CURRICULUM MAP FOR MATHEMATICS YEAR 9

HALF TERM 1:
Venn Diagrams and Data Analysis

Venn Diagrams

- Identify factors and multiples from a list.
- Understood what is meant by a prime number.
- List prime numbers and give an example to show a number is not prime.
- Express a number as a product of prime factors.
- *Write a product of prime factors in index notation.*
- ***Use a Venn diagram to find the HCF of two numbers by enumerating it with prime factors.***
- ***Use a Venn diagram to find the LCM of two numbers by enumerating it with prime factors.***
- Understand set notation for Venn diagrams (including listing elements of a set, *the union of sets, the intersection of sets and the empty set).*
- ***Understand the notation denoting the complement of a set and what regions of the Venn diagram this would include.***

Data Analysis

- Calculate measures of central tendency (mean, median and mode) from a list of numbers.
- Calculate a measure of spread (range) and identify outliers.
- ***Understand which measures of central tendency are affected by outliers and how this can skew data.***
- Find a missing value from a list when an average is given.
- When given the population mean and a sample mean, calculate the mean of the remaining data.
- Identify the mode from a frequency table.
- ***Identify the median from a frequency table.***
- *Calculate the mean from a frequency table.*
- Identify the modal class interval from a grouped frequency table.
- *Understand why we can only estimate the mean from a grouped frequency table.*
- *Calculate the estimate of the mean from a grouped frequency table.*
- ***Identify the class interval in which the median falls in a grouped frequency table.***
- Describe and compare distributions.
- Calculate the angle needed to represent a frequency in a pie chart.
- Accurately draw a pie chart from a frequency table.
- *Read and interpret proportions from a pie chart.*
- *Calculate frequencies from a pie chart when the total frequency is given.*
- Understand what is meant by the term bivariate data and how we can represent this graphically.
- Draw scatter graphs for bivariate data using appropriate scales.
- Identify the correlation on a scatter graph and understand what relationship this suggests between the two variables.
- Draw a line of best fit and use it for estimations (interpolation).

Opportunities for wider reading and key words:
Students will read worded problems – with pronunciation corrected when necessary.

Key words:
Prime
Product
HCF – highest common factor
LCM – lowest common multiple
Set
Universal set
Intersection
Union
Complement
Class interval
Bivariate
Correlation
Interpolation
Extrapolation

Opportunities for extended writing:
Students will complete a 'What a bad one looks like' known as WABOLL; an incorrectly answered question. Students are required to identify the misconceptions and provide a written explanation in their own words.

Students will be able to reason why a number is prime/coprime or neither referring to how many factors it has.

Students will be able to describe and compare distributions by referring to appropriate averages and spread.

Speak like an expert:
Students will be able to compare distributions and data sets. E.g. "On average the girls scored hisgher than the boys. This is because the mean for the boys was 35.5 and the girls' mean was 38.7. The girls also score more consistently as their range was 12 compared to the boys range of 18."

Homework, links to careers, personal development and other subjects:

Homework: Set weekly to revise key concepts covered.

Personal Development: Data presentation and analysis. Communication, critical-thinking, interpretation of results, logical reasoning and problem-solving.

Careers: Statistician, Data Scientist, Finance, Market and Scientific Research.

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- ***Understand the dangers of extrapolation.***

HALF TERM 2:
Algebraic Manipulation and Linear Graphs

Algebraic Manipulation

- Multiplying out a single bracket involving negative coefficients and laws of indices.
- Multiplying out double brackets (with a coefficient of 1 on the variables) and simplifying the resulting expression if possible.
- *Multiplying out double brackets involving coefficients greater than 1 on the variable.*
- *Multiplying out a bracket that is being squared.*
- ***Multiplying out three brackets and simplifying the resulting expression.***
- Factorise a quadratic expression into 2 brackets when the coefficient of x is 1 and all terms are positive.
- *Factorise a quadratic expression into 2 brackets when the coefficient of x is 1.*
- ***Factorise a quadratic expression into 2 brackets when the coefficient of x is greater than 1.***

Linear Graphs

- Plot a linear graph in the form y=mx+c (positive m) by creating a table of values.
- *Plot a linear graph in the form y=mx+c (negative m) by creating a table of values.*
- Check whether a co-ordinate lies on a line by using substitution.
- ***Plot a linear graph when given an equation that first needs rearranging.***
- Investigate the connection between the equation of a line and key points on the graph.
- Identify the gradient and y-intercept from the equation of a line.
- Identifying the y-intercept from a ready drawn graph.
- Calculating a positive gradient from a graph with a unit scale.
- *Calculating a negative gradient from a graph with a unit scale.*
- ***Calculating gradient from a graph with any scale.***
- ***Understanding that gradient is a rate of change***
- *Naming the equation on a given line on a co-ordinate grid.*

Links to other subjects: Science/Geography: Use of statistics to compare distributions and draw conclusions. Use of charts and diagrams to present information. IT: Use of Microsoft Excel to present data as charts, tables and diagrams.

Opportunities for wider reading and key words:
Students will read worded problems – with pronunciation corrected when necessary.

Key words:
Gradient
y-intercept

Opportunities for extended writing:
Students will complete a 'What a bad one looks like' known as WABOLL; an incorrectly answered question. Students are required to identify the misconceptions and provide a written explanation in their own words.

Speak like an expert:
Students will need to verbally explain key words and concepts. e.g.
"$(y+1)^2$ can't be $y^2 + 1$ because it means (y+1) multiplied by itself; (y+1)(y+1)."

Understanding the meaning of the coefficients in the equation $y = mx + c$. E.g " m represents the gradient and c represents the y axis intercept".

Homework, links to careers, personal development and other subjects:

Homework: Set weekly to revise key concepts covered.

Personal Development: Problem-solving, logical thinking, analytical skills, abstract thinking, mathematical fluency in foundation algebraic skills, graph plotting.

Careers: Engineering, Computer Science, Data Analysis, Mathematical Modelling, Finance.

Links to other subjects: Science: Gradient relating to rates of change. Algebraic manipulation skills. Geography: Linear graphs used to represent trends.

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HALF TERM 3:
Simultaneous Equations and Compound Measures

Simultaneous Equations

- Change the subject of an equation by rearranging.
- *Solve a pair of simultaneous equations by substitution when both equations have the same subject.*
- Solve a pair of simultaneous equations when they have a variable with the same coefficient by eliminating that variable.
- ***Solve a pair of simultaneous equations when they do not have a variable with the same coefficient by eliminating a variable.***
- *Form and solve a pair of simultaneous equations from a worded problem.*
- Understand that the co-ordinates of the point of intersection of two linear graphs are the solutions when solving the equations simultaneously.

Compound Measures

- Calculate speed, distance and time and use appropriate units for each.
- Model journeys graphically by creating distance time graphs.
- Identify stationary sections of journeys from a distance time graph.
- *Understand how we can represent a two-way journey on a distance time graph.*
- Read and interpret distance time graphs.
- *Understand that the gradient represents the rate of change of distance over time on a distance time graph, which is speed.*
- ***Have appreciation that the gradient on a distance time graph is an average speed and the actual speed of a journey may not have been constant.***
- ***Model journeys graphically by creating speed time graphs.***
- ***Understand that the gradient represents the rate of change of speed over time on a speed time graph, which is acceleration.***

Opportunities for wider reading and key words:
Students will read worded problems – with pronunciation corrected when necessary.

Key words:
Simultaneous
Stationary
Acceleration

Opportunities for extended writing:
Students will complete a 'What a bad one looks like' known as WABOLL; an incorrectly answered question. Students are required to identify the misconceptions and provide a written explanation in their own words.

Students will explain a journey displayed on a distance time graph using the correct mathematical language and calculations to support their description.

Speak like an expert:
Students will need to verbally explain key words and concepts. e.g." The first part of the journey had a faster speed because the gradient is more steep."

Homework, links to careers, personal development and other subjects:

Homework: Set weekly to revise key concepts covered.

Personal Development: Mathematical modelling, problem-solving, data analysis, analytical thinking skills, communication.

Careers: Engineering, Animation, Physics, Sport Science.

Links to other subjects: Computer Science: Solving simultaneous equations using matrices in further study. Science: Calculations involving compound measures (speed, distance, time) and presenting these as graphs.

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HALF TERM 4:
Graphs and Proportion

Graphs

- Plotting a quadratic graph from an equation by substituting positive integers into a table of values.
- Plotting a quadratic graph from an equation by substituting into a table of values.
- *Using a quadratic graph (ready drawn or once plotted) to find approximate solutions to equations including a* quadratic's roots.
- ***Check the validity of approximate solutions from graphs by substituting them into the equation being solved.***
- ***Plotting exponential graphs from an equation using a table of values.***
- ***Using ready draw exponential and reciprocal graphs to find approximate solutions to equations.***

Proportion

- Use simple direct proportion to find single amounts or a multiple of an amount.
- Understand the language of proportionality and how direct proportion can be written as a linear function once the "unit cost" has been calculated.
- *Refer to the "unit cost" as a constant of proportionality and denote it as k.*
- Write linear functions representing direct proportion.
- Use linear functions for direct proportion.
- Identify graphs representing direct proportion.
- ***Write linear functions for inverse proportion.***
- ***Use linear functions for inverse proportion.***
- ***Identify graphs representing inverse proportion.***

Opportunities for wider reading and key words:
Students will read worded problems – with pronunciation corrected when necessary.

Key words:
Quadratic
Exponential
Reciprocal
Direct proportion
Unit cost
Constant of proportionality
Inverse proportion

Opportunities for extended writing:
Students will complete a 'What a bad one looks like' known as WABOLL; an incorrectly answered question. Students are required to identify the misconceptions and provide a written explanation in their own words.

Students can justify why they think two things are in direct proportion or not. For example, "a taxi fare is not directly proportional to the distance travelled as when I enter the taxi there is already a charge and I havn't travelled anywhere."

Speak like an expert:
Students will need to explain the relationship between two variables that are in direct or inverse proportion. For example, what would you expect to happen to someones wages as they work more hours? What would you expect to happen to the time taken to complete a job if more people are working on it?

Homework, links to careers, personal development and other subjects:

Homework: Set weekly to revise key concepts covered.

Personal Development: Use of direct proportion to work with recipes and best buy calculations. E.g. *If I need 20g of butter for 10 people, how much butter will I need for 20 people?* Multiplicative thinking, problem-solving.

Careers: Engineering, Sports, Astronomy, Physics, Catering, Architecture, Fashion, Finance.

Links to other subjects: Hospitality: Proportion used in calculations with recipes. Science/Sport/Mechanics: Modeling the flight of a projectile using Quadratic equations.

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HALF TERM 5:
Right-Angled Triangles

Pythagoras

- Identify the hypotenuse of a right-angled triangle.
- Understand that the hypotenuse is always opposite the largest angle in the triangle; the right angle.
- Use Pythagoras' Theorem to calculate the length of a hypotenuse when given the length of the other two sides in the triangle.
- Use Pythagoras' Theorem to calculate a smaller side of a right-angled triangle.
- *Use Pythagoras' Theorem to check whether a triangle contains a right angle.*
- ***Use Pythagoras' Theorem to calculate the length of a line segment on a co-ordinate grid.***
- ***Model worded problems to apply Pythagoras' Theorem to.***

Trigonometry

- Identify the hypotenuse, opposite and adjacent sides in a right-angled triangle relative to a given angle.
- Understand that although the hypotenuse is always the longest side, the opposite and adjacent can move depending on which angle we are concerned with.
- Identify which trigonometric function can be used given the sides and/or angle that has been given.
- *Understand that each trigonometric function has an inverse, and are denoted as $\sin^{-1}$, $\cos^{-1}$ and $\tan^{-1}$.*
- Calculate a missing side in a right-angled triangle when given an angle and another side.
- *Calculate a missing angle in a right-angled triangle when given two sides.*
- ***Decide whether to use Pythagoras' Theorem or trigonometry for problems involving right-angled triangles.***
- ***Model worded problems to apply trigonometry to.***

Opportunities for wider reading and key words:
Students will read worded problems – with pronunciation corrected when necessary.

Key words:
Hypotenuse
Opposite
Adjacent
Trigonometric function

Opportunities for extended writing:
Students will complete a 'What a bad one looks like' known as WABOLL; an incorrectly answered question. Students are required to identify the misconceptions and provide a written explanation in their own words.

Speak like an expert:
Students will need to verbally explain key words and concepts. e.g. "this triangle doen't contain a right angle because when I square the two shorter sides and add them together it's not the same as the hypotenuse squared."

Students will need to describe Pythagoras' Theorem as "In a right-angled triangle, the sum of the squares of the shorter sides is equal to the square of the hypotenuse."

Homework, links to careers, personal development and other subjects:

Homework: Set weekly to revise key concepts covered.

Personal Development: Mathematical modelling, problem-solving, spatial reasoning and analytical thinking.

Careers: Engineering, Architecture, Surveying, Cartography, Astronomy, Fashion Design.

Links to other subjects: Science/Sport: Trigonometry used to work out distances and projectile motion.

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HALF TERM 6:
Accuracy and Bounds of Calculations

<u>Accuracy and Bounds of Calculations</u>

- Round decimals to a given number of decimal places.
- Round decimals and integers to a number of significant figures.
- *Understand the difference between rounding and truncating.*
- *Truncate decimals to a given number of decimal places.*
- ***Describe the benefits and drawbacks of truncating rather than rounding.***
- Use a number line find the upper bound of a number when rounded to a number of decimal places or significant figures.
- Use a number line find the lower bound of a number when rounded to a number of decimal places or significant figures.
- *Write the error interval for a rounded number as an inequality.*
- ***Calculate an upper or lower bound for a calculation.***
- Application to previously taught topics.

Opportunities for wider reading and key words:
Students will read worded problems – with pronunciation corrected when necessary.

Key words:
Truncate
Upper bound
Lower bound
Error interval

Opportunities for extended writing:
Students will complete a 'What a bad one looks like' known as WABOLL; an incorrectly answered question. Students are required to identify the misconceptions and provide a written explanation in their own words.

Speak like an expert:
Students will need to verbally explain key words and concepts. e.g. "2.56789 rounds to 2.6 to 1 dp but truncates to 2.5 to 1dp."

Homework, links to careers, personal development and other subjects:

Homework: Set weekly to revise key concepts covered.

Personal Development: Estimation, simplification of calculations, checking for the reliability of a result, precision and accuracy.

Careers: Construction, Finance, Healthcare, Interior Design.

Links to other subjects: Science: Rounding and estimation skills necessary. Error intervals calculated to evaluate accuracy of results.