

Direct proportion and the unitary method

CURRICULUM ALIGNMENT

NUM.FRC.4b

investigate proportionality and ratios of quantities (sets).

MEA.MON.4

solve and pose practical tasks to investigate and make informed judgements about transactions and financial plans.

INTERACTIVES **Function Machine** · display, explore

WHAT THIS LESSON TEACHES

Two quantities are in direct proportion when doubling one doubles the other – more items cost proportionally more. Use the unitary method: divide to find the price of one then multiply up.

→ 3 pencils cost 90c so 6 cost 1.80.

→ 4 apples for 1.20 so one is 30c and seven cost 2.10.

MODEL THIS ON THE BOARD

UNITARY METHOD FOR NINE BUNS

- 1 Nine buns cost 4.50 so divide 4.50 by 9 to find one bun costs 50c.
- 2 Then multiply 50c by 4 to find four buns cost 2.00.

LESSON ARC

Open with the school-shop pencil hook — three for 90c — and take spoken guesses before anything is confirmed. Move to the function-machine interactive and work four machines in order, each pivoting on divide-to-one then multiply-up. Pupils take turns at the board for the oranges/buns/car problems, then write the two labelled steps in their copybook. The Class Challenge bank consolidates prices, distance and capacity before the maths-talk wrap.

TEACHING MOVES

1. **Getting Started.** Give five seconds of silent think-time before hands. Take two or three answers deliberately — grab one pupil who jumped to seven and one who found one pencil first, and put both routes on the board without confirming either. The divide-first route is what the machines will justify.
2. **Watch and Notice.** Work the four machines in order and make the divide the star. On the pencils, ask 'what does one cost?' and hold before revealing 30c. On the six-apples machine, watch for pupils multiplying 4 by 6 directly instead of pricing from one. Finish with the flour prediction — no machine — and take two spoken answers to check the divide has landed.
3. **Try It Together.** One problem at a time so the watching class can track the numbers on the machine. Set the divide rule first ($\div 6$, $\div 5$, $\div 3$), read the value of one aloud and agree it as a class, then switch to the multiply rule. On the car, name that km-per-hour is the same idea as price-per-item. Re-voice a good move: 'so once we know one, the rest is just multiplying.'
4. **Write the Two Steps in Your Copy.** Keep the three problems on the board while pupils write ' $\div$ to find one' then ' $\times$ up to find the answer', boxing the final answer. Walk the room glancing for the divide line on every problem — catch any pupil who has only written the final answer with no working.
5. **Class Challenge.** Brisk board work — pupils take turns, check each answer, class confirms, move on. Hold out for the divide said aloud on the bottle problem before anyone multiplies, since one bottle is 0.75 l — not a whole number. Keep it to consolidation, not fresh explanation.

6. What Did We Notice?. Listen for pupils naming the divide-first move as the thing that made the rest easy. Re-voice: 'so once we know what one costs, we can price any number at all.' Push the distance link — km-per-hour is a value-of-one in disguise. Discussion only, no writing.

COMMON MISCONCEPTIONS

⚠ Pupils skip the divide and scale straight from the given numbers — for six apples at €1.20 asked to price six, they'll say 'that's the same, €1.20' or multiply 4 by 6 without ever finding one apple.

Freeze the machine and ask 'what does ONE cost?' before any multiply. Key in the divide rule live and read the unit price aloud. Nothing goes on the multiply machine until the value of one is agreed.

⚠ Pupils treat a non-whole value of one as wrong — on six bottles holding 4.5 litres they'll say '0.75 doesn't work, one bottle can't hold that' and abandon the divide.

Reassure that the value of one can be a decimal. Key in $4.5 \div 6 = 0.75$ | on the machine and read it as 'three-quarters of a litre in one bottle', then multiply up by ten. A decimal unit still scales the same way.

⚠ Pupils assume scaling down needs a different method — on eight tickets for €60 asked to price five, they stall because five is fewer than eight.

Name that down still starts with the value of one. Divide 60 by 8 to get €7.50 per ticket on the machine, then multiply by five. Same two moves whether you scale up or down.

DIFFERENTIATION

EMERGING

- Keep these pupils on whole-number unit prices only (pencils, oranges, buns) and away from the bottle problem's 0.75 l until the divide-then-multiply pattern is secure.
- Have them copy the two labelled step-lines ('÷ to find one', '× up') from the board before filling the numbers in, so the structure is given and they only supply the arithmetic.

DEVELOPING

- After the copybook moment, hand them a value-of-one to work backwards from: 'one bun is 40c — how much are nine, and how much did five cost?'
- Ask them to price the same item at two different pack sizes and say which is better value — still one divide each, plus a comparison.

PROFICIENT

- Pose the ticket-style scale-down as a spoken challenge: 'if seven of something costs €5.25, invent a matching problem where the answer is exactly €3.' They set the value of one first, then build the numbers — narrate it at the board for the class.

↗ **Cross-curricular:** Tie to Geography — pupils take a steady km-per-hour speed and work out how far a car travels on a named route, e.g. Cork to Limerick.

ANSWER KEY

Scaffold: visual check on the page

Q1: €0.30

Q2: €0.40

Q3: €0.50; €2.00

Q4: 400 km

a) Always — Doubling the items doubles the cost in direct proportion.

b) Always — Divide total cost by number of items to get the unit price.

c) Never — Ten buns would cost 4.00 as the unit price is 40c.

d) Sometimes — It depends if the speed stays constant over that journey.

EXTENSION SHEET · STRETCH ANSWERS

S1: €120

S3: €27

S2: €50