KESTEVEN AND SLEAFORD HIGH SCHOOL

Mathematics Scheme of Learning

Year 9 – Term 1/Expanding&Factorising/Solving Equations/Area&Perimeter

Intent – Rationale

Year 9 is the finale of KS3, where students must have secured knowledge up to Foundation GCSE to be prepared for Higher GCSE studies. Underpinning much of GCSE mathematics is algebraic methods so this begins term 1 in Y9, and this is then repeated, with deeper knowledge, at the beginning of the GCSE curriculum.

Sequencing – what prior learning does this topic build upon?	Sequencing – what subsequent learning does this topic feed into?
• Year 7 Term 1 Polygons • Year 7 Term 1 Area and perimeter • Year 7 Term 2 Algebraic expressions • Year 8 Term 1 Expressions and substitutions • Year 8 Term 1 Area and perimeter • Year 8 Term 2 Linear graphs • Year 8 Term 4 Forming and solving equations • Year 8 Term 6 Volume • Year 8 Term 6 Intro to factorising	• Year 9 Term 3 Substitution • Year 9 Term 4 Constructions • Year 9 Term 5 Volume and Surface Area • Year 10 Term 1 Basic algebra and linear equations • Year 10 Term 1 Rearranging and quadratics • Year 10 Term 3 Perimeter and area • Year 11 Term 1 Algebraic fractions • Year 11 Term 2 Volume
What are the links with other subjects in the curriculum?	**What are the links to SMSC, British Values and Careers?**
• Art - transformation/tessellation of shapes (Escher) • Design and Technology -calculating areas and perimeters for design/construction and transformations strands of shape, space and measures • English-etymology of word structure • Science -indices/use of known or given formulae	• Expanding and factorising/solving equations - SP2&3, C1/BV5/GB4efghi. The use of symbols to represent numbers, developing the understanding that a letter can represent any number. Draw students' attention to the roots of algebra in the Middle East and India. • Area and perimeter-SP2&3, C1/ GB4efghi - An introduction to Pi as an infinite number, link to its use in astronomy. Discussion of the independent discovery of Pi by various cultures and the

	work carrying on today across the globe investigating this fascinating ratio. SP2&3, C1 - An introduction to Pi as an infinite number, link to its use in astronomy. Discussion of the independent discovery of Pi by various cultures and the work carrying on today across the globe investigating this fascinating ratio.
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	• Ensure a clear understanding of algebraic manipulation and understanding of command words such as solve, expand, simplify. • Development of spatial awareness, including reflecting and rotating objects.

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Intent – Concepts

What knowledge will students gain and what skills will they develop as a consequence of this topic?
Know Use and interpret algebraic notation, including: ab in place of a × b,3y in place of y + y+ y and 3 × y, a^2 in place of a × a, a^3 in place of a × a × a; a^2b in place of a × a × b $\frac{a}{b}$ in place of a ÷b Recognise coefficients written as fractions rather than as decimals

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Brackets: simplify and manipulate algebraic expressions to maintain equivalence by: collecting like terms, multiplying a single term over a bracket , taking out common factors. Model situations or procedures by translating them into algebraic expression or formulae and by using graphs. Use algebraic methods to solve linear equations in one variable (including all forms that require rearrangement).

Identify an expression, equation, formula and identity. Factorise by common factors into a single bracket. Expand single and double brackets Factorise quadratic equations with coefficients of x^2.

Solve linear equations with brackets, fractions and unknowns on both sides.

Solve quadratic equations by factorising.

Know and use the formulae for area and perimeter of square, rectangle, parallelogram, trapezium, triangles and circles. Calculate the area and perimeter of compound shapes.

Apply

Form and solve linear and quadratic equations from a worded problem.

Link quadratic solutions with graphical form.

Use algebraic methods to solve area and perimeter problems.

Area and perimeter problems in context.

Extend

Solve simple algebraic fraction equations.

Solve quadratic equations with coefficient of x^2

Compound algebraic shape problems.

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What subject specific language will be used and developed in this topic?	What opportunities are available for assessing the progress of students?
Expression, identity, equation, formula, formulae, term, coefficient, expand, solve, factorise, simplify, collect like terms, linear, quadratic, factor, common, form, algebraic fraction, simplest form, variable, inverse Area, perimeter, compound, length, units, similar, exact answer, parallel, perpendicular, quadrilateral, polygon, square, rectangle, trapezium, circle, radius, diameter, arc, sector, segment, pi, composite	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. • Y9 Homework booklet which contains a mixture of retrieval questions, current topic questions and extension tasks via Intermediate Maths Challenge 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.

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	Assessment • Retrieval assessment will follow on from this with year group 'topic top up' identified in preparation for next term's teaching

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Intent – Concepts

Lesson title	Learning challenge	Higher level challenge	Suggested activities and resources
Expanding and Factorising Approx. 6 lessons	<u>Key Knowledge</u> Be able to factorise by common factors into a single bracket; ensure expression is fully factorised Know how to expand single (recap) and double brackets. Know how to factorise quadratic expressions in to two brackets. <u>Common Misconceptions</u> Pupils may interchange between adding and multiplying terms during the expansion process When collecting like terms pupils do not correctly calculate with directed numbers Once pupils have learnt the FOIL method they may incorrectly apply this to calculations such as	Factorising with fractions and decimals Expanding with fractions and decimals. Combining expanding single brackets. Can students recognise how this leads to "quicker" factorisation of $1x^2$ expressions? (find two factors that add to coefficient of x) 'Extension 9' Algebra A1.2	• Department PowerPoint and folder resources (to be adapted to reflect class requirements) • Simplifying expressions calculated colouring • Algebraic vocab calculated colouring • Expanding single brackets catchphrase • **FOIL as opposed to grid method should be used for expanding binomial expressions** • **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.**

	2(x+7) – 5(x-2) because there are two brackets		• Teaching can be adapted to focus on positive terms where appropriate Useful websites: Mathsbox Goteachmaths AccessMaths CorbettMaths MWB

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Solving Equations Approx. 7 lessons	<u>Key Knowledge</u> Solving linear equations, including with brackets Solving Quadratic equations with a coefficient of 1 of x^2 Forming and solving equations; students realising that the word *same* means they can set expressions = to form an equation. <u>Common Misconceptions</u> Pupils confusing order of operations in solving equations such as 2 +x/3 = 7 vs (2+x)/3=7 Only ever subtracting in order to balance equations rather than applying the inverse operation	Solving linear equations with fractions and decimals Solve quadratic equations with a coefficient of x^2, include negative terms. Quadratics in context - area	▪ Department PowerPoint and folder resources (to be adapted to reflect class requirements) ▪ Emphasise set = 0 when solving quadratic equations ▪ Refer back to Year 8 graphs as to why there are 2 solutions - starter with plotting quadratic graphs (Y10 progress to be proficient in linking up algebraic solutions with graphical representation) Useful websites: Mathsbox Goteachmaths AccessMaths CorbettMaths MWB

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Area & Perimeter Approx. 4 lessons	<u>Key Knowledge</u> Recap area of simple shapes (including circles) Area and Perimeter of compound shapes Working in reverse when area or perimeter is known. Solving algebraic problems (link back to previous topic of forming and solving) <u>Common Misconceptions</u> Confusion between formulae Forgetting to divide by two in finding area of a triangle Not using perpendicular height when calculating area of a triangle, parallelogram or trapezium	Lengths in different units eg m and cm. Area & Perimeter of circles in terms of π 'The National Curriculum…and beyond' pg90 'Extension 9' Geometry GM1.3 'Problem Solved! Book 3' Chapter 7 'The two shapes have the same area, what is the missing length of shape b?' 'Problem Solved! Book 3' Chapter 7 Algebra with area and perimeter worksheet Compound area problems Problem solving with shapes and algebra worksheet	▪ Department PowerPoint and folder resources (to be adapted to reflect class requirements) ▪ Algebraic problems - Goalless problems to increase confidence Useful websites: Mathsbox Goteachmaths AccessMaths CorbettMaths MWB

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Expanding and Factorising	R	A	G
Be able to factorise by common factors in to a single bracket			
Expand expressions with single brackets			
Expand expressions with double brackets			
Know how to factorise quadratic expressions into two brackets			

Equations	R	A	G
Solve linear equations, including those with brackets and fractions			
Know how to solve quadratic equations by factorising			
Form and solve equations from a written problem			

Area and Perimeter	R	A	G
Find the area and perimeter of simple shapes			
Find the area and perimeter of compound shapes			
Solve using algebraic methods area and perimeter problems			