KESTEVEN AND SLEAFORD HIGH SCHOOL

Mathematics Scheme of Learning

Year 8 – Term 3/Angle facts/Bearings/Statistical graphs/%increase&decrease

Intent – Rationale

Angle facts is taught in preparation for bearings with a focus on language and real-life contexts being used alongside refinement of students' use of mathematical equipment. Year 8 students progress from calculating statistical averages to using them to make decisions and justify. Percentages of amounts is recapped in their interpreting of statistical graphs and leads in to calculator methods for % change with a focus on real life problems giving purpose.

Sequencing – what prior learning does this topic build upon?	Sequencing – what subsequent learning does this topic feed into?
• Year 7 Term 4 angles • Year 8 Term 3 use angle facts, Year 7 protractor use with angles • Year 7 Term 5 statistical diagrams • Year 7 Term 5 percentages	• Year 8 Term 5 angles in polygons • Year 8 Pythagoras problems • Year 9 Term 4 statistical diagrams • Year 9 Term 2 percentages
What are the links with other subjects in the curriculum?	**What are the links to SMSC, British Values and Careers?**
Design and Technology • Percentage calculations for product design and profit Geography • Map work – bearings • Analysing, collecting, representing, interpreting data History • Analysing and interpreting data Languages • Interpret and discuss results PE • Compass bearings RE • Analysing, collecting, representing, interpreting data	• SMSC (C) Work on angles lends itself to a look at the history of the development of measuring equipment and techniques and the importance of other cultures in this. • SMSC (C) History of the early beginnings of angle in Egypt the recognition of other powerful culture through the medium of mathematics • SMSC (SO) Work on percentages can lead to a discussion of money lending and rates of interest. • SMSC (SO) Using percentages in everyday life – link to banking and interest rates • GB4a)d)e)f)g)

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PSHE • Analysing, collecting, representing, interpreting data Science • Data handling • Percentage calculations	
What are the opportunities for developing literacy skills and developing learner confidence and enjoyment in reading?	**What are the opportunities for developing mathematical skills?**
Why do Buses Come in Threes? by Rob Eastaway and Jeremy Wyndham *Age 13+* With a foreword by Tim Rice, this book will change the way you see the world. Why is it better to buy a lottery ticket on a Friday? Why are showers always too hot or too cold? And what's the connection between a rugby player taking a conversion and a tourist trying to get the best photograph of Nelson's Column? These and many other fascinating questions are answered in this entertaining and highly informative book, which is ideal for anyone wanting to remind themselves - or discover for the first time - that maths is relevant to almost everything we do. Dating, cooking, travelling by car, gambling and even life-saving techniques have links with intriguing mathematical problems, as you will find explained here. Whether you have a PhD in astrophysics or haven't touched a maths problem since your school days, this book will give you a fresh understanding of the world around you.	• Use of mathematical equipment protractor and compass • New language introduced: depreciation, angle of elevation, comparing distributions

Mathematics Scheme of Learning

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Year 8 – Term 3

Intent – Concepts

What knowledge will students gain and what skills will they develop as a consequence of this topic?
National Curriculum reference • Identify and name all types of angles formed by parallel lines and a transversal. Use all known angle facts to calculate unknown angles, justifying reasons. Classify special quadrilaterals based on their properties. Find unknown angles using properties of quadrilaterals, e.g. that opposite angles in parallelograms are equal, or that the diagonals of a kite are perpendicular. Reason about what a shape must be from given angle properties, e.g. "My shape is a quadrilateral and the diagonals are perpendicular to each other, what could it be? What if the diagonals also bisect each other?" Solve problems using angles, including forming equations, e.g. the base angles of an isosceles triangle are x°, the other angle is twice as big, calculate the angles. Understand and use alternate and corresponding angles on parallel lines. Derive and use the sum of angles in a triangle (e.g. to deduce and use the angle sum in any polygon, and to derive properties of regular polygons). • Plot scatter graphs, including choosing appropriate scales, this should include graphs where variables take negative values e.g. temperature. Describe the correlation observed, and interpret this in the context of the data set e.g. 'the greater the… the lower the … Understand the difference between correlation and causation and that correlation refers to linear relationships; there may be a relationship between variables, but this does not necessarily equate to a correlation. Find (by eye) and use lines of best fit to interpolate for scatter graphs. Understand the risks of extrapolation **Know** To calculate angles in parallel lines. To know the geometric properties of quadrilaterals. To find missing angles in all types of triangles, quadrilaterals and parallel line problems using angle properties. To be able to draw and measure bearings. To draw a scatter diagram. To interpret and describe the relationship between two variables and identify correlation. To be able to draw a suitable line of best fit. To construct a pie chart. To be able to interpret a pie chart including calculating frequency of categories or population. To write one quantity as a percentage of another. To use multipliers to increase and decrease an amount. To work out a change in value as a percentage. **Apply**

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Bearings in context e.g. map work
To be able to estimate from a scatter graph and identify outliers, justifying why they are outliers.
Context problems including simple interest.

Extend

Use angle facts to sketch and solve bearing problems.
To understanding and explain misleading information in charts. To recognise when extrapolation occurs and its disadvantages. To be able to compare pie charts, recognising proportion and population is different.
Increase amounts by a percentage greater than 100% using a multiplier.

What subject specific language will be used and developed in this topic?	What opportunities are available for assessing the progress of students?
Degrees, right angle, acute angle, obtuse angle, reflex angle, vertically opposite, geometry, geometrical, parallel, alternate angles, corresponding angles, bearing, pie chart, total frequency, correlation, scatter graph, line of best fit, strong, weak, percentage, decrease, increase, profit, loss, compare, reverse, compound, multiplier, off, of, depreciate, appreciate, interest, tax, VAT, decay, Notation Dash notation to represent equal lengths in shapes and geometric diagrams Arrow notation to show parallel lines Bearings are always given as three figures; e.g. 025°	• End of half term test • Mid-term target questions • Show me a pair of alternate (corresponding) angles. And another. And another … • Jenny thinks that hexagons are the only polygon that tessellates. Do you agree? Explain your reasoning. • Convince me that the angles in a triangle total 180°. • Show me an example of a sketch where the bearing of A from B is between 90° and 180°. And another. And another • The bearing of A from B is 'x'. Find the bearing of B from A in terms of 'x'. Explain why this works. • Show me a scatter graph with positive (negative, no) correlation. And another. And another. • What's the same and what's different: scatter diagram, bar chart, pie chart? • Always/Sometimes/Never: A scatter graph shows correlation • Convince me that the multiplier for a 150% increase is 2.5

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	• Kenny buys a poncho in a 25% sale. The sale price is £40. Kenny thinks that the original is £50. Do you agree with Kenny? Explain your answer. • Jenny thinks that increasing an amount by 200% is the same as multiplying by 3. Do you agree with Jenny? Explain your answer. • **Misconceptions include:** • Some pupils may think that alternate and/or corresponding angles have a total of 180° rather than being equal. • Some pupils may think that the sum of the interior angles of an n-sided polygon can be calculated using Sum = n × 180°. • Use of non-mathematical language such as 'Z-angle' or 'F-angle' • Lack of awareness of labelling conventions such as arrows on parallel lines, hatch markings, ∠ABC and perpendicular markings • If the bearing of A from B is 'x', then some pupils may think that the bearing of B from A is '180 – x'. • The north elevation is the view of a shape from the north (the north face of the shape), not the view of the shape while facing north. • Being unable to read or choose an appropriate scale • Having difficulty viewing the graph dynamically, i.e. thinking about what happens as a variable varies • Having difficulty expressing correlations in context, particularly negative correlations • Confusing no correlation and negative correlation • Thinking that all lines of best fit must pass through the origin • Some pupils may confuse the fact that the sections of the pie chart total 100% and 360° • Not understanding that percent means out of 100

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	• Not understanding that fractions, decimals and percentages can all be equivalent • Failing to differentiate between 'of' and 'off' • Lack of contextual real-life understanding of e.g. 30% off or +VAT • Only being able to use one method to calculate percentages, e.g. an additive model • Some pupils may think that the multiplier for a 150% increase is 1.5 • Some pupils may think that increasing an amount by 200% is the same as doubling. Reverse percentage problems will not be studied in Year 8. A secure understanding of always multiplying by the multiplier for an increase or decrease should be gained this year in preparation.

Angles	R	A	G
To calculate angles in parallel lines			
To know the geometric properties of quadrilaterals			
To find missing angles in triangles, quadrilaterals and parallel line problems using angle properties.			
To draw and measure bearings			

Statistical graphs	R	A	G
To draw and interpret scatter graphs			

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To draw a line of best fit and interpret data			
To draw and interpret pie charts			
To interpret statistical diagrams including misleading charts			

Percentages	R	A	G
To write one quantity as a percentage of another			
To use a multiplier to calculate a percentage change			
To work out a change in value as a percentage increase or decrease			

Intent – Concepts

Lesson title	Learning challenge	Higher level challenge	Suggested activities and resources
Angles	To calculate angles in parallel lines	State reasonings using accurate language.	HRE Y8 Angles PPT
	To know the geometric properties of quadrilaterals	Quadrilateral flow diagram design	Shape sorter task, Completing Quadrilaterals http://nrich.maths.org/11234 SSI Sheet 4 Classifying Quadrilaterals
	To find missing angles in triangles, quadrilaterals and parallel line problems using angle properties.	Multistep problems Finding multiple methods of calculating the answer in multistep problems	'Show me two ways' – pupils must show workings of two methods to calculate answer of missing angle

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			T:\Departments\Curriculum\Maths\2019-20\KS3\Year 8 resources\Term 3 resources\Angles in parallel lines
	To draw and measure bearings	Find angles using angle facts (not measuring) Estimating angle/bearing size with justification. Discuss the accuracy and implications of incorrect estimations	Draw bearings e.g. dot to dot cat In context e.g. map work – check use of scales if scaled diagrams T:\Departments\Curriculum\Maths\2019-20\KS3\Year 8 resources\Term 3 resources\Angles in parallel lines
Statistical graphs	To draw and interpret scatter graphs		HRE Y8 Statistical Graphs PPT Matching activity
	To draw a line of best fit and interpret data	Extrapolation	Line of best fit comparisons
	To draw and interpret pie charts	Recognise the difference between proportion and population.	Covered via remote learning in Y7. More interpretation than drawing.
	To interpret statistical diagrams including misleading charts		
Percentages	To write one quantity as a percentage of another	Two/three step problems	HRE Y8 Percentages PPT
	To use a multiplier to calculate a percentage change	Multiplier for percentage change greater than 100%	Simple interest problems Student friendly contexts – sale shopping! When it is necessary to identify the type of percentage problem, many pupils will apply a method for a more simple percentage increase / decrease problem. If pupils use models (e.g. the bar model, or proportion tables) to represent all problems then they are less likely to make errors in identifying the type of problem. The bar model is a powerful strategy for pupils to 're-present' a problem involving percentage change. NCETM: The Bar Model (https://www.ncetm.org.uk/resources/44568)

			Only simple interest should be explored in this unit. Compound interest will be developed later. T:\Departments\Curriculum\Maths\2019-20\KS3\Year 8 resources\Term 3 resources\percentage stocks and shares Percentage increase and decrease covered via remote learning in Y7.
	To work out a change in value as a percentage increase or decrease		