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| Key stage 4 Curriculum map 2020-21 Subject: Maths | | | | | | |
| Year 10 | Half term 1  Sept – October | Half term 2  November – December | Half term 3  January - Feb | Half term 4  February – April | Half term 5  April - May | Half term 6  June - July |
| Weeks | 7 weeks | 7 weeks | 6 weeks | 6 weeks | 5 weeks | 7.5 weeks |
| **Modules** | Basic Number Work; Factors, Multiples and Primes; Fractions, Decimals and Percentages; Rounding and Estimation | Angles; Scale Diagrams and Bearings; Basic Algebra; Sequences; Solving Equations; Collecting data and Representing data | Perimeter and Area of 2D shapes (Including Circles); Properties of shapes; Co-ordinates and Linear Graphs; Ratio and Proportion | Indices: Standard Form; Probability Basics; Transformations | Congruence and Similarity; 2D representations of 3D shapes; Measures | Revision and Practice: **Functional Skills Level 1 Examinations**; Statistics; Constructions and Loci |
| **Key Learning questions and Intent** | **Key Learning**  We currently use AQA as our examination board so we follow their scheme of work which sets out all the learning objectives for each of the five key areas of learning in Mathematics. Due to the volume of key learning questions that would emerge from following our scheme of work and the National Curriculum these will not be fully detailed here but can be found on AQA’s website: <https://www.aqa.org.uk/subjects/mathematics> and on the Government website: <https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/331882/KS4_maths_PoS_FINAL_170714.pdf>  **Intent:**  Our main intention will be to ensure our students have the knowledge, skills and understanding to apply their learning to their lives in the future as well as to achieve a qualification in Maths (Entry Level, Functional Skills and GCSE).  Our course is based on an AQA specification in mathematics should enable our students to:   * develop fluent knowledge, skills and understanding of mathematical methods and concepts * acquire, select and apply mathematical techniques to solve problems * reason mathematically, make deductions and inferences and draw conclusions * comprehend, interpret and communicate mathematical information in a variety of forms appropriate to the information and context.   The national curriculum for mathematics aims to ensure that all pupils:   * become fluent in the fundamentals of mathematics, including through varied and frequent practice with increasingly complex problems over time, so that pupils develop conceptual understanding and the ability to recall and apply knowledge rapidly and accurately. * reason mathematically by following a line of enquiry, conjecturing relationships and generalisations, and developing an argument, justification or proof using mathematical language * can solve problems by applying their mathematics to a variety of routine and nonroutine problems with increasing sophistication, including breaking down problems into a series of simpler steps and persevering in seeking solutions. | | | | | |
| **Unit Names from AQA:** | N1, N2, N3, N14; N4, N5; N8; N10; N15, N16; R9, N12 | G1, G3; R2, G15; A1, N3, A3, A4; A23, A24, A25; A2, A17, S2, S4 | G12, G16, G17; G9, G18, N8; A8, G11, A9, A10, A14 R14, N11, R3, R4, R5, R6, R7, R8 | N6, N7; N2, N9; P1, P4, P7; G7, G24 | G5, G6, G19; G13; N16, G14, N13; R1, R11 | S1, S4, S5; G2 |
| **AQA Unit Awards Scheme** | Suitable Unit Awards will be selected throughout the year when our students have achieved the specific outcomes for these within their maths lessons. Students will then receive a certificate through AQA. | | | | | |
| **Off-site opportunity** | Visit to local shops to practice their mental maths and estimations skills when purchasing goods from a shop.  Look out for special offers such as 30% off and use their percentages skills to calculate how much they would now need to pay for an item. Calculate how much change they should be given after making a purchase. | Walk around the local community and identify angles and understand their importance in terms of stability of structures (for example in the local playground). Students can select an object or building they would like to produce a scale drawing of back in the classroom. | Make use of our surroundings and the building we use to calculate area’s and perimeters of our spaces. Look for shapes in our local environment and local building sites. | Visit to local DIY stores to identify mathematical transformations on wall-paper samples.  Generate a hypothesis about a topic area of their choice and test this out in the local community (for example: the most popular car colour in the area is black). (Probability) | Practice measuring skills and produce a 3D scale model of an object or a room from home (or other buildings). | Identify where Loci and Construction has been used to develop the built environment around us within the local area and beyond. |
| **Extended writing** | Students will be required to complete full written responses to contextual Maths questions within their classroom learning tasks and their final exams. Students should be able to communicate their responses fully to a mathematical problem in order to demonstrate the sequence they chose to solve the given problem. | | | | | |
| **Skills and Abilities** | The skills and abilities our students require to complete exams and create a solid foundation for their future will assess the following AOs (Assessment Outcomes) in the context of the content set out in the Subject content section on AQA’s website. These assessment objectives cover the entire maths curriculum.   * **AO1: Use and apply standard techniques**   Students should be able to:   * accurately recall facts, terminology and definitions * use and interpret notation correctly * accurately carry out routine procedures or set tasks requiring multi-step solutions.   **AO2: Reason, interpret and communicate mathematically**  Students should be able to:   * make deductions, inferences and draw conclusions from mathematical information * construct chains of reasoning to achieve a given result * interpret and communicate information accurately * present arguments and proofs * assess the validity of an argument and critically evaluate a given way of presenting information.   **AO3: Solve problems within mathematics and in other contexts**  Students should be able to:   * translate problems in mathematical or non-mathematical contexts into a process or a series of mathematical processes * make and use connections between different parts of mathematics * interpret results in the context of the given problem * evaluate methods used and results obtained * evaluate solutions to identify how they may have been affected by assumptions made.   We will also follow the National Curriculum guidance as set out below.  **National Curriculum**  Working mathematically through the mathematics content\*, students will be taught to:  **Develop fluency**   * consolidate their numerical and mathematical capability from key stage 3 (Year 7, 8 and 9) and extend their understanding of the number system to include powers, roots {**and fractional indices**} * select and use appropriate calculation strategies to solve increasingly complex problems, including exact calculations involving multiples of π {**and surds**}, use of standard form and application and interpretation of limits of accuracy * consolidate their algebraic capability from key stage 3 and extend their understanding of algebraic simplification and manipulation to include quadratic expressions, {**and expressions involving surds and algebraic fractions**} * extend fluency with expressions and equations from key stage 3, to include quadratic equations, simultaneous equations and inequalities * move freely between different numerical, algebraic, graphical and diagrammatic representations, including of linear, quadratic, reciprocal, {**exponential and trigonometric**} functions * use mathematical language and properties precisely.   **Reason mathematically**   * extend and formalise their knowledge of ratio and proportion, including trigonometric ratios, in working with measures and geometry, and in working with proportional relations algebraically and graphically * extend their ability to identify variables and express relations between variables algebraically and graphically * make and test conjectures about the generalisations that underlie patterns and relationships; look for proofs or counterexamples; begin to use algebra to support and construct arguments {**and proofs**} * reason deductively in geometry, number and algebra, including using geometrical constructions * interpret when the structure of a numerical problem requires additive, multiplicative or proportional reasoning * explore what can and cannot be inferred in statistical and probabilistic settings, and express their arguments formally * assess the validity of an argument and the accuracy of a given way of presenting information.   **Solve problems**   * develop their mathematical knowledge, in part through solving problems and evaluating the outcomes, including multi-step problems * develop their use of formal mathematical knowledge to interpret and solve problems, including in financial contexts * make and use connections between different parts of mathematics to solve problems * model situations mathematically and express the results using a range of formal mathematical representations, reflecting on how their solutions may have been affected by any modelling assumptions * select appropriate concepts, methods and techniques to apply to unfamiliar and nonroutine problems; interpret their solution in the context of the given problem.   Our students will also be expected to develop the skills of using and applying a variety of mathematical instruments such as a ruler, protractor, compasses and a scientific calculator to be able to complete specific mathematical questions across all topic areas. | | | | | |
| **Assessment**  **End of module and Impact** | Students’ assessments at the end of each module will be in the form of exam style questions on the topic areas that have been covered (this will also include prior knowledge) Summary sheets outlining outcomes achieved and evidence of students work in books/folders/posters will then inform future planning and highlight any gaps in their learning that may have occurred due to absence.  The impact of knowing the learning that has taken place and the areas still to develop with help develop our students knowledge, understanding and skills that are required for their future exams and life skills, as well as inform the planning of revision sessions and future teaching. | | | | | |
| **Celebration of Achievement:** | To celebrate our students achievements we will display their work in the school setting; students can obtain Unit awards with AQA and receive certificates for units they have achieved; we will send home regular reports on students’ progress and attainment; positive phone calls will be made home to ensure parents/carers and our students are made aware of how proud we are of what they are achieving; we currently run a points reward system that results in our students receiving vouchers to spend at the end of each term (two half terms) to celebrate their success in school. | | | | | |
| **PD passport** | TBC | TBC | TBC | TBC | TBC | TBC |

**\* National Curriculum**

**Subject content**

Note: additional mathematical content to be taught to more highly attaining pupils, in **bold** type and braces { } is used to show .

**Number**

In addition to consolidating subject content from key stage 3, pupils should be taught to:

* apply systematic listing strategies, {**including use of the product rule for counting**}
* {**estimate powers and roots of any given positive number**}
* calculate with roots, and with integer {**and fractional**} indices
* calculate exactly with fractions, {surds} and multiples of π; {**simplify surd expressions involving squares** [for example √12 = √4 x √3 which also = √4x3 = 2√3 ] **and rationalise denominators**}
* calculate with numbers in standard form A 10n, where 1 ≤ A < 10 and n is an integer
* {**change recurring decimals into their corresponding fractions and vice versa**}
* identify and work with fractions in ratio problems
* apply and interpret limits of accuracy when rounding or truncating, {**including upper and lower bounds**}.

**Algebra**

In addition to consolidating subject content from key stage 3, pupils should be taught to:

• simplify and manipulate algebraic expressions (including those involving surds {and algebraic fractions}) by:

* factorising quadratic expressions of the form 2 ++ x bx c2 ax bx c ++ , including the difference of two squares; {factorising quadratic expressions of the form }
* simplifying expressions involving sums, products and powers, including the laws of indices  know the difference between an equation and an identity; argue mathematically to show algebraic expressions are equivalent, and use algebra to support and construct arguments {and proofs}  where appropriate, interpret simple expressions as functions with inputs and outputs; {interpret the reverse process as the ‘inverse function’; interpret the succession of two functions as a ‘composite function’}
* use the form = + y mx c to identify parallel {and perpendicular} lines; find the equation of the line through two given points, or through one point with a given gradient
* identify and interpret roots, intercepts and turning points of quadratic functions graphically; deduce roots algebraically {and turning points by completing the square}
* recognise, sketch and interpret graphs of linear functions, quadratic functions, simple cubic functions, the reciprocal function 1 =y xcos yx = with x ≠ 0, {the exponential function x yk = sin yx = for positive values of k, and the trigonometric functions (with arguments in degrees) , and tanyx = for angles of any size}
* {sketch translations and reflections of the graph of a given function}
* plot and interpret graphs (including reciprocal graphs {and exponential graphs}) and graphs of non-standard functions in real contexts, to find approximate solutions to problems such as simple kinematic problems involving distance, speed and acceleration
* {calculate or estimate gradients of graphs and areas under graphs (including quadratic and other non-linear graphs), and interpret results in cases such as distance-time graphs, velocity-time graphs and graphs in financial contexts}
* {recognise and use the equation of a circle with centre at the origin; find the equation of a tangent to a circle at a given point}
* solve quadratic equations {including those that require rearrangement} algebraically by factorising, {by completing the square and by using the quadratic formula}; find approximate solutions using a graph
* solve two simultaneous equations in two variables (linear/linear {or linear/quadratic}) algebraically; find approximate solutions using a graph
* {find approximate solutions to equations numerically using iteration}
* translate simple situations or procedures into algebraic expressions or formulae; derive an equation (or two simultaneous equations), solve the equation(s) and interpret the solution
* solve linear inequalities in one {or two} variable{s}, {and quadratic inequalities in one variable}; represent the solution set on a number line, {using set notation and on a graph}
* recognise and use sequences of triangular, square and cube numbers, simple arithmetic progressions, Fibonacci type sequences, quadratic sequences, and simple geometric progressions (r n where n is an integer, and r is a positive rational number {or a surd}) {and other sequences}
* deduce expressions to calculate the nth term of linear {and quadratic} sequences.

**Ratio, proportion and rates of change**

In addition to consolidating subject content from key stage 3, pupils should be taught to:

* compare lengths, areas and volumes using ratio notation and/or scale factors; make links to similarity (including trigonometric ratios)
* convert between related compound units (speed, rates of pay, prices, density, pressure) in numerical and algebraic contexts
* understand that X is inversely proportional to Y is equivalent to X is proportional to 1/Y; {construct and} interpret equations that describe direct and inverse proportion
* interpret the gradient of a straight-line graph as a rate of change; recognise and interpret graphs that illustrate direct and inverse proportion
* {interpret the gradient at a point on a curve as the instantaneous rate of change; apply the concepts of instantaneous and average rate of change (gradients of tangents and chords) in numerical, algebraic and graphical contexts}
* set up, solve and interpret the answers in growth and decay problems, including compound interest {and work with general iterative processes}.

**Geometry and measures**

In addition to consolidating subject content from key stage 3, pupils should be taught to:

* interpret and use fractional {and negative} scale factors for enlargements
* {describe the changes and invariance achieved by combinations of rotations, reflections and translations}
* identify and apply circle definitions and properties, including: centre, radius, chord, diameter, circumference, tangent, arc, sector and segment
* {apply and prove the standard circle theorems concerning angles, radii, tangents and chords, and use them to prove related results}
* construct and interpret plans and elevations of 3D shapes
* interpret and use bearings
* calculate arc lengths, angles and areas of sectors of circles
* calculate surface areas and volumes of spheres, pyramids, cones and composite solids
* apply the concepts of congruence and similarity, including the relationships between lengths, {areas and volumes} in similar figures
* apply Pythagoras’ Theorem and trigonometric ratios to find angles and lengths in right-angled triangles {and, where possible, general triangles} in two {and three} dimensional figures
* know the exact values of sin cos θθ and 000 0 , 30 , 45 60 θ = 0 and sin sin sin abc ABC = = for 0 00 0 0 , 30 , 45 , 60 90 θ = 0 and ; know the exact value of tan θ a2 = b22 +− c 2bccosA 1 Area = sin 2 ab C for
* {**know and apply the sine rule, , and cosine rule, , to find unknown lengths and angles**}
* {**know and apply to calculate the area, sides or angles of any triangle**}
* describe translations as 2D vectors
* apply addition and subtraction of vectors, multiplication of vectors by a scalar, and diagrammatic and column representations of vectors; {**use vectors to construct geometric arguments and proofs**}.

**Probability**

In addition to consolidating subject content from key stage 3, pupils should be taught to:

* apply the property that the probabilities of an exhaustive set of mutually exclusive events sum to one
* use a probability model to predict the outcomes of future experiments; understand that empirical unbiased samples tend towards theoretical probability distributions, with increasing sample size
* calculate the probability of independent and dependent combined events, including using tree diagrams and other representations, and know the underlying assumptions
* {calculate and interpret conditional probabilities through representation using expected frequencies with two-way tables, tree diagrams and Venn diagrams}.

**Statistics**

In addition to consolidating subject content from key stage 3, pupils should be taught to:

* infer properties of populations or distributions from a sample, whilst knowing the limitations of sampling
* interpret and construct tables and line graphs for time series data
* {**construct and interpret diagrams for grouped discrete data and continuous data, i.e. histograms with equal and unequal class intervals and cumulative frequency graphs, and know their appropriate use**}
* interpret, analyse and compare the distributions of data sets from univariate empirical distributions through:
  + appropriate graphical representation involving discrete, continuous and grouped data, {**including box plots**}
  + appropriate measures of central tendency (including modal class) and spread {**including quartiles and inter-quartile range**}
* apply statistics to describe a population
* use and interpret scatter graphs of bivariate data; recognise correlation and know that it does not indicate causation; draw estimated lines of best fit; make predictions; interpolate and extrapolate apparent trends whilst knowing the dangers of so doing.