Scheme of Learning: Year 8 Spring Term

Topic Sequence: Algebraic Techniques

7	8	9
Brackets, Equations and Inequalities	**Sequences**	**Indices**

Topic Overview:

Building on their understanding of equivalence from Year 7, students will explore expanding over a single bracket and factorising by taking out common factors. The higher strand will also explore expanding two binomials. All students will revisit and extend their knowledge of solving equations, now to include those brackets and for the higher strand, with unknowns on both sides. Bar models will be recommended as a tool to help students make sense of the maths. Students will also learn to solve formal inequalities for the first time, learning the meaning of a solution set and exploring the similarities and differences compared to solving equations. Emphasis is placed on both forming and solving equations rather than just looking at procedural methods of finding solutions.

Learning Sequence:

Form algebraic expressions This step revises the basic algebraic notation students have met in Year 7. Students may need reminding that × and ÷ signs should not appear in algebraic expressions, numbers are written before letters and that, for example aa is written a^2. Students could revisit the use of function machines and explore the use of algebraic expression within any other area that needs revising, for example probability.

Use directed number with algebra: This step revisits the use of directed number and substitution into algebraic expressions, both of which were covered in Year 7, in preparation for the more complex expressions coming up later in this block. Double-sided counters are very helpful to support understanding of the four operations with directed numbers. Entering negative numbers on a calculator in not always obvious and may need modelling by the teacher.

Multiply out a single bracket: It is useful to represent the expansion of brackets in many forms making links to number work in particular through the use of the area model. As well as including all combinations of **+** and **–** signs, examples should include those where the multiplier is a constant, for example just 5, a variable, for example just x or more complex, for example $3a$. Examples involving more than two terms inside the bracket are also useful to include.

Factorise into a single bracket; Students do not always link factorising expressions with looking for factors of numbers, so it is useful to be explicit about the similarities. This helps to reinforce the language of common factor and highest common factor, and these topics could be revisited during starters. When factorising into a single bracket, again using a variety of signs and types of terms (numerical, algebraic) is useful.

Expand multiple single brackeys and simplify: Students often only expand and simplify expressions of the form $3(x \pm 4) \pm 4(x \pm 5)$ and make errors with shorter expressions like $3 \pm 4(x \pm 5)$. Using concrete manipulatives to "build" the expressions is a useful way of developing understanding of the difference between similar looking expressions. Careful choice of numbers in examples and exercises, and varying numbers and signs is also helpful.

Solve equations, including with brackets: Solving one-step and two-step equations should be secure before moving on to working with equations with brackets. "Think of a number" problems are a good introduction, but students should also deal with equations with non-integer solutions (using a calculator when necessary) to avoid reliance on "spotting" solutions.

Form and solve equations with brackets: "Think of a number" problems and flowcharts are good models to support students to distinguish between, for example $2x + 3$ and $2(x + 3)$. It is worth investing class time developing students' skills in forming equations as the mechanics of solving can be more easily practised as homework. It is also useful to interleave other topics here, for example forming equations to find missing angles on a straight line, missing probabilities, etc.

Understand and solve simple inequalities: Students will be familiar with the inequality signs from earlier work on comparison, but solving inequalities and the idea of a solution set (as opposed to a single value) will be new to most. It is worth discussing that, for example $x > 7$ and $7 < x$ mean the same; reading the inequalities aloud is helpful in determining meaning. Students sometimes replace the given sign with an equals sign; this is error-prone and should be discouraged.

Form and solve inequalities: Teacher modelling is again important here, as students often find forming equations/inequalities from given information difficult; class time can be spent just forming the inequalities with the solving left to later in the lesson and/or homework. Consideration needs to be given as to whether the full solution set or only particular integers are required. It is also worth discussing which values could be chosen to test whether the solution set is correct.

Identify and use formulae, expressions, identities and equations: In this step, students have the opportunity to practice distinguishing between expressions, equations, formulas (or formulae) and identities. It is particularly important that students know that an identity is true for all values of the variable(s) and includes the symbol ≡, whereas an equation can be solved to find particular values. A formula is distinguished from an equation as it can be used to find particular values of the subject.

Sequence of Learning:

1	Form algebraic expressions
2	Use directed number with algebra
3	Multiply out a single bracket
4	Factorise into a single bracket
5	Expand multiple single brackets and simplify
6	Solve equations, including with brackets
7	Form and solve equations with brackets
8	Understand and solve simple inequalities
9	Form and solve inequalities
10	Identify and use formulae, expressions, identities and equations

Topic Resources:

Knowledge Maps:	Notation and manipulation Inequalities Solving linear equations

Assessment:

Knowledge:	End of Topic test
Application of Knowledge:	Termly mixed topic assessment

Supportive Reading:

Any supported reading listed here	Sparx Maths www.sparxmaths.co.uk
	Corbett Maths : www.corbettmaths.com
	AQA Revision Guide