The Sutton Academy

Knowledge Rich Curriculum Plan

Year 10 Intermediate – Algebra 4

Lesson	Intended Knowledge:	Tiered Vocabulary	Prior Knowledge:	Assessment	Feedback
To learn how to find the nth term of a quadratic sequence.	• Students will know how to find the nth term of a quadratic sequence in the form $an^2 + b$. **Opportunity for challenge:** • Students will know how to find the nth term of a quadratic sequence in the form $an^2 + bn + c$.	**Quadratic –** involving a squared algebraic term but no other power higher than 2 **Substitution** - replacing letters with numbers in algebraic expressions or equations	• Students need to know how to find the nth term of a linear sequence. • Students will need to know how to generate a sequence for a given quadratic nth term.	**Steps to Success – Quadratic nth term in the form $an^2 + b$** **Step 1:** Find the differences between the terms in the sequence, if it isn't the same you have to find the second difference – this shows that it is a quadratic sequence. **Step 2:** Half the second difference and put it as the coefficient of n^2. • if the second difference is 2 then the sequence contains $1n^2$ (we just write this as n^2). • if the second difference is 4 the sequence contains $2n^2$ • if the second difference is 6 then the sequence contains $3n^2$ and so on… **Step 3:** Write out an^2 – substitute in 1, 2, 3, 4, 5 to generate this sequence, remember the order of operations! **Step 4:** Subtract an^2 from your original sequence. **Step 5:** These numbers should be the same. Add or subtract this number from your an^2. **Steps to Success – Quadratic nth term in the form $an^2 + bn + c$** **Step 1:** Find the differences between the terms in the sequence, if it isn't the same you have to find the second difference – this shows that it is a quadratic sequence. **Step 2:** Half the second difference and put it as the coefficient of n^2. • if the second difference is 2 then the sequence contains $1n^2$ (we just write this as n^2). • if the second difference is 4 the sequence contains $2n^2$ • if the second difference is 6 then the sequence contains $3n^2$ and so on… **Step 3:** Write out an^2 – substitute in 1, 2, 3, 4, 5 to generate this sequence, remember the order of operations! **Step 4:** Subtract an^2 from your original sequence. **Step 5:** Find the nth term of the linear sequence that is left over after the subtraction - if it is the same number repeating it is just +/- that number. **Step 6:** Write your answer in the form $an^2 + bn + c$.	
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".	

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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.	
To learn how to solve quadratics using the quadratic formula.	• Students will know that the quadratic formula is $x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$ • Students will know that we use the quadratic formula when a quadratic cannot be factorised. • Students will know how to identify the values for a, b and c from a quadratic equation including where the equation is not necessarily in the order $ax^2 + bx + c$. • Students will know how to substitute the values for a, b and c into the quadratic formula to solve the corresponding quadratic equation. • Students will know that to solve quadratic equations they must be equal to zero. **Opportunity for challenge:** • Students will know how to rearrange equations to make them equal to zero before using the quadratic formula to solve them.	**Formula** – A mathematical relationship or rule expressed in symbols. **Formula sheet**	• Students need to be able to substitute numbers into formulae.	**Steps to Success – Using the Quadratic Formula** **Step 1:** Identify the values of a, b and c **Step 2:** Substitute the values for a, b and c into the correct places in the formula **Step 3:** Write out the calculation twice, once with the + and once with the – in place of the ± **Step 4:** Use your calculator to work out the answer to each of the calculations produced in step 3 **Step 5:** Check you've rounded to the correct degree of accuracy $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$	
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 $x \neq 0$ • 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**	

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				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 11					