Y9 Maths Knowledge Organiser Topic 1: Basic Algebraic Manipulation

What must I be able to do?

You may need to revise the following:

- Year 8 Topic 4: Algebra 2
- Year 7 Topic 6: Algebra 1

New content:

- ☐ Know the meaning of the words variable, expression, equation, formula and identity
  - ➢ Mathswatch 7 (GCSE)
- ☐ Change the subject of a formula where the subject only appears once
  - ➢ Mathswatch 136 (GCSE)
- ☐ Write an algebraic expression
  - ➢ Mathswatch 137 (GCSE)

Key vocabulary

Subject of a formula	The letter which appears on one side of the equation by itself.
Variable	Usually represented by a letter, it can take a range of values.
Formula	A fact or rule which has 2 or more variables, connected by an equals sign. If you know all but one of the variables you can use the formula to find the value of the final one.

Identify equations, expressions, formulae and identities

Collection of terms with no equals sign

More than one variable and an equals sign

	Expression	Equation	Formula	Identity
$3x + 4$	✓			
$3x + 4 = 12$		✓		
$P = 4x$			✓	
$3x + 12 \equiv 3(x + 4)$				✓

Has an equals sign and only one unknown. Can be solved.

Use of the identity symbol. Both sides are always true no matter what value is chosen for the variable.

Writing algebraic expressions

e.g. Jack buys n metres of ribbon. The ribbon costs £3 per metre.

(a) Write down an expression in terms of n for the cost, in pounds, of n metres of ribbon.

Sarah orders 5 pairs of trousers costing £t each and 6 jumpers costing £j each. The total cost of the order is £108

(b) Write down an equation in terms of t and j for the total cost of the order.

a) £3 for each metre of ribbon and n metres means the cost will be £3 x n. So the cost is just $3n$.

The question asks for an expression so there is no = sign.

b) 5 pairs of trousers at £t each is $5t$
6 jumpers at £j each is $6j$
We know the total cost is £108, so

$$5t + 6j = £108$$

The question asks for an equation so there is an = sign.

Changing the subject of a formula

This follows the same rules as when solving equations.

e.g. make u the subject of the formula

$v = 2u + 3p$

$-3p$: $v - 3p = 2u$

$\div 2$: $\frac{v - 3p}{2} = u$

e.g. make c the subject of the formula

$$m = 5(c - 1)$$

There are 2 options here:

Method 1: expand the bracket first

expand: $m = 5c - 5$

$+5$: $m + 5 = 5c$

$\div 5$: $\frac{m + 5}{5} = c$

Method 2: divide by the coefficient first

$\div 5$: $\frac{m}{5} = c - 1$

$+1$: $\frac{m}{5} + 1 = c$

Tip – examiners tell schools that method 1 usually has a higher success rate in an exam than method 2 does!