

Long multiplication strategies and estimation

CURRICULUM ALIGNMENT

NUM.OPS.4

build upon, select and make use of a range of operation strategies.

INTERACTIVES **Estimation Game** · challenge, explore

WHAT THIS LESSON TEACHES

Round each factor to a friendly number then multiply the rounded numbers to get a rough idea of how big the answer should be.

→ 412×23 rounds to $400 \times 20 = 8,000$ so the real answer should land near eight thousand.

→ For 412×23 you work 412×3 then 412×20 then add the two rows for the total.

MODEL THIS ON THE BOARD

ESTIMATE THEN MULTIPLY ON SQUARED PAPER

- 1 Round 412 to 400 and 23 to 20 then multiply 400×20 to get the estimate of 8,000.
- 2 Write $412 \times 3 = 1,236$ as the first row.
- 3 Write $412 \times 20 = 8,240$ as the second row shifted one place left.
- 4 Add the rows to get the exact total and compare it with the estimate.

LESSON ARC

Open with a wrong scoreboard answer on the board — $384 \times 27 = 1,363$ — and take three hands-up estimates without confirming. Model two full products live, stressing the placeholder zero in the tens row, then a quick guided third. Pupils write estimate-then-working for one product in their copy. Try It Together and Class Challenge run the algorithm live on the board with the interactive logging only the estimate check. Copybook slot is the individual practice.

TEACHING MOVES

1. **Getting Started.** Leave 1,363 on the board as the club's season total and give five seconds of quiet think-time. Take three hands-up estimates only — no open call-outs — and refuse to say right or wrong. The point is pupils feel 1,363 is far too small before any pencil touches paper.
2. **Watch and Notice.** Write each example live, not pre-typed. On the 27, say 'twenty means we're really multiplying by two tens, so a zero holds the units column' and physically write that zero first. Pause hard on the zero inside 506 for the second example. Run 729×35 fast with the class calling each partial product.
3. **Estimate Then Work It in Your Copy.** Hold pupils to writing the rounded estimate ($400 \times 20 = 8,000$) before any working on 412×23 . Walk the room glancing for two things only: the placeholder zero and the estimate written first. If a total is wildly off, point at the estimate and let the pupil find their own slip — don't correct it for them.
4. **Try It Together.** Enforce the rule: estimate said aloud before anyone touches the working. Pupils take turns at the board; the class agrees or corrects out loud. Revoice a strong check — 'the estimate said about fifteen thousand, so an answer of one thousand three hundred means a whole row slipped a column'. Watch for the missing tens-row zero.

5. **Class Challenge.** Brisk practice — pupils take turns at the board, work each answer, class confirms against the estimate before moving on. Don't re-explain the method each time; this is consolidation. If time is short, drop the 'within five hundred' scoring and just check each answer sits near its estimate.
6. **What Did We Notice?.** Listen for pupils naming the missing placeholder zero as the usual cause of a slipped row. Revoice: 'the estimate is a size-check — if the answer is ten times out, a row landed in the wrong column'. Head off the idea that an estimate must match exactly — same ballpark is enough.

COMMON MISCONCEPTIONS

⚠ Pupils leave out the placeholder zero in the tens row — they write 384×2 as 768 tucked under the units, so the whole second row lands one column too far right.

Freeze on the board and write the zero first, before the digits, saying 'the 2 is really two tens, so the units column is empty'. Point at the estimate of 12,000 — the missing-zero answer will be about a tenth of that, and that ten-times gap is the tell.

⚠ Pupils treat the estimate as something that must exactly equal the answer, so they distrust a correct answer of 7,840 because their estimate said 7,500.

Ask 'did we round 245 up or down?' and 'did we round 32 up or down?' — both up, so the estimate should sit a bit above the true answer. Reframe the estimate as a ballpark size-check, not a target to hit.

⚠ Pupils round both factors the same wrong way in a hurry — e.g. rounding 517 down to 500 but 26 down to 20, giving 10,000 instead of 15,000, then panic when the real answer is 13,442.

Slow the rounding step down on the board: round each factor to the nearest ten or hundred out loud before combining. Show 26 rounds to 30, not 20, and let the class see the estimate shift closer to the true answer.

DIFFERENTIATION

EMERGING

- Give the estimate-working-compare template with the rounded estimate box pre-filled for the first product, so pupils focus only on the written algorithm.
- Stay with a two-digit-by-two-digit product in the copybook slot while the class works three-digit factors, and sketch the place-value column headings in the copy first.

DEVELOPING

- After the copybook product, ask pupils to redo 412×23 rounding to the nearest hundred rather than ten and say which estimate is closer and why.
- Pose a missing-digit puzzle: the tens row of one worked product reads 8,24_ — what digit is missing, and how does the estimate tell you the row hasn't slipped?

PROFICIENT

- Narrate a harder variant of the current target aloud — a four-digit factor like $1,248 \times 36$ — and ask pupils to estimate, work it, and explain how the estimate would flag a slipped row.
- Pull fast finishers into planting a deliberate place-value slip in a correct product, then challenge them to write the one-line estimate check that would catch it.

✚ **Cross-curricular:** Tie to PE and the GAA context already in the lesson — pupils total real season point tallies from a local club's fixture list and sense-check each total against an estimate.

ANSWER KEY

- a) est. $400 \times 30 = 12000$; 2688 / 7680 / 10368
 b) est. $500 \times 40 = 20000$; 2868 / 14340 / 17208
 c) est. $900 \times 50 = 45000$; 6482 / 37040 / 43522

Q1: 14,337

Q2: 8,760

Q3: 33,264

- a) **Never** — The estimate is only close not exact.

- b) **Always** — The estimate warns when the working is far smaller than expected.

- c) **Never** — You round to the nearest friendly number which may be up or down.

- d) **Sometimes** — It is usually true but a slip could still land near the estimate by chance.

EXTENSION SHEET · STRETCH ANSWERS

S1: 3475

S2: 7479