Equivalent Expressions - What It Means

Key idea

Two expressions are **equivalent** when they have the same value for **every** value of the variable.

We write it with $\equiv$: $3(x+2) \equiv 3x+6$.

Quick examples

$a+a+a+a \equiv 4a$

$7x-2x \equiv 5x$

$4(y+3) \equiv 4y+12$

Common mistake

Equal for **one** value is not equivalent.

$x^2 = 2x$ when $x=2$, but at $x=3$, $9 \neq 6$.

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Prove It By Simplifying

Key idea

To check, **simplify both** expressions: collect like terms and expand.

If they reduce to the same form, they are equivalent for every value.

Example

Are $2(x+4)+x$ and $3x+8$ equivalent?

$2(x+4)+x = 2x+8+x = 3x+8$

Yes — the left side becomes the right side.

Common mistake

Distribute to **every** term: $4(a+2) \equiv 4a+8$, not $4a+2$.

Find A Missing Value

Key idea

If two expressions are equivalent for every value, their **matching coefficients** must be equal.

Example

Find k if $k(2y+5) \equiv 6y+15$.

$2ky + 5k \equiv 6y + 15$

Match coefficients: $2k = 6$ and $5k = 15$, so $k = 3$.

Common mistake

Equal **once** is not equivalent: $3x + 5 = 5x - 1$ only when $x = 3$.

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