The Sutton Academy

Knowledge Rich Curriculum Plan

Year 10 Foundation + – Algebra 3

Lesson	Intended Knowledge:	Tiered Vocabulary	Prior Knowledge:	Steps to Success:	Feedback
To learn how to generate sequences and find the nth term of a sequence.	• Students will know how to generate both linear and quadratic sequences using the nth term. • Students will know how to find the nth term of a linear sequence. • Students will know how to find the nth term of a pattern sequence.	**Sequence** - a particular order in which related things follow each other **Generate –** produce or create **Arithmetic Sequence** - A sequence made by adding or subtracting by the same value each time **Geometric Sequence –** a sequence made by multiplying by the same value each time **nth Term –** a formula that allows us to find any term in a sequence. The 'n' stands for the term number **Quadratic** – an expression where the highest power of the variable is 2 **Substitution** - replacing letters with numbers in algebraic expressions or equations	• Students need to know how to continue sequences including patterns, linear and geometric. • Students need to know how to describe the term-to-term rule for a sequence.	**Steps to Success – Generating a Sequence** **Step 1:** Begin by substituting the letter 'n' with the number 1, this will create the first term of the sequence. **Step 2:** Then substitute the letter 'n' with the number 2, this will create the second term of the sequence. **Step 3:** Then substitute the letter 'n' with the number 3, this will create the third term of the sequence. **Step 4:** Repeat this process until you have generate the required number of terms. You may also be able to generate the rest of the sequence, once you know the term to term rule. You can then continue adding or subtracting the value until you have the required number of terms. **Steps to Success - Finding the nth term of linear sequences** **Step 1:** Find the differences between each term – these should be the same number. **Step 2:** Multiply your difference by n. **Step 3:** Substitute the number 1 into your nth term. **Step 4:** Work out what you would do to get to the first term in the sequence. **Step 5:** Make this adjustment to your nth term. You can double check your answer by substituting in 2 and this should give you the second term in the sequence. **Steps to Success – Pattern Sequences** **Step 1:** Identify how many items/pictures is contained each pattern. Write this above each pattern. **Step 2:** Find the differences between each term – these should be the same number. **Step 3:** Multiply your difference by n. **Step 4:** Substitute the number 1 into your nth term. **Step 5:** Work out what you would do to get to the first term in the sequence. **Step 6:** Make this adjustment to your nth term.	
To learn how to use the nth term of a linear sequence.	• Students will know how to find a particular term in the sequence by using the nth term of the sequence. E.g. 10^{th} term • Students will know how to determine whether a number is in the sequence or not. • Students will know how to use the nth term of an arithmetic sequence to decide if a given number is a term in the sequence. • Students will know how to find the first term greater/less than a certain number. • Students will know how to find the next term and state the term-to-term rule for a Fibonacci sequence.	**Fibonacci Sequence –** a sequence of numbers in which each number is the sum of the two preceding numbers. The simplest is the series 1, 1, 2, 3, 5, 8, etc.	• Students need to know how to find the nth term of a sequence.	**Steps to Success – Finding a particular term** **Step 1:** Begin by substituting the letter 'n' with the term numbers. **Step 2:** Use BIDMAS to calculate the value of the term. **Steps to Success – Identifying if a term is within a sequence** **Step 1:** If a sequence is given, you may firstly need to calculate the nth term, if a rule and the first term is given you will need to write out the sequence and the calculate the nth term **Step 2:** Write an equation where the nth term is equal to the number given and solve. **Step 3:** If the answer is an integer, then it is in the sequence, if not it does appear in the sequence.	

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To learn how to draw straight line graphs.	• Students will know how to draw and recognise graphs of y = a, x = b, y = x and y = –x. • Students will know how to draw straight line graphs in the form $y = mx + c$ by using a table of values. • Students will know how to plot straight line graphs in the form $y = mx + c$ by first constructing their own table of values. **Opportunity for challenge:** • Students will know how to plot and draw graphs of straight lines in the form $x + y = c$.	**Substitution** - replacing letters with numbers in algebraic expressions or equations **Linear Equation –** an equation between two variables that can be written in the form y = mx + c. Linear equations give a straight line when plotted on a graph.	Students need to know how to plot and write coordinates.	**Steps to Success – Plotting Straight Line Graphs in the form $y = a$ and $x = b$** **Step 1**: Highlight the axes that you need to use. The y-axis for y= and the x-axis for x=. **Step 2:** Circle the number that is in the equation. **Step 3:** Draw a straight line through that number with a pencil and ruler. Double check that every x or y coordinate on the line matches the value in the equation. **Steps to Success – Plotting Straight Line Graphs in the form $y = mx + c$** **Step 1**: Use the table of values for your coordinates for drawing the graph. If a table is not provided, create one using the x values on the axis as the x values in your table. Substitute your x values into the equation of the line in order to find your y coordinates. Remember to use BIDMAS. **Step 2**: Choose a pair of coordinates (x,y) from your table to plot on the graph. Remember that the 'x' coordinate is for the horizontal axis and the 'y' coordinate is for the vertical axis. Mark this point on the graph with a cross (x). **Step 3:** Continue this process until all pairs of coordinates have been plotted. **Step 4:** Join up the points with one straight line using a pencil and a ruler. If the coordinates do not form a straight line, check each coordinate is plotted correctly.	
To learn how to find the gradient from two points.	• Students will know how to identify the gradient and y-intercept of a straight line given the equation. • Students will know that $gradient = \frac{change\ in\ y}{change\ in\ x}$ • Students will know how to find the gradient from two coordinates.	**Intercept** – cross **Y-intercept** – the y-intercept tells us where a graph crosses the y-axis, this where x = 0 **X-intercept** – the x-intercept tells us where a graph crosses the x-axis, this where y = 0 **Gradient** – steepness. The gradient of a line tells us how steep the line is. **Origin** – The origin is located at the intersection of the vertical and horizontal axes at the coordinates (0, 0)	• Students need to know how to plot and write coordinates.	**Steps to Success – Calculating the gradient from two points** **Step 1:** Label the coordinates x and y. **Step 2:** Work out the change in the y-coordinates. **Step 3:** Work out the change in the x-coordinates (remember to do this in the same direction as you did for the y-coordinates). **Step 4:** Calculate the gradient by dividing the 'change in y' by the 'change in x'. $$gradient = \frac{change\ in\ y}{change\ in\ x}$$	
To learn how to find the equation of a straight line.	• Students will know how to identify the y-intercept of a given straight line. • Students will know how to find the equation of a given straight line. • Students will know how to find the equation of a straight line with a given gradient and a point.		• Students need to know how to find the gradient from two points.	**Steps to Success - The equation of a straight line** **Step 1:** Identify two pairs of integer coordinates on the given straight line. **Step 2:** Work out the difference between the y-coordinates **Step 3:** Work out the difference between the x-coordinates **Step 4:** Calculate the gradient between the two pairs of coordinates using: $$gradient = \frac{change\ in\ y}{change\ in\ x}$$ **Step 5:** Identify the y-intercept of the straight line, this is the point at which the line crosses the y-axis	

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				Step 6: Substitute the gradient and y-intercept into the equation of the straight line. If the y-intercept is positive, the equation of the line will end in +c, if it is negative, it will end in – c. **Steps to Success - The equation of a straight line from a given gradient and point** **Step 1:** Replace the m in $y = mx + c$ with the gradient you have been given. **Step 5:** Substitute in the numbers from the coordinate into the equation for the letters x and y. **Step 6:** Rearrange the equation to find the value of c. **Step 7:** Substitute the gradient and y-intercept into the equation of the straight line. If the y-intercept is positive, the equation of the line will end in +c, if it is negative, it will end in – c.	
To learn how to find the equation a straight line and of parallel lines.	• Students will know how find the equation of a straight line from two points. • Students will know how to generate equations of lines parallel to the given line or equation. • Students will know how to identify sets of parallel lines from their equations.	**Parallel –** parallel lines are two lines that are side by side and have the same distance continuously between them	• Students need to know how to calculate gradient between two coordinates. • Students need to know how to substitute values into an equation.	**Steps to Success - The equation of a straight line from two points** **Step 1:** Work out the difference between the y-coordinates **Step 2:** Work out the difference between the x-coordinates **Step 3:** Calculate the gradient between the two pairs of coordinates using: $$gradient = \frac{change\ in\ y}{change\ in\ x}$$ **Step 4:** Replace the m in $y = mx + c$ with the gradient you have just found. **Step 5:** Substitute in the numbers from one of the coordinates into the equation for the letters x and y. **Step 6:** Rearrange the equation to find the value of c. **Step 7:** Substitute the gradient and y-intercept into the equation of the straight line. If the y-intercept is positive, the equation of the line will end in +c, if it is negative, it will end in – c.	
To learn how to solve linear simultaneous equations graphically.	• Students will know how to use linear graphs to estimate values of y for given values of x and vice versa. • Students will know how to solve linear simultaneous equations graphically when the straight lines graphs are given. **Opportunity for challenge:** • Students will know how to solve linear simultaneous equations graphically when at least one line needs to be drawn first.	**Solve –** find an answer **Simultaneous –** occurring at the same time **Simultaneous equations –** equations involving two or more unknowns that are to have the same values in each equation **Linear Equation –** an equation where the highest power of x is 1	• Students need to know how to plot and write coordinates.	**Steps to Success – Solving simultaneous equations graphically** **Step 1:** Highlight the point where the two lines cross each other. **Step 2:** Write down the coordinate of this point. **Step 3:** Write down the answers in the form x= and y=. **Steps to Success – Solving Simultaneous Equations graphically** **Step 1:** Check if both your equations are in the form of y = mx + c. If they are not, rearrange them into this. **Step 2**: Plot your first equation on your graph, if it is not already plotted. **Step 3**: Plot your second equation on your graph, if it is not already plotted. **Step 4:** Find the point of intersection, this co-ordinate is the solution for x and y. **Step 5:** State the values for x and y. **Step 6:** Check your answer by substituting you value for x and y into a different equation to ensure your values are correct.	
To learn how to solve linear simultaneous equations.	• Students will use elimination to solve basic linear simultaneous equations algebraically without scaling any of the equations.		• Students need to know how to solve linear equations.	**Steps to Success – Solving Simultaneous Equations** **Step 1:** Eliminate the x's or y's by either adding the two equations together (when the signs in front the of the x's or y's are different) or by subtracting the two equations from each other (when the signs in front of the x's or y's are the same). **Step 2:** Solve the remaining equation for x or y. **Step 3:** Substitute the value you have found into any of your equations. **Step 4:** Solve this equation to find the variable. **Step 5:** Check your answer by substituting you value for x and y into a different equation to ensure your values are correct.	

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To learn how to solve linear simultaneous equations.	• Students will know how to use elimination to solve linear simultaneous equations algebraically where scaling is needed. **Opportunity for challenge:** • Students will know how to form and solve linear simultaneous equations.		• Students need to know how to solve basic simultaneous equations without the use of scaling.	**Steps to Success – Solving Simultaneous Equations** **Step 1:** Check to see if the coefficients of x or y are the same in both equations. **Step 2:** If they are different, multiply one or both equations to make them the same (or find the Lowest Common Multiple of the coefficients of x or y) **Step 3:** Eliminate the x's or y's by either adding the two equations together (when the signs in front the of the x's or y's are different) or by subtracting the two equations from each other (when the signs in front of the x's or y's are the same). **Step 4:** Solve the remaining equation for x or y. **Step 5:** Substitute the value you have found into any of your equations. **Step 6:** Solve this equation to find the variable. **Step 7:** Check your answer by substituting you value for x and y into a different equation to ensure your values are correct.	
To learn how to draw quadratic graphs.	• Students will know how to recognise graphs of quadratic functions. • Students will know how to draw quadratic graphs by using a table of values without a calculator. • Students will know how to draw quadratic graphs by using a table of values with a calculator.	**Quadratic** – an expression where the highest power of the variable is 2 **Parabola –** the U or ∩ shape of a quadratic graph	• Students need to know how to substitute positive and negative integers into formulae involving squared terms.	**Steps to Success – Plotting Quadratic Graphs** **Step 1:** If one isn't given, construct a table with one row for x-values and another for y-values. Use the values given in the question to determine what x-coordinates to use – this may be given as an inequality or "for the values of x from -3 to 3". **Step 2:** Substitute each x-value into the given equation to generate each y-value. **Step 3:** Plot each coordinate pair on the graph with an x. **Step 4:** Draw one smooth continuous curve through every point. This should either be in the shape of a U or ∩.	
To learn how to interpret quadratic graphs.	• Students will know how to identify the turning point using a graph of a quadratic equation in the form of $ax^2 + bx + c = 0$. • Students will know how to identify roots using the graph of quadratic equation in the form of $ax^2 + bx + c = 0$. • Students will know how to identify roots using the graph of quadratic equation in the form of $ax^2 + bx + c = d$. Where d is a constant. **Opportunity for challenge:** • Students will know how to draw a quadratic graph to find the turning points and roots.	**Turning Point** – the point at which the gradient changes of a curve (the maximum or minimum point on a curve). **Root** – a solution to an equation where a line or curve crosses the x-axis.	• Students need to know how to draw quadratic graphs.	**Steps to Success- Interpreting Quadratic Graphs** **Solutions or roots to quadratic graphs** If you are asked to find the solution or root of a quadratic graph in the form of $ax^2 + bx + c = 0$, it is asking for the x coordinate of where the curve touches or crosses the x-axis. **Turning point** If you are asked to find the turning point of a quadratic, it is asking for the highest or lowest co-ordinate depending on the quadratic, where it "turns around".	
To learn how to solve quadratics by factorising.	• Students will know how to solve quadratic equations in the form $ax^2 + bx + c = 0$, where $a = 1$, by factorising. • Students will know how to solve quadratic equations involving the difference of two squares and where the coefficient of x^2 is 1. **Opportunity for challenge:** • Students will know how to rearrange quadratic equations in the form $ax^2 + bx + c = 0$, where $a = 1$, to then factorise and solve.	**Solve –** find an answer **Equation –** a mathematical statement where two algebraic expressions are equal **Factorise –** put into brackets by bringing common factors outside **Quadratic Equation –** an equation where the highest power of the variable is 2	• Students need to know how to factorise quadratic equations in the form $ax^2 + bx + c$ where $a = 1$.	**Steps to Success – Factorising and Solving Quadratics** **Step 1:** If required, rearrange the equation to make it equal zero and ensure that the x^2 term is positive. **Step 2:** Factorise the quadratic into either single or double brackets. **Step 3:** Write each bracket equal to 0. **Step 4:** Solve each of the linear equations formed to find the two values for x.	

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To learn how to recognise and draw cubic, reciprocal and exponential graphs.	• Students will know how to complete a table of values and plot a cubic function. • Students will know how to recognise and sketch graphs of the reciprocal function $y = \frac{k}{x}$ with x ≠ 0 • Students will know how to recognise and sketch graphs of exponential functions. • Students will know how to recognise the shape of different graphs and match equations to sketches.	**Cubic –** an expression where the highest power of the variable is 3 **Reciprocal –** The reciprocal of a number is: 1 divided by the number. E.g. $\frac{1}{x}$ **Exponential –** a relation of the form $y = a^x$	• Students need to know how to substitute positive and negative numbers into formulae.	**Steps to Success- Plotting Cubic Graphs** **Step 1**: If one isn't given, construct a table with one row for x-values and another for y-values. Use the values given in the question to determine what x-coordinates to use. **Step 2**: Substitute each x-value into the given equation to generate each y-value. **Step 3**: Plot each coordinate pair on the graph with an x. **Step 4:** Connect the points together with a smooth connected curve. Do not use a ruler! **Steps to Success- Plotting Reciprocal Graphs** **Step 1:** If one isn't given, construct a table with one row for x-values and another for y-values. Use the values given in the question to determine what x-coordinates to use. Remember- 0 is **never** plotted on reciprocal graphs. **Step 2**: Substitute each x-value into the given equation to generate each y-value. This is always in the form $\frac{k}{x}$. **Step 3**: Plot each coordinate pair on the graph with an x, joining together the positive coordinates and negative coordinates as separate curves. **Steps to Success- Plotting Exponential Graphs** **Step 1**: If one isn't given, construct a table with one row for x-values and another for y-values. Use the values given in the question to determine what x-coordinates to use. Remember- when x = 1, y = 0. **Step 2**: Substitute each x-value into the given equation to generate each y-value. **Step 3**: Plot each coordinate pair on the graph with an x. **Step 4:** Connect the points together with a smooth connected curve. Do not use a ruler!	
Exam Preparation 10					