Helping Your Child with Algebra: Expressions & Equations

Algebra · Year 7 to Year 10 · Australian Curriculum Mathematics

Algebra is a way of using letters to stand for unknown numbers. Instead of saying 'I think of a number…', algebra lets us write it down and solve it. An **expression** is a collection of terms (like 3x + 5). An **equation** says two expressions are equal (like 3x + 5 = 20). Algebra is the language of science, engineering, finance, and technology — learning it opens many doors.

Year	What your child learns	What this looks like at home
Year 7	**Variables, expressions and simple equations** **variable** — a letter that stands for an unknown number: x, y, n **expression** — a mathematical phrase with no equals sign: 3x + 5 **equation** — two expressions joined by an equals sign: 3x + 5 = 20 Your child builds expressions: **'I think of a number, double it, then add 5' → 2n + 5** They solve one-step and two-step equations: **2n + 5 = 13 → 2n = 8 → n = 4** They substitute values: If x = 3, find 4x − 7 → 4(3) − 7 = 5	'I think of a number, multiply by 3, and get 18. What is the number?' (n × 3 = 18, so n = 6) **'Apples cost $a each. Write an expression for the cost of 5 apples.' (5a)** **'If apples are $1.50 each, use your expression to find the cost of 5.' (5 × 1.50 = $7.50)**
Year 8	**Expanding, factorising and equations with fractions** **expanding** — removing brackets by multiplying: 3(x + 4) = 3x + 12 **factorising** — the reverse: put back into bracket form: 3x + 12 = 3(x + 4) **like terms** — terms with the same variable: 4x and 7x are like terms **4x + 7x = 11x | 3x + 2y cannot be simplified (different letters)** Your child solves equations with brackets and with fractions: **2(x + 3) = 14 → 2x + 6 = 14 → 2x = 8 → x = 4** **x/3 + 5 = 9 → x/3 = 4 → x = 12**	'Expand 4(2x − 3)' (4 × 2x − 4 × 3 = 8x − 12) **'Factorise 6x + 9' (3 is the highest common factor → 3(2x + 3))** **'What are like terms? Are 5x and 5y like terms? Why not?'**
Year 9	**Quadratics, factorising and simultaneous equations** **quadratic expression** — contains x^2 as the highest power: $x^2 + 5x + 6$ **factorising a quadratic**: $x^2 + 5x + 6 = (x + 2)(x + 3)$ **simultaneous equations** — two equations with two unknowns; solve both at the same time: **x + y = 10 and x − y = 4 → x = 7, y = 3** Your child also finds the roots of quadratic equations: Solve $x^2 + 5x + 6 = 0$ → (x+2)(x+3) = 0 → x = −2 or x = −3	'What does "solving simultaneously" mean? Why do we need two equations for two unknowns?' **'Two numbers add to 15 and subtract to 3. Find the numbers.' (x+y=15, x−y=3 → x=9, y=6)** **Discuss: 'A quadratic equation can have two answers. How is that possible?'**
Year 10	**Polynomials, the quadratic formula and complex equations** **polynomial** — an expression with multiple terms and whole-number powers: $2x^3 − 5x^2 + 3x − 1$ **quadratic formula** — solves any quadratic $ax^2 + bx + c = 0$: $x = (−b \pm \sqrt{(b^2−4ac)}) \div 2a$ **discriminant** — the part under the square root: $b^2 − 4ac$ **If $b^2−4ac > 0$: two solutions** **If $b^2−4ac = 0$: one solution (touches x-axis)** **If $b^2−4ac < 0$: no real solutions (doesn't cross x-axis)** Your child uses the formula to solve quadratics that don't factorise neatly.	'Why do we need the quadratic formula if we can factorise?' (Not all quadratics factorise with whole numbers.) **'What does the discriminant tell you about a parabola?'** **'Solve: $x^2 − 5x + 6 = 0$ by factorising.' ((x−2)(x−3) = 0 → x = 2 or x = 3)** 'Now try: $x^2 − 4x + 1 = 0$. Does it factorise? Use the formula instead.'

★ Algebra building blocks — what the words mean

Building block	Example	What it means
Term	**$3x^2$ or $-5y$ or 7**	A single part of an expression: a number, a variable, or both multiplied together
Expression	**$4x + 3y - 2$**	Two or more terms combined — no equals sign
Equation	**$4x + 3y = 20$**	An expression with an equals sign — we can solve it
Formula	**$A = l \times w$**	An equation that shows the relationship between quantities

Solving equations — the golden rule: *whatever you do to one side, you must do to the other side. Think of the equation as a set of balance scales — to keep it balanced, every operation must happen on both sides.*

Substitution: *replace the variable with its value and calculate. If $p = 5$: find $3p - 4 \rightarrow 3(5) - 4 = 15 - 4 = 11$. Always put the number in brackets to avoid errors.*

Helping at Home — Algebra: Expressions & Equations

Worked examples and questions to ask · Year 7 to Year 10

How it works — worked examples

Year 7 — Solving a two-step equation

Solve: 4x + 7 = 23

Start	4x + 7 = 23
Step 1: −7	4x + 7 − 7 = 23 − 7 → 4x = 16
Step 2: ÷4	4x ÷ 4 = 16 ÷ 4 → x = 4
Check	**4(4) + 7 = 16 + 7 = 23 ✓**

Year 8 — Expanding brackets and solving

Solve: 3(2x − 4) = 18

Expand brackets	3 × 2x − 3 × 4 = 18 → 6x − 12 = 18
Step 1: +12	6x − 12 + 12 = 18 + 12 → 6x = 30
Step 2: ÷6	6x ÷ 6 = 30 ÷ 6 → x = 5
Check	**3(2×5 − 4) = 3(10−4) = 3(6) = 18 ✓**

Year 9 — Simultaneous equations

Solve: x + y = 10 and x − y = 4

Add the equations	(x+y) + (x−y) = 10 + 4 → 2x = 14
Find x	x = 14 ÷ 2 = 7
Find y	x + y = 10 → 7 + y = 10 → y = 3
Check	**7 + 3 = 10 ✓ | 7 − 3 = 4 ✓**

Questions to ask your child

You don't need to solve these. Ask them and let your child explain their thinking!

7 Year 7

→ I think of a number, multiply by 4, and subtract 3. The answer is 17. What is the number?
→ If n = 6, find the value of 5n − 8.
→ Write an expression for the cost of x items at $9 each with a $5 delivery fee.
→ Solve: 3x + 2 = 14.

8 Year 8

→ Expand: 5(3x + 2).
→ Simplify: 7y + 3y − 2y.
→ Factorise: 4x + 12.
→ Solve: 2(x + 5) = 22.

9 Year 9

→ Factorise: $x^2 + 7x + 12$.
→ Solve: $x^2 + 7x + 12 = 0$.
→ Two numbers have a sum of 20 and a product of 96. Find them using simultaneous equations.
→ What is the difference between an expression and an equation?

10 Year 10

→ Use the quadratic formula to solve $x^2 − 6x + 5 = 0$.
→ What does the discriminant tell you about the number of solutions?
→ Solve: $x^2 + 3x + 1 = 0$ (this doesn't factorise easily — use the formula).
→ When would a quadratic equation have no real solutions? Give an example from real life.

Things to try at home

Year 7: 'I think of a number' games: make up a riddle, let your child write the equation and solve it.	**Year 7:** At the shops: 'Apples are $2.50 each. Write an expression for the cost of n apples.' Then substitute real values.
Year 8: Play 'what's my rule?' — give a sequence of numbers (2, 5, 8, 11…) and ask them to write the expression (3n − 1).	**Year 8:** 'If a cafe charges $8 per person plus a $5 booking fee, write the total cost for n people. How much for 6 people?'
Year 9: Puzzle: 'The sum of two numbers is 25, and one is 7 more than the other. Find them.' (simultaneous equations)	**Year 10:** Find a real maths problem online that uses the quadratic formula (e.g. projectile motion). Discuss what each part means.

Key words to learn together

variable: a letter used to represent an unknown number: x, y, n, t	**term:** a single part of an expression: 3x, −5, $2y^2$
expression: a mathematical phrase with no equals sign: 4x + 3y − 2	**equation:** a mathematical statement with an equals sign: 2x + 1 = 9
substitution: replacing a variable with a number: if x = 4, then 3x = 3(4) = 12	**expanding:** multiplying out brackets: 3(x + 4) = 3x + 12
factorising: putting back into bracket form: 3x + 12 = 3(x + 4)	**like terms:** terms with the same variable(s): 5x and 3x are like terms
simultaneous equations: two equations with two unknowns — solved at the same time	**quadratic:** an expression or equation with x^2 as the highest power
discriminant: $b^2 - 4ac$ in the quadratic formula — tells how many solutions exist	**solution:** the value(s) of the variable that make an equation true