Expressions and like terms

An expression has no equals sign. An equation says two expressions have the same value.

Simplify 3x² + 4x − 5 + 2x² − x + 7.

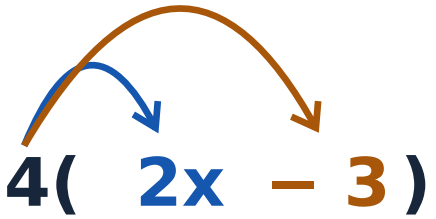
$(3x^2+2x^2)+(4x-x)+(-5+7)$	Group x² terms, x terms and numbers separately.
$5x^2+3x+2$	Add the coefficients within each group.
$5x^2+3x+2$	

Remember

Substitute x = 2 by replacing each x with 2; the original and simplified expressions both give 28.

Expanding one bracket

Multiply the outside factor by each term, including its sign.



Follow each arrow from the outside 4 to one signed term.

Expand 4(2x − 3).

$4(2x) = 8x$	Multiply the first term by 4.
$4(-3) = -12$	Multiply the second term by 4.

$8x - 12$

Remember

The minus belongs to the 3. Keep it when multiplying.

Expanding two brackets

Every term in one bracket multiplies every term in the other.

×	x	−3
x	x^2	−3x
4	4x	−12

Expand (x + 4)(x − 3).

$x^2 - 3x + 4x - 12$	Read off all four products from the box.
$-3x + 4x = x$	Collect the middle terms.
$x^2 + x - 12$	

Remember

For a linear bracket times a quadratic bracket, use the same method: draw two rows and three product columns.

Linear equations with fractions

Multiply both complete sides by the lowest common denominator.

Solve (2x + 1)/5 = (x − 2)/3.

$15\left(\frac{2x+1}{5}\right)=15\left(\frac{x-2}{3}\right)$	Multiply both sides by 15.
$3(2x+1)=5(x-2)$	15 ÷ 5 = 3 and 15 ÷ 3 = 5.
$6x+3=5x-10$	Expand both brackets.
$x+3=-10$	Subtract 5x from both sides.

$x=-13$

Remember

Check: both original fractions equal −5 when x = −13.

Inequalities: real numbers

For real numbers, draw a continuous line. An open circle excludes the endpoint; a filled circle includes it.



Filled circle: 3 is included.

Solve 2x ≤ 6 for real numbers.

$2x \div 2 \leq 6 \div 2$	Divide both sides by positive 2. Do not reverse the sign.

$x \leq 3$

Remember

For x < 3 the circle at 3 is open. For x ≤ 3 it is filled.

Inequalities: integers and natural numbers

Use individual dots for allowed whole-number values. The number set tells you which dots to draw.

Solve −2x > −6. Give the natural-number solutions using N = {1, 2, 3, …}.

$x < 3$	Dividing by −2 reverses the inequality sign.
$x \in \{1, 2\}$	Only these natural numbers are strictly less than 3.

$\{1, 2\}$

Remember

For integers use …, −2, −1, 0, 1, 2. Check whether a question includes 0 in its natural-number convention.

JUNIOR CYCLE HIGHER LEVEL · CHAPTER PRACTICE

Algebra 1

Try the questions before opening the separate answer key. Show one step per line.

10.1 · Fluency

Expand $-3(2x - 5)$.

10.2 · Variation

Solve $(x + 2)/3 = (x - 1)/2$. Show the line that multiplies both sides by 6.

10.3 · Choose a method

Solve $-3x \geq -9$ for positive natural numbers, then show the answer on a number line.

Check your work: are the sign, units and level of accuracy appropriate?