

Lesson 112 ALGEBRA

Finding the missing number ($\square + 5 = 12$)

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, explore

WHAT THIS LESSON TEACHES

A box in a number sentence stands for a number we do not know yet. To find it, do the opposite of the number beside the box, then check by putting your answer back in.

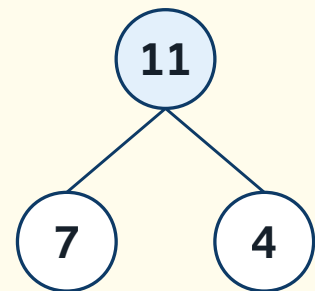
→ In $\square + 5 = 12$, take 5 from 12: $12 - 5 = 7$, so the box holds 7.

→ Check: $7 + 5 = 12$ is true, so 7 is correct.

MODEL THIS ON THE BOARD

FINDING THE MISSING NUMBER

- 1 The box has 4 added to it and the total is 11.
- 2 Do the opposite: take 4 away from 11.
- 3 $11 - 4 = 7$, so the box holds 7.
- 4 Check: $7 + 4 = 11$. That is true.



DISCUSSION STARTER

REFLECT

Does thinking of equals as balance change how you read a number sentence?

LESSON ARC

Open with $\square + 5 = 12$ on the IWB and hold the reveal — no confirming yet. On the balance-beam interactive, name the opposite move aloud (take 5 off 12) and substitute 7 back so the class sees it level. Pupils take turns setting the box on four sentences, then solve three in their copy with a check-line. Class Challenge runs four beam problems, including a same-value double box and a two-number far side.

TEACHING MOVES

1. **Getting Started.** Display $\square + 5 = 12$ and give a silent five-count before hands. Take exactly three hands-up answers, not call-outs, and hold your poker face — don't confirm, right or wrong. The reveal belongs to Watch and Notice.
2. **Watch and Notice.** For every beam, say the opposite move out loud as it settles ('5 was added, so take 5 off 12'), then substitute the value back and let the class watch it level. Watch the $\square - 3 = 4$ beam: flag anyone who guesses 1 with 'three was taken off — what gets it back?' Take one prediction on hands-up between beams to keep the watch lively.

3. **Try It Together.** Pupils take turns at the board setting the box until the beam levels, class agrees or corrects aloud. The $\square - 2 = 6$ sentence is the trap — the box must be bigger than 6. After each, read the value back into the sentence out loud so the checking habit is heard, not just done.
4. **Solve Them in Your Copy.** Walk the room glancing for the check-line, not marking. The tell for the subtraction sentence is a pupil writing 4 for $\square - 2 = 6$ — their own check-back ($4 - 2 = 2$, not 6) is what catches it, so nudge them to write the whole sentence out, don't just correct.
5. **Class Challenge.** Brisk turns at the board — set box, press Check, class confirms, move on. For $\square + \square = 16$ remind them both boxes hold the same number; for the last one, get the far side added ($5 + 9 = 14$) before anyone touches the box. Consolidation, not re-explaining.
6. **What Did We Notice?.** Ask how you check an answer with nobody telling you if it's right. Revoice a strong reply: 'so the sentence checks itself — you never need me to check.' Head off 'I tried it once' — the substitute-and-read is what confirms, not the first guess.

COMMON MISCONCEPTIONS

⚠ For $\square - 2 = 6$ a pupil sets the box to 4 — they subtract 2 from 6 because they see a minus sign and take away.

Have them read their answer back into the sentence: '4 take away 2 is 2, not 6.' Then on the beam, 3 was taken off the box, so the box must be heavier — put 3 back to get 8 and watch it level.

⚠ When the box jumps to the right side ($9 = \square + 2$, or $20 = 13 + \square$) pupils stall, saying they can't do it 'backwards'.

On the beam, show that side doesn't change the job — it's still a balance. For $20 = 13 + \square$ ask what fills the gap between 13 and 20; count up on the beam if needed.

DIFFERENTIATION

EMERGING

- Keep this group on the two add-shapes ($\square + 4 = 11$, $6 + \square = 15$) with totals under 12 while the class meets the subtraction and right-side sentences on the beam.
- Let them use counters to build both sides physically before setting the box, so the balance is something they've handled, not just watched.

DEVELOPING

- After the copy work, hand them $\square + 5 = 3 + 8$ — a two-number far side to add first, then find the box.
- Give a missing-number-inside-the-total variant: $\square + 6 = 14$, then change it to $\square + 6 = 20$ and ask what happened to the box and why.

PROFICIENT

- Pose $\square + \square = 15$ (odd total) and ask why it can't work with two whole boxes the same — get them to explain it back as if to a younger pupil.
- While the class finishes, narrate a harder beam variant: $\square + 7 = 6 + 9$, then $\square - 4 = 6 + 3$, and ask them to predict the box before you settle the beam.

✂ **Cross-curricular:** Tie to PE — set up a real see-saw or balance in the yard and let pupils feel what 'keeping both sides level' actually takes.

ANSWER KEY

a) 8, 8, 8, 13, 4, 8

Q1: 9

Spot: Aoife subtracted 3 instead of adding it. The inverse of subtracting 3 is adding 3, so $\square = 8 + 3 = 11$. Check: $11 - 3 = 8$.

EXTENSION SHEET · STRETCH ANSWERS

S1: $x = 24$

S2: $x = 312$

S3: $x = 26$

S4: $x = 15$

S5: $x = 23$