Lesson 24 NUMBER

Divisibility rules and tests

CURRICULUM ALIGNMENT

NUM.OPS.4 build upon, select and make use of a range of operation strategies.

ALG.PRR.4a identify, explain and apply generalisations, including properties of operations, mathematical models and patterns.

INTERACTIVES Hundred Square · challenge, display, explore

WHAT THIS LESSON TEACHES

A quick check that tells you whether one number divides evenly into another, with nothing left over, without actually doing the division.

→ 3540 ends in 0 so divides by 2, by 5 and by 10 at a glance.

→ 162 has digit sum 9 so divides by 3 and by 9.

MODEL THIS ON THE BOARD

TEST 3540 FOR 2, 5 AND 10

1. Look at the last digit of **3540** which is 0.
2. A last digit of 0 means it divides evenly by 2, by 5 and by 10.
3. No division needed to know the answer.

LESSON ARC

Open with 3,540 on the board and five seconds of silent think-time — pupils spot the final zero settles 2, 5 and 10. Move to the hundred-square interactive, shading multiples of 2, then 4, then the 3/9 grids, saying each test aloud. Pupils tick four numbers against six tests in their copy, naming the test used. Class Challenge shades multiples of 6 and 12 at the board, working the two-test idea.

TEACHING MOVES

1. **Getting Started.** Hold 3,540 on the board and enforce five seconds of quiet before any hands. Take three hands-up answers, not call-outs, and listen for the pupil who spots the final zero. Don't confirm — say 'we'll prove it in a minute' and move on.
2. **Watch and Notice.** On the hundred-square interactive, trace 'even fills every second cell; four fills fewer — even alone isn't enough' by pointing at 14 (even, unshaded) versus 36 and 96 (shaded). On the 9 grid, say 81 → 8+1=9 slowly and draw the sharp line: digit-sum divides by 9 means divides by 9; digit-sum divides by 3 only means 3 only.
3. **Try It Together.** Pupils take turns shading at the board and the class names each test aloud. Before revealing the multiples of 6, ask 'which two tests does a number have to pass?' and draw out 6 = 2 × 3. Point at 12 (passes both) versus 8 (even but digit-sum 8 fails the 3 test).
4. **Tick the Tests in Your Copy.** Walk the room checking pupils write the test in words beside each tick, not just the tick. The number to watch is 144 — glance for the 4 test being skipped or muddled with the 2 test. This is copybook practice, not marking, so nudge rather than correct fully.
5. **Class Challenge.** Keep the board brisk — pupils shade, check, class confirms, move on. On the ÷12 round revoice a clean justification: '24 → 2+4=6 divides by 3, and 24 divides by 4.' Don't re-teach each number; this is consolidation.

6. **What Did We Notice?.** Ask a pupil to say back why a number ending in 0 divides by 5 and 10 — 'it's a whole number of tens'. For the digit-sum, revoice anyone who spots that each ten, hundred and thousand leaves a remainder of one. A plain restatement is the target, not a proof.

COMMON MISCONCEPTIONS

⚠ A pupil ticks 4 for any even number — 'it's even, so it divides by 4' — and marks 14 or 6 as divisible by 4.

On the hundred square, point at 14 and 6: even, but not shaded on the 4 grid. Run the last-two-digits test aloud on one of them so the class hears that even alone isn't enough.

⚠ A pupil claims the digit-sum rule tests for 4, e.g. 'the digits of 144 add to 9, so it divides by 4.'

Stop and separate the two families on the board: digit-sum is only for 3 and 9; 4 uses the last two digits. Test 144 both ways so the class sees the digit-sum answer is about 9, and the 44 answer is about 4.

⚠ A pupil says a number divides by 9 because its digit-sum divides by 3, e.g. '24 → 2+4=6, so 24 divides by 9.'

Say 81 → 8+1=9 and 24 → 2+4=6 side by side. Only when the digit-sum itself divides by 9 does the number divide by 9 — 6 doesn't, so 24 divides by 3 only.

DIFFERENTIATION

EMERGING

- Stay on the last-digit tests (2, 5, 10) in the copybook while the class works 3 and 9. Pupils tick 90 and 3,540 only, both settled by the final digit.
- Let the pupil find each example on the shaded hundred square before ticking, so the test is something they can see rather than recall.

DEVELOPING

- After the copybook page, ask them to find a three-digit number that passes every one of 2, 3, 4, 5, 9 and 10 at once, and to name each test.
- Give 486 and ask: does it divide by 6? By 12? Which two tests did you combine to decide?

PROFICIENT

- Narrate this harder variant at the board for fast finishers: 'build a divisibility test for 8 using the pattern you saw for 4' — let them predict last-three-digits and test it on a number before you confirm.
- Ask them to explain to a pupil who missed the lesson why the digit-sum trick works for 3 but not for 4 — in their own words, using 'every ten is one more than a multiple of three'.

ANSWER KEY

Scaffold: visual check on the page

Q1: Yes

Q2: Yes

Q3: Yes

a) Always — Any number ending in 0 is a multiple of 10.

b) Always — This is the exact rule for divisibility by 4.

c) Never — Digit sum 9 means divisible by 3 or 9, not by 2.

d) Sometimes — Even means divisible by 2 but needs end in 0 or 5 for 5.

EXTENSION SHEET · STRETCH ANSWERS

S1: 1, 2, 3, 6, 9, 18