MATHEMATICS Unit 13: Solving equations and inequalities	**Year Group: 8 set 4-5**

Key Vocabulary

Unknown or variable	The value we are trying to find. This is typically represented by a letter of the alphabet, often *x*.
Equation	A piece of algebra with an equals sign and variables. These can often be solved. E.g. 2x + 3 = 7
Operations	Things that can be done to values, e.g. +, -, x, ÷, square and square root.
Solve	Find the value of the unknown variable(s).
Solution	The answer. The value for each unknown variable. E.g. in 2x + 3 = 7, x = 2.
Brackets	(and). In order to solve an equation, you might need to start by expanding brackets. E.g. 2(x + 3) = 9 2x + 6 =9 2x = 3 X = 1 ½
Substitute	Put the given value of the unknown into an equation. This can be used to check an answer. E.g. 2(x + 3) = 9, check the answer x = 1 ½ 2(1 ½ +3) = 2 x 4 ½ = 9, so x = 1 ½ is a correct solution.
Inequalities	>, <, ≥ and ≤

Key facts / Diagrams

In order to solve an equation you must:

1. Do the same to BOTH sides of the equals sign
2. Remember the correct order of operations and work backwards to remove elements
3. Use the inverse of operations. To "remove" +2, you must -2 to each side

Remember that if algebraic methods are used correctly, problems can be solved in different ways:

2(x + 3) = 10 2x + 6 = 10
2x = 4 x = 2
OR
Start by dividing each side by 2
2(x + 3) = 10 x + 3 = 5
X = 2

Remember when items are added, the order can be changed:
5 + 3x = 11 is the same as 3x + 5 = 11
If there is an equals sign, then the two sides can be switched
11 = 3x + 5 is the same as 3x + 5 =11

With inequalities, you can't just switch the signs
If 11 > x, then x > 11 is wrong.
This means if:
11 < 3x + 2, then 3x + 2 > 11

Common misconceptions

- Assuming a=1, b=2, etc.
- Overlooking that the solution could be that the unknown is negative or a fraction
- Having problems with negative numbers, especially when the variable is preceded by a minus sign. E.g. 10 – 2x = 20
  Subtracting 10 from each side gives
  -2x = 10 NOT 2x =10

Worked examples

When the unknown appears on both sides, deal with the "lower" one first. E.g.:
5x + 3 = 2x + 15 (subtract 2 x from BOTH sides)
3x + 3 = 15 (subtract 3 from BOTH sides)
3x = 12 (divide by 3)
X = 4

With negatives more care is needed:
2x – 5 = 25 – 3x (-3x is "lower" than 2x, so start by adding 3x to BOTH sides)
5x – 5 = 25 (add 5 to BOTH sides)
5x = 30 (divide by 5)
X = 6

With inequalities, remember that the symbol might need to be reversed.
3x – 2 < 5x – 10
- 2 < 2x -10
2x – 10 > -2 2x > -2 + 10
2x > 8 x > 4