KESTEVEN AND SLEAFORD HIGH SCHOOL

Mathematics Scheme of Learning
Year 10 – Term 1 Basic algebra & linear equations/Rearranging and quadratics/Ratio/Scale diagrams and bearings

(All sets may deviate from termly timings but should continue to follow the curriculum map. All sets should focus on key number and algebra skills spending longer where necessary to embed. Pupils should be exposed to retrieval practice and problem solving regularly)

Intent – Rationale

"Maths is for everyone". AQA GCSE Mathematics is designed to be diverse, engaging and essential to equip all students with the skills and knowledge to reach their future destination. Opportunities to make connections, generalise and apply are embedded where appropriate for each individual student. References to careers and future learning are shared with students. Term 1 aims to establish a secure understanding in algebraic manipulation and ratio, in recognition of these topics cross topic application, in particular in problem solving scenarios.

Sequencing – what prior learning does this topic build upon?	Sequencing – what subsequent learning does this topic feed into?
• Y7 Term 1 Algebraic expressions • Y7 Term 3 Equations • Y7 Term 5 Proportion • Y8 Term 1 Expressions and substitution • Y8 Term 2 Proportion • Y8 Term 4 Forming and solving equations • Y8 Term 4 Scale diagrams, plans and nets • Y8 Term 5 Ratio • Y8 Term 6 Intro to factorising • Y9 Term 1 Expanding and factorising quadratics • Y9 Term 3 Substitution • Y9 Term 1 Equations	• Y10 Term 3 Sequences • Y10 Term 5 Functions • Y10 Term 6 Simultaneous equations • Y10 Term 6 Inequalities • Y10 Term 6 2D Representation • Y11 Term 1 Algebraic fractions • Y11 Term 2 Direct and inverse proportion • Y11 Term 3 Numerical methods • A level Pure mathematics algebraic manipulation is essential for many topics including Calculus, exponentials and trigonometric identities.

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• Y9 Term 6 Ratio	
What are the links with other subjects in the curriculum?	**What are the links to SMSC, British Values and Careers?**
• Science – compound measures • Design and technology - ratio to scale amounts in a recipe or of material/resources • Geography – map skills	• GB4e • SP234
What are the opportunities for developing literacy skills and developing learner confidence and enjoyment in reading?	**What are the opportunities for developing mathematical skills?**
• 'The Math Book' - Clifford Pickover • 'Alex's Adventures in Numberland' – Alex Bollos	• Secure knowledge of algebraic manipulation and a focus on accurate use of language. • Ratio is embedded in many AO2/3 questions linking to other topics including fractions/decimal/percentages and decision making.

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Intent – Concepts

What knowledge will students gain and what skills will they develop as a consequence of this topic?
Know The definition of identity, expression, equation and formula. Simplify and manipulate algebraic expressions including expanding and factorising linear and quadratic expressions, including difference of two squares. Substitute values into formulae. Solve linear equations including with brackets, fractions and unknowns on both sides. Change the subject of a formula with the variable appearing once and twice. Factorise quadratic equations with coefficients of x^2. Solve quadratic equations by factorising, including with a>1. Know the quadratic formula and use to solve quadratic equations, including with a>1. Complete the square where a =1, use to solve quadratic equations. Simplify ratios in to form 1:n and simplest form, share quantities in a ratio and use a quantity to find another in a ratio. Express one quantity as a ratio of another. Solve combining ratio problems and changing ratio problems. Use standard notation for labelling sides and angles. Know and give reason for finding missing angles in parallel lines and triangles. Measure and draw accurately 3 figure bearing angles. Apply angle properties to find missing angles. **Apply** Solve linear equations in context eg equivalent perimeters. Use formulae required for other topics such as SUVAT equations, Cosine rule, quadratic formula. This should also be implemented for common equations used in Science Ratio problems in context. Bearings in context eg boat/airplane travelling, scale diagrams **Extend** Solve linear equations with simple algebraic fractions (linear only).

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Solve quadratic equations and relate solutions to graphical representation. Algebraic ratio problems. Bearing problems where Pythagoras or trigonometry required. Angle of elevation or depression.	
What subject specific language will be used and developed in this topic?	**What opportunities are available for assessing the progress of students?**
Formulae, formula, expressions, equations, identity, linear, quadratic, term, inverse, expanding, factorising, common factor, substitution, subject, simplify, simplify fully, equivalent, complete the square, coefficient, difference of two squares Ensure secure in exam command words, eg expanding is to remove from brackets, Ratio, variable, in terms of, proportion, parts, fraction, quantity, simplest form, express Angle, <ABC, scale, image, bearing, clockwise, anticlockwise, direction	Lesson • Formative assessment occurs throughout lessons and will address common misconceptions as well as help to inform pace and depth of lesson delivery. Formative assessment will be conducted using a variety of methods as prescribed in the Mathematics Teaching and Learning Protocol. Homework • Retrieval homework issued termly followed by teacher www/ebi comments with a week built in for pupils to digest and follow up on feedback in preparation for retrieval/termly test. • Y10 Homework booklet which contains problem solving questions and the most recent AQA Topic Test questions • Mathswatch assignments Marking • Retrieval homework issued termly followed by teacher www/ebi comments with a week built in for pupils to digest and follow up on feedback in preparation for retrieval/termly test. • Pupils are to self-mark classwork as directed by the teacher. The use of a green marking triangle is encouraged to allow efficient monitoring of pupil progress during book and pupil folder checks

	which occur termly for each class. Common errors and misconceptions should be addressed as a class. Assessment Retrieval assessment will occur this term which will identify pupils for 'topic top-up' in preparation for next terms teaching

Intent – Concepts

Lesson title	Learning challenge	Higher level challenge	Suggested activities and resources

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Basic algebra and Linear equations Approx. 6 lessons	<u>Key Knowledge</u> Use basic algebra notation Understand the concepts of expressions, equations, formulae, identities, terms and factors Simplify and manipulate algebraic expressions by collecting like terms, multiplying a term over a bracket, taking out common factors Substitute values into formulae Solve linear equations including those with unknowns on both sides <u>Common Misconceptions</u> When balancing equations, always subtracting terms when sometimes the requirement is to add as the term is negative	Formulae with increased difficulty of BIDMAS Fraction and decimal coefficients Solve linear equations with algebraic fractions	▪ Department PowerPoint and folder resources (to be adapted to reflect class requirements) ▪ Use of games (instil confidence with new class) ▪ Simplifying calculated colouring for prior knowledge check ▪ Checking prior knowledge of expanding and factorising into single brackets ▪ Simple algebraic fractions (studied in greater depth in Y11 Term 1). ▪ Use formulae students are required to learn eg quadratic formula, volume formulae ▪ Progressive task – move to next 'type' as soon as ready. (saved in Topic resources) ▪ Solving linear equations with algebraic fractions for higher sets

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	Interpreting 3y as 3+y as opposed to 3 x y Errors with directed numbers when collecting like terms		Useful websites: Mathsbox Goteachmaths AccessMaths CorbettMaths MWB

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Rearranging and Quadratics Approx. 7 lessons	<u>Key Knowledge</u> Change the subject of the formula with variable once Change the subject of the formula with variable twice Factorise quadratic expressions including in the form of the difference of two squares Solve quadratic equations by factorising Solve quadratic equation using the formula Complete the square Solve quadratic equations by completing the square <u>Common Misconceptions</u> Fully factorise $4x^2-36$ is not $(2x+6)(2x-6)$	Use of formulae with only letters. Formulae with algebraic fractions. Solve equations when not given in the form =0 Mixed problems to identify appropriate method to solve. Complete the square for quadratics with positive and negative coefficients of x^2. Make links to sketching the parabola	▪ Department PowerPoint and folder resources (to be adapted to reflect class requirements) ▪ Checking prior knowledge of expanding and factorising into double brackets (Lower sets may need some teaching time especially with factorising quadratics). ▪ **Teach factorising quadratics with a coefficient of x^2 first, then students can identify the efficient method for when coefficient of x^2 is 1.** ▪ Make links from DOTS to solve $9.3^2 – 7.16^2$ without a calculator. • Pop goes the weasel song to learn the quadratic formula Useful websites: Mathsbox Goteachmaths AccessMaths CorbettMaths MWB

	Identifying which method to use to factorise and/or solve a quadratic expression/equation Remembering the quadratic formula		

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Ratio Approx. 5 lessons	<u>Key Knowledge</u> Work with fractions in ratio problems Express one quantity as a fraction of another Use ratio notation Divide a given quantity into two parts Combining ratios Changing ratios <u>Common Misconceptions</u> 'The ratio of blue to red marbles is 2:3. What is the fraction of blue marbles'. The correct answer is 2/5 but pupils may answer 2/3 When simplifying ratios, only dividing by 2 rather than trying to find the highest common factor	Algebraic ratio problems	▪ Department PowerPoint and folder resources (to be adapted to reflect class requirements) ▪ Low stakes assessment for higher sets to assess prior knowledge on ratio notation and dividing in a ratio ▪ Recap prior knowledge (Y9 Term 6) on combining ratios ▪ Goteachmaths has lots of great scaffolded worksheets for comparing, combining, and changing ratios. ▪ Make use of the numerous multiple choice questions available from past papers. Useful websites: Mathsbox Goteachmaths AccessMaths CorbettMaths MWB

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Scale diagrams & Bearings Approx. 5 lessons	<u>Key Knowledge</u> Use the standard conventions for labelling and referring to the sides and angles of triangles Identify angles around a point, angles on a straight line, alternate angles, corresponding angles and supplementary angles Measure and draw accurately a 3 figure bearing Apply the properties of angles to bearings problems Apply scale factors to scale drawings including maps <u>Common Misconceptions</u> 'What is bearing A from B?' – pupils should learn this is the same as 'What is bearing B to A?'	Algebraic problems Pythagoras & Trig bearing problems Angles of elevation and depression.	▪ Department PowerPoint and folder resources (to be adapted to reflect class requirements) ▪ Check prior knowledge on angles in parallel lines – colouring sheet ▪ DOT to DOT measuring angles worksheet • Using bearings treasure hunt Useful websites: Mathsbox Goteachmaths AccessMaths CorbettMaths MWB

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	Confusing angle totals for basic angle facts		

Basic Algebra & Linear Equations	R	A	G
Use basic algebra notation (3y,ab)			
Understand the concepts of expressions, equations, formulae, identities, inequalities, terms and factors			
Simplify and manipulate algebraic expressions by - collecting like terms, multiplying a term over a bracket, taking out common factors			
Substitute values into formulae			
Solve linear equations including those with unknown on both sides			

Rearranging & Quadratics	R	A	G
Change the subject of the formula with variable once			

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Change the subject of the formula with variable twice			
Factorise quadratic expressions including in the form of the difference of two squares			
Solve quadratic equations by factorising			
Solve quadratic equations using the formula			
Complete the Square			
Solve quadratic equations by completing the square			

Ratio	R	A	G
Work with fractions in ratio problems			
Express one quantity as a fraction of another			
Use ratio notation			
Divide a given quantity into two parts			
Combining ratios			
Changing ratios			

Scale diagrams & Bearings	R	A	G
Use the standard conventions for labelling and referring to the sides and angles of triangles			
Identify angles around a point, angles on a straight line, alternate angles, corresponding angles and supplementary angles			
Measure and draw accurately a 3 figure bearing			
Apply the properties of angles to bearings problems			
Apply scale factors to scale drawings including maps			