Key focus

This objective is about understanding when two different-looking expressions are actually the same. Students must move beyond surface-level symbol matching and use collecting like terms, expanding brackets, and substitution to test equivalence. Build confidence in the idea that algebraic expressions can be written in many equivalent forms, each useful in different contexts.

Suggested teaching sequence

1. Start with direct recognition: which forms represent the same quantity? Use concrete examples such as $a + a + a + a$ and $4a$, or $5b$ and $b + b + b + b + b$.
2. Introduce the equivalence symbol $\equiv$ to distinguish it from $=$ (equality at specific values). Use substitution to verify: "when $a = 2$, does $3(a + 1)$ give the same answer as $3a + 3$?"
3. Teach systematic collection of like terms: match the variable part, add coefficients. Show that $4x + 2x = 6x$ but $4x + 2y \neq 6z$.
4. Model bracket expansion and show why $2(x + 5)$ is equivalent to $2x + 10$, not $2x + 5$. Use diagrams (arrays or area models) to make the distributive property concrete.
5. Teach students to spot non-equivalences: explain why $5m + m$ is $6m$, not $5m^2$, and why $4a + 4$ is not equivalent to $8a$.
6. Finish with mixed problems: identify equivalent pairs, explain your reasoning, and correct common errors.

Core examples to model

- Direct form matching: $a + a + a + a \equiv 4a$ (repeated addition to multiplication).
- Collecting like terms: $3x + 2x \equiv 5x$ (but $3x + 2y$ does not simplify the same way).
- Expanding: $2(a + 3) \equiv 2a + 6$ (use the distributive property or an area model).
- Using substitution to check: when $x = 3$, both $4x$ and $x + x + x + x$ equal 12, so they are equivalent.
- Explaining non-equivalence: $5m + m = 6m$, not $5m^2$; the power tells us how many times to multiply, not how many copies of the base.
- Context-based equivalence: a rectangle with length $2(x + 3)$ and width 2 has perimeter $2 \cdot 2(x + 3) + 2 \cdot 2 = 4(x + 3) + 4 = 4x + 16$ (show all equivalent forms).

Watch for

- Students often confuse $5m + m$ with $5m^2$ because they see addition and powers and mix them. Emphasise: the power is part of the variable, not a result of combining.
- When expanding $2(x + 5)$, students may write $2x + 5$ (forgetting to multiply the constant). Use area or array diagrams to show all parts must be multiplied.
- Some students think $4a + 4 = 8a$ because they add all numbers. Remind them: constants

and variable terms are unlike, so they stay separate.

- Using $\equiv$ (identity) versus $=$ (equality) matters: $2x + 3 = 7$ only when $x = 2$, but $2(x + 1) \equiv 2x + 2$ for all x.
- When using substitution, always use the same value in both expressions to test equivalence.

Checks for understanding

- Can students use substitution to check whether two expressions are equivalent?
- Can they collect like terms and explain why the variable part stays unchanged while only coefficients combine?
- Can they expand simple brackets and justify the distributive property?
- Can they explain why $5m + m \neq 5m^2$ and why $4a + 4 \neq 8a$?
- Can they recognise equivalent expressions written in different forms (expanded, factored, collected) and explain the equivalence?
- Can they spot and correct miswritten equivalences provided by others?