the left what you do to the right.
3. Isolate the variable (the suspect).
4. Always verify by substituting your answer back into the equation.

YOU ARE NOW READY TO SOLVE TWO-STEP EQUATIONS CONFIDENTLY. GOOD LUCK, AGENT.



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