Year 8 Expressions and Equations – Revision Notes

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Year 8 · Maths · Expressions, Formulae and Equations · Key ideas and worked examples

For grown-ups and learners: read each part and try the worked example. Then work through the sheets: Foundation, Developing, Challenge, then Mixed Practice to revise everything. Show your working: it earns marks in tests and helps you spot mistakes.

1. Expressions, formulae and equations

An **expression** has no equals sign: $4p - 2q + 7$. An **equation** is true for particular values of the unknown: $3x + 5 = 20$ only when $x = 5$. A **formula** connects variables that can take many values: $A = lw$.

Example: Is $3x + 5 = 20$ an expression, a formula or an equation? Explain.
→ An equation: it is true for one value of x only ($x = 5$)
Answer: an equation: it is true for one value of x only ($x = 5$)

2. Simplifying, expanding and factorising

Multiply the numbers and add the powers: $3a \times 4a^2 = \mathbf{12a^3}$; divide and subtract the powers: $12x^5 \div 4x^2 = \mathbf{3x^3}$. To **expand**, multiply every term in the bracket by the term outside: $3x(2x - 5) = \mathbf{6x^2 - 15x}$. To **factorise**, take out the HCF of the terms: $8a^2 - 12a = \mathbf{4a(2a - 3)}$.

Example: Expand $3x(x + 3)$.
→ Multiply each term in the bracket by $3x$
→ $3x^2 + 9x$
Answer: $3x^2 + 9x$

3. Changing the subject

Undo the operations on the letter you want, in reverse order, doing the same to both sides. For $y = 3x + 5$: subtract 5 ($y - 5 = 3x$), then divide by 3: $\mathbf{x = (y - 5)/3}$.

Example: Make h the subject of the formula $A = bh/2$.
→ Undo the operations on h in reverse order, doing the same to both sides
→ $h = 2A/b$
Answer: $h = 2A/b$

4. Unknowns on both sides

Collect the unknown on the side with more of it. To solve $5x + 3 = 2x + 18$, subtract $2x$ from both sides ($3x + 3 = 18$), then subtract 3 ($3x = 15$) and divide by 3: $\mathbf{x = 5}$. Check: $5 \times 5 + 3 = 28$ and $2 \times 5 + 18 = 28$.

Example: Solve $x/5 + 1 = 4$.
→ Subtract 1: $x/5 = 3$
→ Multiply by 5: $x = 15$
→ Check by substituting $x = 15$
Answer: $x = 15$

5. Intervals

$-2 \leq x < 3$ means x is at least −2 and less than 3. The end −2 is included (closed) and the end 3 is not (open). If n is an integer, n can be −2, −1, 0, 1 or 2.

Think like a mathematician: test a few cases (**specialising**), look for the rule that always works (**generalising**), and explain why you are sure (**convincing**). When you check someone's working, say what is wrong and how to **improve** it.

Common mistakes: multiplying only the first term of a bracket. Leaving a common factor inside the bracket. Adding instead of subtracting when moving a term. Thinking $(a + b)^2 = a^2 + b^2$.