

Factors, multiples, prime and composite numbers

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 factor divides a whole number evenly with no remainder, and factors come in pairs. A prime has exactly two factors (1 and itself); a composite has more than two.

→ Factors of 12 are 1, 2, 3, 4, 6 and 12.

→ 7 is prime; 51 is composite because $3 \times 17 = 51$.

MODEL THIS ON THE BOARD

FACTORS OF 18 FOR A BOARD GAME

- 1 Find whole-number pairs that multiply to make **18**.
- 2 $1 \times 18 = 18$, so 1 and 18 are factors.
- 3 $2 \times 9 = 18$, so 2 and 9 are factors.
- 4 $3 \times 6 = 18$, so 3 and 6 are factors.
- 5 The full list is 1, 2, 3, 6, 9 and 18.

LESSON ARC

Open with 12 on the board — pupils call out its divisors and you leave the 'have we got them all?' question hanging. In Watch and Notice the multiple/factor grids do the work, and the pairing trick (1×24 , 2×12 , 3×8 , 4×6) answers that hanging question. Pupils shade together on one clearing grid, then list factors of 12, 18 and 24 in their copies. Class Challenge builds a multiples bank ending on 12 as the tie-together pay-off.

TEACHING MOVES

1. **Getting Started.** Jot each hands-up divisor of 12 on the board unordered — resist tidying them into sequence. Say the 'how do we know we've got them all?' line and then move on without answering it; that unanswered question is the whole lesson's engine.
2. **Watch and Notice.** Trace the sixes slant with your finger, then take the thumbs prediction on 9. When the factors-of-24 grid lands, say each pair aloud as a multiplication — 'one twenty-four, two twelve, three eight, four six' — and name it explicitly as the answer to the Getting Started question. Pause hard on 51: let them guess 'prime', then read 3×17 off the two shaded cells.
3. **Try It Together.** Send one pupil up to shade each number while the class names the cells aloud; clear the grid between each so only one pattern shows. When you flip to multiples, ask the class to name the next multiple before it's shaded so they count on rather than read off. Watch for someone shading 8 as a factor of 18 — $18 \div 8$ leaves a remainder.
4. **List the Factors in Your Copy.** Give pupils three rows for 12, 18 and 24 and circulate glancing that factors are paired, not scattered. The listing is the core task; underlining common factors and circling the

number itself are for early finishers only. Watch especially for the missing self-factor — 12 belongs on the 12 row.

5. **Class Challenge.** Keep it brisk — take a crowded-or-sparse prediction before each shade, confirm with the Check ✓ ('yes — that's every one'), and move on. Save your breath for the multiples-of-12 round: draw out that those cells are also multiples of 3 and of 4, which ties the whole bank together.
6. **What Did We Notice?.** Listen for 'one has only one factor' and revoice it as the rule: 'a prime needs exactly two factors, and 1 only has itself.' If a pupil reaches for the factoring angle, name it; otherwise point straight back to 51 to head off 'odd means prime'.

COMMON MISCONCEPTIONS

⚠ Pupils decide 51 is prime because it's odd and 'looks prime' — they're using 'odd equals prime' as a shortcut.

Point to the two shaded cells on the 51 grid and read off $3 \times 17 = 51$ together. Stress that 3 and 17 are the factors that break 51, so it has more than two factors and is composite. Odd tells you nothing on its own.

⚠ Pupils leave the number itself off their factor list — they write the factors of 12 as 1, 2, 3, 4, 6 and stop.

During the copybook round, ask 'does 12 divide evenly into 12?' Rebuild the pairing on the board — 1×12 — so the missing 12 falls out of the first pair. Every number is a factor of itself.

⚠ Pupils shade 8 as a factor of 18 because 8 feels 'about right' near other factors.

Stop the shading and do $18 \div 8$ aloud as a class — it leaves a remainder of 2. A factor must divide evenly with nothing left over; if there's a remainder, it's out.

DIFFERENTIATION

EMERGING

- In the copybook round, give these pupils just 12 to factor while the class does all three rows, and prompt each pairing aloud ('what times 1? what times 2?') so they build the list from products.
- Let them read factors straight off the shaded Try It Together grid rather than generating them cold.

DEVELOPING

- After the three factor rows, ask which factor appears on all three — introduce 'common factor' as a name for what they've underlined.
- Pose 3/9 style missing-factor puzzles: 'a number under 30 with exactly the factors 1, 2, 5 and 10 — what is it?'

PROFICIENT

- During Class Challenge, narrate them a harder variant: 'find a number under 100 with exactly three factors — is that even possible? explain.' (Square-of-a-prime territory — let them hunt.)
- Pull them ahead into the Student Activity Book while the class finishes the multiples bank, then have them explain to you why 1 breaks the prime rule in their own words.

✓ **Cross-curricular:** Tie to music — clap multiples of 3 and multiples of 4 as two rhythms, and hear where they land together on the multiples of 12.

ANSWER KEY

Scaffold: visual check on the page

Q1: 1, 2, 3, 4, 6, 12

Q2: prime

Q3: 6, 12, 18, 24, 30, 36

Q4: 1×30 , 2×15 , 3×10 , 5×6

a) Always : By definition 1 and the number itself always divide it evenly.

b) Always : That is the definition of a prime: only 1 and itself.

c) Never : 1 has only one factor, so it is neither prime nor composite.

d) Sometimes : Some odds like 9 and 15 are composite; others like 7 and 11 are prime.

EXTENSION SHEET · STRETCH ANSWERS

S1: 1, 2, 3, 4, 6, 8, 12, 16, 24, 48

S2: 38 is composite — it can be divided evenly by 2 (so 1 and 38 are not its only factors).

S3: 1, 2, 3, 6, 9, 18

S4: 20 is composite — it can be divided evenly by 2 (so 1 and 20 are not its only factors).

S5: 48 is composite — it can be divided evenly by 2 (so 1 and 48 are not its only factors).