GCSE Mathematics – Unit 5: Equations, Inequalities and Sequences

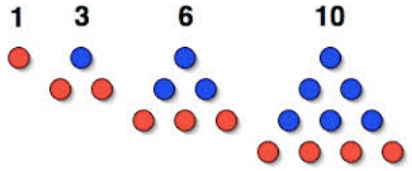
Topic/Skill	Explanation	Example	Your Turn
Solve	To find the **answer**/value of something: **Use inverse operations** on both sides of the equation (balancing method) until you find the value for the letter.	$2 + a = 10$ $(-2) \qquad (-2)$ $a = 8$ --- $2x = 10$ $(\div 2) \qquad (\div 2)$ $x = 5$ --- $m - 3 = 10$ $(+3) \qquad (+3)$ $m = 13$ --- $\frac{y}{4} = 10$ $(\times 4) \qquad (\times 4)$ $y = 40$	$b + 7 = 10$ --- $4y = 100$ --- $n - 8 = 20$ --- $\frac{w}{5} = 3$
Solve 2-Step Equations	**A 2 step equation** is an equation where there are 2 operations. Don't worry if the x is on the 'wrong' side, you follow the exact same steps.	$2x + 8 = 18$ $(-8) \qquad (-8)$ $2x = 10$ $(\div 2) \qquad (\div 2)$ $x = 5$ $20 = 14 + 2y$ $(-14) \qquad (-14)$ $6 = 2y$ $(\div 2) \qquad (\div 2)$	$\frac{y}{3} + 4 = 34$ $40 = 4k + 24$

		$3 = y$ $y = 3$	
Negatives in Equations	Make sure you keep an eye on negative **variables** (letters) Solve like you normally would, but don't forget the minus is there! If your equation ends with a negative variable, just multiply by –1 at the end.	$15 - 2x = 9$ (-15) (-15) $-2x = -6$ $(\div -2)$ $(\div -2)$ $x = 3$ --- $10 - k = 17$ (-10) (-10) $-k = 7$ $(\times -1)$ $(\times -1)$ $k = 7$	$28 - 4y = 8$ --- $15 - m = 20$
Solve Equations with Brackets	Expand, then solve! Remember, you haven't changed the equation by expanding brackets so **the other side can stay the same.**	$2(x + 8) = 18$ $2x + 16 = 18$ (-16) (-16) $2x = 2$ $(\div 2)$ $(\div 2)$ $x = 5$	$5(x - 8) = 10$
Solve with x on both sides	Remove the variables (x) from one side of the equation and then solve as normal.	$8x + 4 = 2x + 34$ $(-2x)$ $(-2x)$ $6x + 4 = 34$ (-4) (-4) $6x = 30$ (-4) (-4) $x = 5$ ---	$10j - 3 = 9j + 2$ $4 - 4k = -11 - k$

	If you get a negative variable, you can add the same amount to both sides.	$3 - 2m = -12 + m$ $(+2m) \quad (+2m)$ $3 = -12 + 3m$ …	
Inequality	An inequality says that two values are **not equal**. $a \neq b$ means that a is not equal to b.	$7 \neq 3$ $x \neq 0$	Give 3 values for x if … $x \neq 2$
Inequality symbols	$x > 2$ means **x is greater than 2** $x < 3$ means **x is less than 3** $x \geq 1$ means **x is greater than or equal to 1** $x \leq 6$ means **x is less than or equal to 6**	State the integers that satisfy $-2 < x \leq 4$. -1, 0, 1, 2, 3, 4	State the integers that satisfy $-5 \leq x < 2$.
Inequalities on a Number Line	Inequalities can be shown on a number line. **Open circles** are used for numbers that are **less than or greater than** $(< or >)$ **Closed circles** are used for numbers that are **less than or equal or greater than or equal** $(\leq or \geq)$	 $x \geq 0$ $x < 2$ $-5 \leq x < 4$	Draw the inequalities: $x > -2$ $-1 \leq x < 3$
Set notation	$\{x : x > 2\}$ means the set of numbers such that x is greater than 2	x = 3, 4, 5, 6 …….	$\{x : x \leq 3\}$ $x =$
Solving inequalities	Inequalities are solved in the same way as equations	$4x - 2 > 6$ $4x > 8$ $x > 2$	$2x + 1 \leq 7$

Upper and lower limits	If an inequality has an upper and lower limit,, solve the 2 sides separately	$-7 < 2x + 1 \leq 5$ $-7 < 2x + 1$ and $2x + 1 \leq 5$ $-8 < 2x$ $2x \leq 4$ $-4 < x$ $x \leq 2$ $-4 < x \leq 2$	$-3 < 3x - 3 \leq 27$
Negative numbers	When you multiply or divide an inequality by a negative number, **reverse** the inequality signs **Always check by substituting values**	$4 < -2x$ divide by 2 $2 < -x$ divide by -1 $-2 > x$ or $x < -2$	$12 <- 4x$
Sequence	A set of numbers that follows a pattern	90,80,70,60…	
Term	**Each value** in a sequence is called a term.	In the sequence 2, 5, 8, 11…, 8 is the third term of the sequence.	5,7,9,11… The third term is:
Position	The **place** in the sequence. The first term has position 1, the second term has position 2, the third term has position 3, and so on.	In the sequence 2, 5, 8, 11…, The term '8' has position 3.	5,7,9,11… The term '7' has position:
Term-to-term rule	The **rule to get from one term to the next** 'How much it goes up or down by'	In the sequence 2, 5, 8, 11… The term-to-term rule is 'add 3'	a) 1,2,4,8,16,32… Term-to-term rule: b) Example of a sequence with a term to term rule of -3:
nth term (Position-to-term rule)	The rule to work out **any** term from its **position.** **n** is the **position**.	In the sequence 2, 5, 8, 11… The nth term is $3n - 1$. 1st term: $3\times1 - 1 = 2$	a) nth term: **2n+2** First 4 terms: 100th term:

		2nd term: $3\times2-1=5$ 3rd term: $3\times3-1=8$ 4th term: $3\times4-1=11$ 100th term: $3\times100-1=299$	b) nth term: **5n + 9** First 4 terms: 100th term:
Linear Sequence	A number pattern with a **common difference**; it goes up or down by the same amount every time. It has a **term-to-term rule of add or subtract.**	2, 5, 8, 11… is a linear sequence because it increases by 3 every time 1, 4, 16, 64… is not a linear sequence because it doesn't go up by the same amount	Circle and complete: a) 12, 14, 16, 18… is/isn't linear because… b) 2, 8, 18, 32… is/isn't linear because…
Find the nth term of a **linear** sequence	1. Find the common difference. 2. Multiply that by n. 3. Find the difference between the sequences you have to find **the constant**	Find the nth term of: 3, 7, 11, 15… 1. Difference is **+4** 2. Start with $4n$ 3. **4n: 4, 8, 12, 16…** **3, 7, 11, 15…** Each term of our sequence is always 1 less than 4n, so the nth term is **4n-1**	Find the nth term of: 5, 9, 13, 17… Find the nth term of: 15, 9, 3, -3…
Non-Linear Sequences			
Fibonacci type sequences	A sequence where the next number is found by **adding up the previous two terms**	The Fibonacci sequence is: $1, 1, 2, 3, 5, 8, 13, 21, 34...$ An example of a Fibonacci-type sequence is: $4,\ 7,\ 11,\ 18,\ 29...$	Find the next 2 terms: 5, 5, 10, 15, 25…

Geometric Sequence	A sequence where the term-to-term is multiply or divide.	An example of a geometric sequence is: $2, 10, 50, 250...$ The term-to-term rule is x5 Another example of a geometric sequence is: $81, -27, 9, -3, 1...$ The term-to-term rule is $\div -3$	a) Tick which ones are geometric: 1, 3, 9, 27, 81… 1, 3, 5, 7, 9… 2.5, 5, 10, 20, 40… b) What is the term to term rule? 0.25, 1, 4, 16, 64…
Quadratic Sequence	A sequence that involves the square numbers: 1, 4, 9, 16, 25 … The nth-term of a quadratic sequence will involve n^2	n^2: 1, 4, 9, 16, 25… $2n^2$: 2, 8, 18, 32, 50… $2n^2 + 2$: 4, 10, 20, 34, 52…	Find the first 4 terms of: $n^2 + 3$: $4n^2$: $2n^2 - 3$:
Triangular numbers	The sequence which comes from a pattern of dots that form a triangle. $1, 3, 6, 10, 15, 21...$		Find the next 3 terms: $1, 3, 6, 10, 15, 21...$ Can you spot any other patterns?