LEARNER GUIDE

Keeping the balance

Equations, Inequalities and Simultaneous Relationships · Lesson 1. A short guide to walk beside you — read as much or as little as helps. *Connection before curriculum. Always.*

What this lesson is about

An **equation** like $2x + 1 = 7$ is a puzzle in disguise: some starting number x was worked on — here it was **doubled**, then **1 was added** — and the result was 7. To find x you run those steps *backwards*, undoing each with its **inverse** (opposite) operation. The safe way to do this is to picture a pair of **scales**: the two sides are equal, so whatever you do to one side you must do to the other, and the balance is never broken. When a single x stands alone, you have your answer — and you can always **check** it by putting it back in.

What you are learning to notice

- Solving is **undoing**: reverse each operation with its inverse, last step first.
- Adding and subtracting undo each other; multiplying and dividing undo each other.
- Do the **same thing to both sides** — that is what keeps the equation true.
- A solution is only a solution if it **checks**: substitute it back and both sides must match.

Moving through it, one step at a time

Look at what has been done to x and in what order. To undo it, work backwards: clear anything added or subtracted first (do the opposite to both sides), then undo the multiplication or division. After each move the equation is simpler but still balanced. When you reach x = something, substitute that value into the original equation and confirm both sides are equal. Show each line — the working is the proof.

Worked examples

Two full examples to follow. Read them slowly — the aim is to see how each line follows from the one before, not to memorise a rule. It can help to cover the steps and predict the next line before you reveal it.

Example 1 — A two-step equation

Solve $2x + 1 = 7$, keeping both sides balanced.



1. Undo the + 1: subtract 1 from both sides.	$2x + 1 - 1 = 7 - 1$
2. Both sides stay equal.	$2x = 6$
3. Undo the × 2: divide both sides by 2.	$2x \div 2 = 6 \div 2$
4. One x now stands alone.	$x = 3$
5. Check by substituting back.	$2 \times 3 + 1 = 7$ ✓

$x = 3$ — subtract 1, then divide by 2; the check $2 \times 3 + 1 = 7$ confirms it.

Example 2 — A subtraction inside

Solve $3x - 4 = 8$. (First deal with the – 4, then the × 3.)



1. Undo the – 4: add 4 to both sides.	$3x - 4 + 4 = 8 + 4$
2. The equation stays balanced.	$3x = 12$
3. Undo the × 3: divide both sides by 3.	$3x \div 3 = 12 \div 3$
4. A single x is left.	$x = 4$
5. Check by substituting back.	$3 \times 4 - 4 = 8$ ✓

$x = 4$ — add 4 to both sides to get $3x = 12$, then divide by 3; the check $3 \times 4 - 4 = 8$ confirms it.

A gentle reminder

You can pause. You can return. You do not need to complete everything in one sitting.

If you get stuck

Getting stuck is part of doing mathematics, not a sign that something is wrong. There is support built into the lesson, and using it is a strong move:

- **Reconnection Routes** — if an earlier idea feels shaky (inverse operations and directed (negative) numbers), open a short recap and return whenever you are ready.
- **Socratic prompt** — a question to nudge your thinking.
- **Hint** — a little more help with the step in front of you.
- **Check** — try an answer and see how you are doing; a wrong try is useful information.
- **Worked solution** — a full model to compare your thinking against.

How the worked solution unlocks

The worked solution unlocks after you use the Socratic prompt, use the hint, and check two answers. Those steps are the learning — the worked solution is there to confirm your thinking, not to replace it.

Using support is part of learning. It is not cheating.

Recording your thinking

You can show your working in whatever way suits you today — the on-screen Scratchpad, paper, a spoken explanation, or a photo of a sketch. There is no single right format. If you do not finish everything in one sitting, that is completely fine: what you have done is information for your next step, never a failure.

Before you begin

Settle into a comfortable pace and take the steps one at a time. If your attention drifts, pause and come back — the lesson will keep your place. When you are ready, begin.

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