Y9 Maths Knowledge Organiser Topic 2: Algebraic Manipulation

What must I be able to do?	Key vocabulary	
You may need to revise the following: • Year 8 Topic 5: Solving Equations 2 • Year 7 Topic 8: Algebra Essentials New content: ☐ Know the meaning of the words variable, expression, equation, formula and identity ➤ Sparx M830 ☐ Write an algebraic expression	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.

Recap of key skills from Y7 & 8

Collecting like terms

Collect terms with the same letter together by adding or subtracting them as appropriate

e.g. $x^2 + 3x + 5 - 2x^2 + 8x - 7$

$x^2 - 2x^2 = -x^2$

$3x + 8x = 11x$

$+5 - 7 = -2$

So we end with $-x^2 + 11x - 2$

Expanding/multiplying out brackets

Multiply all terms inside the bracket by the term in front of the bracket being careful with any negative numbers

e.g. $4(3a - 6) = 12a - 24$

as $4 \times 3a = 12a$ and $4 \times -6 = -24$

Factorising linear expressions

Factorising is the opposite of expanding a bracket. Look for the largest common factors of all terms and divide by these. The factors are put in front of the bracket.

e.g. $12x + 4 = 4(3x + 1)$
   12 and 4 have a HCF of 4

   $25y + 15 = 5(5y + 3)$
   25 and 15 have a HCF of 5

   $18a - 4y = 2(9a - 2y)$
   18 and -4 have a HCF of 2