KESTEVEN AND SLEAFORD HIGH SCHOOL

Mathematics Scheme of Learning

Year 8 – Term 2/Straight Line Graphs/Proportion/Fractions/Averages

Intent – Rationale

Students last term practised substituting into formulae and will use this knowledge to create a table of values to recap sketching linear graphs before progressing on to drawing quadratic curves. The understanding they gain from straight line graphs is used to recognise directly proportional relationships shown graphically. Fraction calculations are used across varying topics so a recap and use with mixed numbers is studied. Finally, this term students extend finding averages from raw data to find averages when collated in a frequency table.

Sequencing – what prior learning does this topic build upon?	Sequencing – what subsequent learning does this topic feed into?
• Year 7 Term 2 fraction calculations • Year 7 Term 4 coordinates • Year 7 Term 5 ratio and proportion • Year 7 Term 5 averages • Year 8 Term 1 expressions • Year 8 Term 1 graphs	• Year 8 Term 3 interpreting statistical graphs (fractions of amounts) • Year 9 Term 1 make links to quadratic graph when factorising and solving quadratics • Year 9 Term 4 straight line graphs • Year 9 Term 4 averages from grouped frequency table • Year 9 Term 6 proportion
What are the links with other subjects in the curriculum?	**What are the links to SMSC, British Values and Careers?**
Art and Design and Technology • Proportion – scale of objects/measurements • Unit value and placement Geography • Coordinates • Collecting, representing and interpreting data History • Handling, representing and interpreting data ICT • Graph plotting	• C2 - Equivalence of fractions, decimals and percentages and the validity of comparisons between them. Link to Food nutrition labelling and healthy eating. • GB4e - Solving real life problems, a chance to put new skills in to context and reflect on how mathematics is relevant to everyday life • GB4e - Use of statistics as a way of measuring and making sense of the world around us. • GB4e - Comparing data sets, using statistical data to make judgements

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Music • Equivalent fractions PE • Performance data • Mean, mode, median and range RE • Interpreting data Science • Continuous and discrete data • Types of graph • FDP • Manipulation of algebraic expressions	
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 Number Devil by Hans Magnus Enzensberger *Age 11+* The quirky and unusual story of a young boy who hates maths at school, but who discovers a new side to the subject when he meets an unusual mathematician in a dream. This book takes you on an adventure through creative mathematical thinking, with great illustrations along the way.	• Technique for drawing curved graphs, no feathering etc • Inverse proportion with real life problems e.g. more people less work each • Explore misconception that multiplying always makes bigger / makes smaller with fractions less than 1 • When calculating the mean from a frequency table, ensure we divide by frequency total not the number of categories in table

Mathematics Scheme of Learning
Year 8 – Term 1

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Intent – Concepts

<table>
<tr><th colspan="2">What knowledge will students gain and what skills will they develop as a consequence of this topic?</th></tr>
<tr><td colspan="2">
<u>National Curriculum Reference</u>
Drawing Straight line graphs. Find the equation of a straight line. Draw curved graphs. Use graphs in a real-life context.
Perform 4 operations applied to fractions (8.3) and to improper fractions and mixed numbers (8.4). Interpreting worded questions in order to determine which operation should be carried out. Finding fractions of amounts.
<u>Know</u>
Draw linear and quadratic graphs using a table of values. Draw a linear graph using the y intercept and gradient.
Calculate values in direct and inverse proportional relationships
Convert between any fraction, decimal and percentage. Add/Subtract fractions and mixed numbers with different denominators. Multiply fractions and mixed numbers using cancelling first. Divide an integer by fraction and two fractions.
State the median mode and range for raw data, calculate the mean. Collect data in an ungrouped frequency table. Find the mode, median mean and range from the table.
<u>Apply</u>
Draw and interpret real life graphs such as depth over time and conversion graphs
Recognise direct and inversely proportional relationships shown graphically
Fraction worded problems – recognising the operation required
Compare sets of data
<u>Extend</u>
Draw linear graphs with negative gradients. Find the equation of a straight line with fractional gradients. Draw quadratic graphs with positive and negative coefficients of x^2 for BIDMAS recap.
Add/Subtract/Multiply/Divide simple algebraic fractions (single term)
</td></tr>
<tr><th>What subject specific language will be used and developed in this topic?</th><th>What opportunities are available for assessing the progress of students?</th></tr>
<tr><td>

Linear equation, variable, constant, gradient, y-intercept, quadratic, average speed, distance-time graph, quadratic, cubic, table of values.
Direct proportion, proportional, formula, graph, inverse proportion
Reciprocal, unit fraction, divisor, equivalent, integer.

</td><td>

Mid-term target questions
End of half term assessment

Common Misconceptions:
</td></tr>
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• Mean, median, mode, range, consistency, measure of spread, averages, frequency, grouped, ungrouped, raw data, discrete, continuous.	• Students may view graphical and algebraic representations as unlinked • Viewing equations such as $y = 2x + 1$ as a procedure to be followed rather than a relationship between coordinates • Misconceptions around the use of algebraic notation • Confusing the equations of horizontal and vertical lines, again due to failure to view them as a relationship • Thinking that coordinates (for points on lines, and more broadly) can only take integer values • Being unable to identify, read or draw suitable scales for axes • Viewing proportion as unconnected to other areas of maths such as fractions • Having a less well developed understanding of multiplication causing difficulties with reasoning proportionally • Being unable to identify whether information relates to a whole or a part a given ratio • Insufficient knowledge of calculations with fractions • A lack of understanding of the concept of a fraction and its size leading to just adding or subtracting numerators and/or denominators • A lack of understanding of equivalent fractions leading to inefficient methods such as *always* 'cross-multiplying' • Confusing the procedures for using different operations with fractions • A lack of understanding of mixed number notation leading to difficulties with e.g. $3\frac{4}{5} + 5\frac{2}{3}$ and $6\frac{1}{9} - 3\frac{4}{7}$ • Confusing different measures of average • Thinking that the range is an average • Lack of conceptual understanding of averages and what they do and don't show, possibly due to lack of exposure to large sets of data • Not knowing what 'frequency' is

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Linear Graphs	R	A	G
Draw a linear graph using a table of values			
Draw a straight-line graph from the equation			
Draw and interpret real life graphs/conversion graphs			
Draw quadratic graphs using a table of values			

Proportion	R	A	G
Calculate values in a directly proportional relationship			
Calculate values in an inversely proportional relationship			
Recognise a direct or inversely proportional relationship shown graphically			

Fractions	R	A	G
Fractions, decimals, % conversions			
Equivalent fractions			
Adding and subtracting fractions (different denominators)			
Multiplying fractions and finding fractions of an amount			
Dividing fractions and dividing an integer by a fraction			

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Averages	R	A	G
Calculating the mean, median, mode and range of a set of numbers			
Comparing sets of data			
Finding averages from a frequency table			

Intent – Concepts

Lesson title	Learning challenge	Higher level challenge	Suggested activities and resources
Linear Graphs	Draw a linear graph using a table of values	Negative coefficients of x, not written in the form y=mx+c	Y8 Linear Graphs Notebook 'Extension 7' Algebra A4.1
	Draw a straight-line graph from the equation y=mx+c	Fractional gradients Rearrange linear equation to y=mx+c before drawing	'Extension 7' Algebra A4.1
	Draw and interpret real life graphs/conversion graphs		'Extension 8' Number N4.4
	Draw quadratic graphs using a table of values	Coefficient of x^2 for use of BIDMAS, negative coefficient of x^2. Draw a cubic using a table of values.	
Proportion	Calculate values in a directly proportional relationship		Matching cards activity - proportion Comparing using multiplicative relationships vertically and horizontally

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			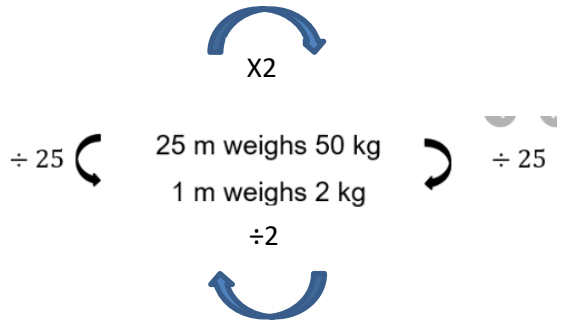 Y8 Proportion Notebook T:\Departments\Curriculum\Maths\2019-20\KS3\Year 8 resources\Term 2 resources\Proportion
	Calculate values in an inversely proportional relationship		Inverse operations
	Recognise a direct or inversely proportional relationship shown graphically		
Fractions	Fractions, decimal, % conversions		Y8 Fractions Notebook 'The National Curriculum…and beyond'pg171-176, pg186 and pg192-193 'Extension 8' pg 55-70 Fractions, decimals and %age conversions covered via remote learning in Y7.
	Equivalent fractions	Simple algebraic fractions – single term denominators 'Extension 9' Algebra A2.1	'The National Curriculum…and beyond' pg160-165
	Adding and subtracting fractions and mixed numbers	Simple algebraic fractions – single term denominators 'Extension 9' Algebra A2.1	

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	Multiplying fractions and finding fractions of an amount		Cancelling factors before multiplying
	Dividing fractions and dividing an integer by a fraction		Secure understanding of what dividing by a fraction means and eliminate misconception of dividing gets a smaller answer.
Averages	Calculating the mean, median, mode and range of a set of numbers	Calculating a missing data value when the mean has been adjusted Algebraic mean problems	Problem solve, eg find 5 numbers which have mode 7 and median 8 etc 1. http://nrich.maths.org/12810 - short problem on finding the numbers when given a mean. Y8 Averages Notebook 'The National Curriculum…and beyond' pg145-147 'Extension 8'-S2.2 Calculation of averages and range covered via remote learning in Y7.
	Comparing sets of data	'Problem Solved! Book 2' Chapter 10	Begin to compare with meaning not just using numerical values (in context, more consistent 'Extension 8'-S2.2 and S3.2 Year 7 work did not go this far.
	Finding averages from a frequency table	'The National Curriculum…and beyond' pg158	T:\Departments\Curriculum\Maths\2019-20\KS3\Year 8 resources\Term 2 resources\Averages\mean-from-frequency-tables (003).pptx Complete with Millionaire game at end of ppt 'The National Curriculum…and beyond' pg151-153 'Extension 8'-S3.2

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			Year 7 work did not go this far.
	Calculating the mean, median, mode and range of a set of numbers		'Extension 8'-S3.2