| | Mathematics Curriculum – Year 8 | | | |
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| **Unit:** | **Proportional Reasoning- Ratio and scale** | **Proportional Reasoning- Multiplicative change** | **Proportional Reasoning- Multiplying and dividing fractions** | **Representations- Working in the Cartesian plane** |
| **Term:** | **Autumn 1: 3 Weeks** | **Autumn 1: 3 Weeks** | **Autumn 1: 1 Week/ Autumn 2: 2 Weeks** | **Autumn 2: 3 Weeks** |
| **What We Will Learn** | This unit focuses initially on the meaning of ratio and the various models that can be used to represent ratios. Based on this understanding, it moves on to sharing in a ratio given the whole or one of the parts, and how to use bar models to ensure the correct approach to solving a problem. After this we look at simplifying ratios, using previous answers to deepen the understanding of equivalent ratio rather than "cancelling" purely as a procedure. We also explore the links between ratio and fractions and understand and use pi as the ratio of the circumference of a circle to its diameter. | Students now work with the link between ratio and scaling, including the idea of direct proportion, linking various forms including graphs and using context such as conversion of currencies which provides rich opportunities for problem solving. Conversion graphs will be looked at in this block. Links are also made with maps and scales, and with the use of scale factors to find missing lengths in pairs of similar shapes. | Students will have had some experience of multiplying and dividing fractions in year 6; here we seek to deepen understanding by looking at multiple representations to see what underpins the algorithms. Multiplication and division by both integers and fractions are covered, with an emphasis on the understanding of the reciprocal and its uses. Links between fractions and decimals are also revisited.. | Building on their knowledge of coordinates from KS2, students will look formally at algebraic rules for straight lines, starting with lines parallel to the axes and moving on to the more general form. They can explore the notions of gradient and intercepts, but the focus at this stage is using the equations to produce lines rather than interpretation of m and c from a given equation. Use of technology to illustrate graphs should be embedded. Appreciating the similarities and differences between sequences, lists of coordinates and lines is another key point. |
| **What We Will Do** | Understand the meaning and representation of ratio. Understand and use ratio notation. Solve problems involving ratios of the form 1:n. Solve proportional problems involving the ration m:n. Divide a value into a given ratio. Express ratios in their simplest integer form. Compare ratios and related fractions. Understand pi as the ratio between diameter and circumference. Understand gradient of a line as a ratio | Solve problems involving direct proportion. Explore conversion graphs. Convert between currencies. Explore direct proportion graphs. Explore relationships between similar shapes. Understand scale factors as multiplicative representations. Draw and interpret scale diagrams. Interpret maps using scale factors and ratios | Represent multiplication of fractions. Multiply a fraction by an integer. Find the product of a pair of unit fractions. Find the product of a pair of any fractions. Divide an integer by a fraction. Divide a fraction by a unit fraction. Understand and use the reciprocal. Divide any pair of fractions. Multiply and divide improper and mixed fractions. Multiply and divide algebraic fractions | Work with coordinates in all four quadrants. Identify and draw lines that are parallel to the axis .Recognise and use the line y=x. Recognise and use the lines of the form y=kx. Link y=kx to direct proportion problems. Explore the gradient of the line y=kx. Recognise and use lines of the form y=x+a. Explore graphs with negative gradient (y=-kx, y=a-x, x+y=a). Link graphs to linear sequences. Plot graphs of the form y=mx+c. Explore nonlinear graphs. Find the midpoint of a line segment |
| **Skills Learned** | Make connections between number relationships, and their algebraic and graphical representations. Use scale factors, scale diagrams and maps. Understand that a multiplicative relationship between two quantities can be expresses as a ratio or a fraction. Divide a given quantity into two parts in a given part: part or part: whole ratio; express the division of a quantity into two parts as a ratio. Solve problems involving direct and inverse proportion. | Extend and formalise their knowledge of ratio and proportion in working with measures and in formulating proportional relations algebraically. Interpret when the structure of a numerical problem requires additive, multiplicative or proportional reasoning. Use scale factors, scale diagrams and maps. Solve problems involving direct and inverse proportion, including graphical and algebraic expressions. Move freely between different numerical, algebraic, graphical and diagrammatic representations. | Consolidate their numerical and mathematical capability from key stage 2 and extend their understanding of the number system and place value to include decimals and fractions. Select and use appropriate calculation strategies to solve increasingly complex problems/ Use the four operations, including formal written methods, applied to integers, decimals, proper and improper fractions, and mixed numbers, all both positive and negative. | Move freely between different numerical, algebraic, graphical and diagrammatic representations. Developed algebraic and graphical fluency, including understanding linear (and simple quadratic) functions. Make connections between number relationships, and their algebraic and graphical representations. Substitute numerical values into formulae and expressions. Recognise, sketch and produce graphs of linear functions of one variable with appropriate scaling, using equations in x and y and the Cartesian plane. |

| Unit: | Representations- Representing data | Representations- Tables and probability | Algebraic Techniques- Brackets, equations and inequalities | Algebraic Techniques- Sequences |
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| **Term:** | **Autumn 2: 2 Weeks / Spring 1: 2 Weeks** | **Spring 1: 2 Weeks** | **Spring 1: 1 week/ Spring 2: 3 Weeks** | **Spring 2: 1 Week** |
| **What We Will Learn** | Students are introduced formally to bivariate data and the idea of linear correlation. They extend their knowledge of graphs and charts from Key stage 2 to deal with both discrete and continuous data | This short block consolidates students of ideas of probability, in particular looking at sample spaces and the use of tables to represent these. | 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 with brackets and unknowns on both sides. Bar models will 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 rather than just looking at procedural methods of finding solutions. | This short block reinforces students' learning from the start of year 7, extending this to look at sequences with more complex algebraic rules now that students are more familiar with a wider range of notation. This block will include finding a rule for the nth term for a linear sequence, using objects and images to understand the meaning of the rule. |
| **What We Will Do** | Draw and interpret scatter graphs. Understand and describe linear correlation. Draw and use line of best fit. Identify nonlinear relationships Identify different types of data. Read and interpret ungrouped frequency tables. Read and interpret grouped frequency tables. Represent grouped discrete data. Represent continuous data grouped into equal classes. Represent data in two way table | Draw and interpret scatter graphs. Understand and describe linear correlation. Draw and use line of best fit Identify nonlinear relationships Identify different types of data. Read and interpret ungrouped frequency tables. Read and interpret grouped frequency tables. Represent grouped discrete data. Represent continuous data grouped into equal classes. Represent data in two way table | Form algebraic expressions. Use directed number with algebra. Multiply out a single bracket. Factorise into a single bracket. Expand multiple single brackets and simplify. Expand a pair of binomials. Solve equations, including with brackets. Form and solve equations with brackets. Understand and solve simple inequalities. Form and solve inequalities. Solve equations and inequalities with unknown on both sides. Form and solve equations and inequalities with unknown on both sides. Identify and use formulae, expressions, identities and equations | Generate sequences given a rule in words. Generate sequences given a simple algebraic form. Generate sequences given a complex algebraic rule. Find the rule for the nth term of a linear sequence |
| **Skills Learned** | Describe, interpret and compare observed distributions of a single variable through appropriate graphical representation involving discrete, continuous and grouped data. Construct and interpret appropriate tables, charts and diagrams, including frequency tables, bar charts, pie charts and pictograms for categorical data, vertical line (or bar) charts for ungrouped and grouped data. Describe simple mathematical relationships between two variables (bivariate data) in observational and experimental contexts and illustrate using scatter graphs. Use language and properties precisely to analyse probability and statistics. | Record, describe and analyse the frequency of outcomes of simple probability experiments involving randomness, fairness, equally and unequally likely outcomes, using appropriate language and the 0-1 probability scale. Generate theoretical sample spaces for single and combined events with equally likely, mutually exclusive outcomes and use these to calculate theoretical probabilities. Use language and properties precisely to analyse probability and statistics. | Identify variables and express relationships between variables algebraically. Begin to model situations mathematically and express the results using a range of formal mathematical representations. Substitute numerical values into formulae and expressions, including scientific formulae. Understand and use the concepts and vocabulary of expressions, equations, inequalities, terms and factors. Simplify and manipulate algebraic expressions to maintain equivalence by: collecting like terms, multiplying a single term over a bracket, taking out common factors and expanding products of two or more binomials. Understand and use standard mathematical formulae. Use algebraic methods to solve linear equations in one variable. | Generate terms of a sequence from either a term-to-term or a position-to-term rule. Recognise arithmetic sequences and find the nth term. Recognise geometric sequences and appreciate other sequences that arise. |

| Unit: | Algebraic techniques- Indices | Developing Number- Fractions and percentages | Developing Number- Standard index form | Developing Number- Number service |
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| **Term:** | **Summer 1: 2 Weeks** | **Summer 1 :4 Weeks** | **Summer 2: 4 Weeks** | **Summer 2: 4 Weeks** |
| **What We Will Learn** | Before exploring the ideas behind the addition and subtraction laws of indices, the groundwork is laid by making sure students are comfortable with expressions involving powers, and simplifying them. | This block focuses on the relationships between fractions and percentages, including decimal equivalents, and using these to work out percentage increase and decrease. Students also explore expressing one number as a fraction and percentage of another. Both calculator and non-calculator methods are developed throughout to support students to choose efficient methods. Financial maths is developed through the contexts of e.g. profit, loss and interest The higher strand also looks at finding the original value given a percentage or after a percentage change. | This block introduces standard form to students, building on earlier work from the indices topic earlier in the term. The use of context is important to help students make sense of the need for the notation and its uses. There is also a basic introduction to negative and fractional indices. | This block provides a timely opportunity to revisit a lot of basic skills in a wide variety of contexts. Estimation is a key focus and the use of mental strategies will therefore be embedded throughout. We will also use conversion of metric units to revisit multiplying and dividing by 10, 100 and 1000 in context. The higher strand will extend this to look at the conversion of area and volume units, as well as having an extra step on the use of error notation. We also look explicitly at solving problems using the time and calendar as this area is sometimes neglected leaving gaps in student knowledge. |
| **What We Will Do** | Adding and subtracting expressions with indices. Simplifying algebraic expression by multiplying indices. Simplifying algebraic expression by dividing indices. Using the addition law for indices. Using the addition and subtraction law for indices. Exploring powers of powers | Convert fluently between key fractions, decimals and percentages. Calculate key fractions, decimals and percentages of an amount without a calculator. Calculate fractions, decimals and percentages of an amount using calculator methods. Convert between decimals and percentages greater than 100%. Percentage decrease with a multiplier. Calculate percentage increase and decrease using multiplier. Express one number as a fraction or a percentage of another without a calculator. Express one number as a fraction or a percentage of another with a calculator. Work with percentage change. Choose appropriate methods to solve percentage problems. Find the original amount given the percentage less than 100%. Find the original amount given the percentage greater than 100%. Choose appropriate methods to solve complex percentage problems | Investigate positive powers of 10 Work with numbers greater than 1 in standard form Investigate negative powers of 10 Work with numbers between 0 and 1 in standard form Compare and order numbers in standard form Mentally calculate with numbers in standard form Add and subtract numbers in standard form Multiply and divide numbers in standard form Use a calculator to work with numbers in standard form Understand and use negative indices Understand and use fractional indices | Round numbers to power of 10, and 1 significant figure. Round numbers to a given number of decimal places. Estimate the answer to a calculation. Understand and use error interval notation. Calculate using the order of operations. Calculate with money. Convert metric units of weight and capacity. Convert metric units of area. Convert metric units of volume. Solve problems using time and calendar |
| **Skills Learned** | Use and interpret algebraic notation. Use language and properties precisely to analyse algebraic expressions. Begin to model situations mathematically and express the results using a range of formal mathematical representations. Substitute values in expressions, rearrange and simplify expressions, and solve equations. | develop their use of formal mathematical knowledge to interpret and solve problems, including in financial mathematics • work interchangeably with terminating decimals and their corresponding fractions • define percentage as 'number of parts per hundred', interpret percentages and percentage changes as a fraction or a decimal, interpret these multiplicatively, express one quantity as a percentage of another, compare two quantities using percentages, and work with percentages greater than 100% • interpret fractions and percentages as operators | use integer powers and associated real roots (square, cube and higher), recognise powers of 2, 3, 4, 5 and distinguish between exact representations of roots and their decimal approximations • interpret and compare numbers in standard form $A \times 10^n$ , $1 \leq A < 10$, where n is a positive or negative integer or zero | use standard units of mass, length, time, money and other measures, including with decimal quantities • round numbers and measures to an appropriate degree of accuracy [for example, to a number of decimal places or significant figures] • use approximation through rounding to estimate answers and calculate possible resulting errors expressed using inequality notation $a < x \leq b$ • use a calculator and other technologies to calculate results accurately and then interpret them appropriately |