Y8 Maths Knowledge Organiser Topic 5: Solving Equations 2

What must I be able to do?

You may need to revise the following:

- Year 7 Topic 7: Algebra Essentials
- Year 7 Topic 10: Solving Equations 1

New content:

- ☐ Expand and factorise linear expressions
  - ➢ Sparx M792, M100, M237
- ☐ Recognise that different-looking expressions may be identical and prove simple algebraic identities
- ☐ Solve linear equations involving brackets and unknowns on both sides
  - ➢ Sparx M509
- ☐ Solve simple fractional equations that can be reduced to linear equations
  - ➢ Sparx M509
- ☐ Formulate a linear equation in one unknown to solve problems
  - ➢ Sparx M957

Key vocabulary

Coefficient	The number written immediately before a letter e.g. the coefficient of 3a is 3.
Identity	Two things which will always be equal, regardless of what numbers are substituted in for the letters. Represented by the symbol ≡

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 HCF of 4

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

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

Solving with the unknown on both sides

If the unknown is on both sides, try to keep it on the side with the largest amount. The first step is to get the unknown on only one side by doing the inverse.

e.g.

$5x - 4 = 3x + 8$ (-3x, -3x)

$2x - 4 = 8$ (+4, +4)

$2x = 12$ (÷2, ÷2)

$x = 6$

For questions with brackets the first step is often to expand the brackets and then proceed as normal.

e.g.

$4(2x + 3) = 3(4x - 2)$ (expand, expand)

$8x + 12 = 12x - 6$ (-8x, -8x)

$12 = 4x - 6$ (+6, +6)

$18 = 4x$ (÷4, ÷4)

$\frac{18}{4} = x$ (simplify, simplify)

$x = \frac{9}{2} = 4.5$

Fractional equations

Most equations with a fraction are best dealt with by multiplying each term by the denominator of the fraction

Be careful if there is an extra term on the same side.

e.g.

$\frac{3x+8}{4} = 8$ (×4, ×4)

$3x + 8 = 32$ (-8, -8)

$3x = 24$ (÷3, ÷3)

$x = 8$

e.g.

$\frac{2x}{3} + 4 = 7$ (×3, ×3)

$2x + 12 = 21$ (-12, -12)

$2x = 9$ (÷2, ÷2)

$x = 4.5$

Note how this term is also multipled by 3 to make + 12

Formulating equations

e.g. James thinks of a number. He multiples it by 7 then adds 4. He ends with 53. What number did he start with?

For the 'thinks of a number' part we use a letter e.g. x

So James thinks of x

He multiples it by 7 $7x$

He then adds 4 $7x + 4$

He ends with 53 $7x + 4 = 53$

Now solve this using normal methods.

Note the order is important when writing so if he had added 4, then multiplied by 7 it would have become:

$$7(x + 4) = 53$$