

Multiplication as arrays and repeated addition

CURRICULUM ALIGNMENT

NUM.OPS.3

understand and apply flexibly the four operations; and the relationships between operations.

INTERACTIVES **Pattern Blocks · challenge, display**

WHAT THIS LESSON TEACHES

Equal groups laid out in neat rows and columns form an array. The total is rows times columns, which is the same as adding one row total again and again.

→ Three rows of five counters is an array showing $3 \times 5 = 15$.

→ $4 + 4 + 4$ is three lots of four, the same as 3×4 .

MODEL THIS ON THE BOARD

BUILDING A 4-BY-3 GAME-TOKEN ARRAY

- 1 Draw 4 neat rows with 3 tokens in each row.
- 2 Write the repeated addition under it: $3 + 3 + 3 + 3$.
- 3 Write both multiplication facts the array shows: 4×3 and 3×4 .

DISCUSSION STARTER

REFLECT Did turning the array change the answer? What stayed the same?

LESSON ARC

Open with three rows of five counters up on the visualiser and the deliberate argument — is this three fives or five threes? Let it sit unresolved. Model 2 rows of 6 and 3 rows of 4 as addition then multiplication, then turn the 3×4 array to show 4×3 is the same counters. Pupils build called facts at their desks alongside the board builder, then draw a 4-by-3 array in copybook writing both multiplication facts.

TEACHING MOVES

1. **Getting Started.** Show three rows of five counters and give a full five seconds of quiet think-time before hands go up. Take two or three answers only, not open call-outs — and deliberately don't settle it. The disagreement is the lesson's engine.
2. **Watch and Notice.** Read 2 rows of 6 aloud as ' $6 + 6$ ' then ' 2×6 ', stressing that reading a whole row beats counting one by one. Before revealing the 3-rows-of-4 total, take a 'more or less than twelve?' prediction. The pay-off is turning the array — say 'tipped onto its side', and don't move on until a pupil can say why turning can't add or lose counters.
3. **Try It Together.** Call a fact, hand counters to one board builder while the whole class lays their own at their desks. Insist rows are straight and equal — a wonky array hides the pattern. Always ask 'say it as an addition first' before anyone reaches for the answer. When 5 rows of 2 lands, set it beside the earlier 2 rows of 5 and ask what they notice. Rotate four pupils through the turn.
4. **Draw the Array in Your Copy.** Pupils draw a 4-by-3 dot array, then write the repeated addition and both multiplication facts. Walk the room glancing for equal, straight rows and for both 4×3 and 3×4 appearing — this is practice, not marking.

5. **Class Challenge.** Keep the first three builds (2×6 , 3×5 , 4×6) brisk — one pupil builds, the class predicts before each reveal, everyone confirms, move on. Save two or three minutes for the open final challenge: take more than one rectangle that totals twenty-four (6×4 , 8×3 , 2×12) and each time ask how they knew the total stayed twenty-four.
6. **What Did We Notice?** Ask what actually happens to the counters when the whole array turns. Listen for 'none are added or taken away'. Revoice a strong answer: 'so 3×4 and 4×3 are the same counters, just read a different way.'

COMMON MISCONCEPTIONS

- ⚠ Pupils insist the turned array is a different amount — 'you turned it so now it's more', treating the quarter-turn as if it adds counters.
Turn the 3×4 array slowly under the visualiser without touching a single counter, then turn it back. Nothing was added or removed — same counters, just facing a different way. Have the pupil count both ways to prove twelve stays twelve.
- ⚠ When laying counters for a called fact like 4 rows of 3, pupils make uneven or staggered rows so the array can't be read cleanly.
Stop and rebuild one row at a time on the board, lining each row directly under the last. 'Equal rows, straight down' — a wonky array hides the pattern we're hunting for. Have them fix their own before the next fact.
- ⚠ Pupils read 3 rows of 4 as the addition $3 + 4$ rather than $4 + 4 + 4$ — they add the two numbers instead of adding the row four three times.
Point to each row in turn and count aloud: 'four, then another four, then another four'. Write $4 + 4 + 4$ under the array, one addend per row, so the repeated addition maps directly onto what they can see.

DIFFERENTIATION

EMERGING

- Give a printed dot grid and have the pupil ring the rows before writing anything — the structure is on the page, they only add the counting.
- Stay with the smaller arrays (2 rows of 5, 4 rows of 3) in the copybook while the class moves to 4×6 , and build alongside them at the teacher table.

DEVELOPING

- After the copybook 4-by-3, ask them to draw one more array with a different shape that still totals twelve and label both its facts.
- Pose a missing-row puzzle: 'an array totals fifteen with rows of five — how many rows?' Let them build to check.

PROFICIENT

- During the open Class Challenge, ask them to find every rectangle that totals twenty-four and explain why they can't make a 5-row one — nudge toward the idea that some totals only make certain arrays.
- Challenge them to explain to the class, in their own words, why an array could never suddenly gain a counter when you turn it — a plain-English proof.

✚ **Cross-curricular:** Tie to Geography — pupils count the rows and columns of desks or windows in the classroom and read the arrangement as a multiplication array.

ANSWER KEY

a) $6 \times 7 = 42$ and $7 \times 6 = 42$

b) $5 + 5 + 5 = 15$

Q1: 56

Q2: 12

Q3: $4 + 4 + 4 = 12$

Q4: 10

a) **Always** : Both arrays hold 15 counters, so the multiplications are equal.

b) **Always** : Each row is the same size so you add that number again and again.

c) **Never** : The counters stay the same; only the rows and columns swap places.

d) Always : Both make 12: $4 + 4 + 4$ is 3 fours, and turning the array shows 4×3 .

EXTENSION SHEET · STRETCH ANSWERS

S1: $5 + 5 + 5 + 5 = 20$ tulips

S2: $3 \times 10 = 30$ and $10 \times 3 = 30$

S3: $7 \times 10 = 70$

S4: Any two of: 2×8 , 8×2 , 4×4 , 1×16 , 16×1

S5: 7 rows of 4, and still 28 counters

Investigation: Arrays around the classroom — open-ended; scan pupils' working for valid solution paths rather than a single answer.