

Using a letter or word for the unknown ($a + 3 = 10$)

CURRICULUM ALIGNMENT

ALG.EXP.3

represent and express problems with known and unknown values in different ways to include the use of appropriate letter-symbols or words.

INTERACTIVES Balance Scales · challenge, display

WHAT THIS LESSON TEACHES

A letter such as a , n or m is just a name for the number we do not know yet. It works exactly like the box we used before, so we find the number that keeps both sides equal.

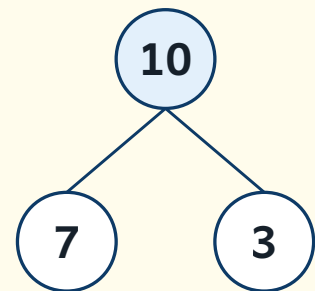
→ In $a + 5 = 12$, the letter a stands for 7 because $7 + 5 = 12$.

→ Swap a for 7: $7 + 5 = 12$. Both sides are 12, so it balances.

MODEL THIS ON THE BOARD

FIND a IN $a + 3 = 10$

- 1 The letter a stands for the missing part in the bond.
- 2 What number with 3 makes the whole 10? That number is 7.
- 3 Check: $7 + 3 = 10$, so $a = 7$.



DISCUSSION STARTER

REFLECT

Do you prefer a box or a letter for the unknown — and why?

LESSON ARC

Open with $a + 3 = 10$ on a levelled balance and take three hands-up guesses without confirming. Demo five balanced sentences — including the total-on-the-left and repeated-letter cases — sliding the letter block until the beam levels. Pupils work four more at the board, then find three in their copybook, rewriting each sentence with the number swapped in as the check. Class Challenge consolidates with a two-sided sum and $d + d = 14$.

TEACHING MOVES

1. **Getting Started.** Show $a + 3 = 10$ on a levelled balance as pupils settle. Give five seconds silent think-time, then take exactly three hands-up answers — no open call-outs. Hold your answer back; listen for whether pupils treat a as a real hidden number rather than decoration.
2. **Watch and Notice.** Slide the letter block on the balance interactive until the beam levels for each sentence. On $b - 2 = 5$, head off the 5 - 2 slip: ask 'what number, take away 2, leaves 5?' and confirm pupils read the -2 as a take-away block, not a stray negative. After every sentence say verbatim: 'the letter is only a name for the missing number.'

3. **Try It Together.** Pupils take turns at the board sliding the letter block; the class agrees or corrects aloud. Hold out for the full sentence read back with the number in place of the letter — that read-back is the check, not the number alone. On $13 = k + 5$, name that the total sitting on the left changes nothing.
4. **Find the Letters in Your Copy.** Pupils find each value in their copy and rewrite the full sentence with the number swapped in. Walk the room glancing for that rewrite — it's the check. No individual marking; this is whole-class practice.
5. **Class Challenge.** Brisk board practice — pupils take turns, check each answer, class confirms before moving on. For $c + 7 = 6 + 8$, have them total the right pan (14) first, then find c. For $d + d = 14$, both blocks are the same letter so both are 7. Don't re-teach each one; keep it moving.
6. **What Did We Notice?.** Ask whether the name matters — box, question mark, or letter. Revoice a strong answer: 'whether we write a box, a d or a ?, it's only standing in for one hidden number, and the scales still decide it.' Head off any sense that a letter is a new, harder maths.

COMMON MISCONCEPTIONS

⚠ On $b - 2 = 5$, pupils slide the block to 5 and say b is 3 — they work $5 - 2$ instead of thinking 'what, take away 2, leaves 5?'

Stop and rebuild it on the balance. Put the take-away 2 block on the left pan with an unknown, and ask 'what number, take away 2, leaves 5?' Let the beam only level at 7. Then read it back: seven take away two is five.

⚠ On $d + d = 14$, pupils treat the two d's as two different unknowns and try to make them add to 14 with any pair.

On the balance, drop two identical letter blocks onto the pan and stress they are the same hidden number — they must weigh the same. Slide both together until the beam levels at 7 each. Say: same letter means same number, twice.

⚠ On $13 = k + 5$, pupils stall because the total is on the left and expect the letter to come first.

Point at the equals sign: it doesn't care which side the total sits on. Physically leave the 13 on the left pan and find k on the right — the balancing job is identical.

DIFFERENTIATION

EMERGING

- Keep these pupils on the two add-type sentences ($a + 3 = 10$, $4 + c = 11$) on the balance while the class moves to the take-away and two-sided cases. The block-sliding gives them the answer physically before any writing.
- In the copybook step, do $a + 5 = 12$ with the pupil at the balance first, then let them copy the rewrite-with-number-swapped-in as the model for the other two.

DEVELOPING

- After the copybook page, give a two-sided sentence to try alone: $m + 6 = 4 + 9$. Ask them to total the right pan first, then find m.
- Ask them to write a balance sentence of their own where the letter turns out to be 8, then read it back with the number in place.

PROFICIENT

- Pose: $a + a + a = 15$ on the balance — three of the same hidden number. How do they find one a, and could they explain the move to someone who only knows $d + d$?
- Give $a + b = 10$ and ask how many different pairs of values keep the beam level — an open investigation into why one letter has one answer but two letters do not.

✂ **Cross-curricular:** Tie to PE — set up a real see-saw or balance in the yard and let pupils add or remove beanbags to make both ends level, matching the on-screen scales.

ANSWER KEY

a) 7

b) 10

Q1: 8

a) Always : The letter names the exact number needed to balance the pans.

b) Always : $7 + 5 = 12$, so a is 7.

c) **Never** : The name does not matter, the hidden number stays the same.

d) **Sometimes** : In $n - 4 = 6$ the value 10 is biggest, but in $a + 5 = 12$ the value 7 is not.

EXTENSION SHEET · STRETCH ANSWERS

S1: $x = 360$

S2: $x = 23$

S3: $x = 168$

S4: $x = 22$

S5: $x = 27$