Increasing and decreasing by a given percentage

Key focus

This objective builds directly on percentage-of-a-quantity: instead of finding just the percentage amount, students find the resulting NEW amount after an increase or decrease, using a single decimal multiplier (1 plus or minus the rate). This is deliberately scoped to finding the new amount only – calculating the percentage-of amount itself belongs to the previous LO, and finding the ORIGINAL amount before a change (reverse percentage) is a separate objective. Teach alongside discounts, markups, GST, growth, and depreciation so the multiplier method feels immediately useful.

Suggested teaching sequence

1. Revisit the two-step method (find the percentage amount, then add or subtract it), then introduce the one-step multiplier method as a shortcut: increase by $r\%$ means multiply by $1 + \frac{r}{100}$; decrease by $r\%$ means multiply by $1 - \frac{r}{100}$.
2. Model the percentage-change bar: a 100% baseline (the original amount) with a hatched extension for an increase or a hatched removed tail for a decrease, so the new total percentage (e.g. 120% or 80%) is visible directly.
3. Practise with benchmark percentages first (10%, 20%, 25%, 50%), then extend to less common whole-number and decimal percentages.
4. Apply the method to money and real-world contexts: discounts, markups, GST, population growth, and single-period depreciation or appreciation.
5. Introduce successive percentage changes (two different rates, or the same rate applied twice in opposite directions) and have students calculate step by step rather than combining the rates first.
6. Discuss why a percentage increase followed by the same percentage decrease (or vice versa) does not generally return the original amount, using the multiplier product (e.g. $1.1 \times 0.9 = 0.99$, not 1).
7. Extend to working backwards from an original and a new amount to find the unknown percentage rate of change.

Core examples to model

- Basic increase: increase 60 by 20%: $60 \times 1.2 = 72$.
- Basic decrease: decrease 80 by 25%: $80 \times 0.75 = 60$.
- GST: a \$60 item with 15% GST added: $60 \times 1.15 = 69$.
- Depreciation: a \$12 500 machine depreciating 6.5%: $12\,500 \times 0.935 = 11\,687.50$.
- Successive changes: a \$500 item increased by 10% then decreased by 10%: $500 \times 1.1 = 550$, then $550 \times 0.9 = 495$ – not \$500, since the second change is a percentage of the larger, already-increased amount.
- Reverse rate: a \$22 000 car worth \$19 800 after one year: the decrease is \$2200, which is

$\frac{2200}{22\,000} = 10\%$ of the original value.

Watch for

- Using the wrong multiplier direction: multiplying by 0.8 for an increase, or by 1.2 for a decrease.
- Forgetting that PicNumberChangeBar-style diagrams and most single-step problems use a whole-number rate, but real contexts often need a decimal rate (e.g. 6.5%, 12.5%) – the same multiplier method still applies.
- Assuming a percentage increase followed by an equal percentage decrease returns the original amount: it generally does not, since the two changes are percentages of different base amounts.
- In successive-change problems, applying both rates to the original amount instead of applying the second rate to the result of the first change.
- Confusing this LO's "find the new amount" questions with reverse-percentage questions ("find the original amount") – the direction of the arithmetic (multiply vs. divide) depends on which quantity is unknown.
- Rounding a money answer before completing a second calculation step, which can shift the final cents.

Checks for understanding

- Can students increase or decrease a quantity by a percentage using the one-step decimal-multiplier method?
- Can they read a percentage-change bar diagram to find the new amount?
- Can they apply the method to GST, discounts, markups, growth, and depreciation contexts, including decimal rates?
- Can they apply two successive percentage changes in the correct order, calculating step by step?
- Can they explain why an increase followed by an equal decrease (or vice versa) does not generally return the original amount?
- Can they work backwards from an original and a new amount to find the percentage rate of change?