



Mathematics

At Alamiyah the study of Mathematics is approached using a structured, step by step approach which focuses on building understanding through three main strands of Number and Algebra, Geometry and Statistics. The approach moves gradually from concrete experience of number towards abstraction when pupils are ready to transition.

The curriculum plan contained in this document is aimed at the 9-11 age group covering upper primary. Number work including counting, place value, the four operations and mental arithmetic are a mainly covered in lower and middle primary. Fractions are part of the lower/middle primary whilst the in depth study of fractions, decimals and percentages and ratio continues in upper primary. The foundations of the geometry curriculum are laid in lower/middle primary and a more complete study is undertaken in upper primary including area, volume and congruence, similarity and equivalence. The study of measurement is started in lower and middle primary but is formalised and treated in detail in upper primary and in later Science, Geography and History. Statistics is presented and taught within Mathematics and also in context within other subjects as a tool to record, display and analyse data. It is therefore applied through other curriculum subjects such as Science, Geography and History. The Upper Primary Mathematics curriculum will introduce basic Logic and Algebra.

Mathematics Long Term Curriculum Plan

Number: Place Value, Parts of a Whole, Four Operations, Factors, Multiples, Powers Negative No.s, Algebra

Area	Topic	Recommended Age/stage
Place Value upto and beyond 1 million	<p>Consolidate the reading, writing and ordering of numbers up to and beyond 10 000 000 understanding the place value of each digit</p> <p>Count forwards or backwards in steps of powers of 10 for any number upto 10 000 000</p> <p>Solve number problems involving large numbers, including problems using the four operations and stating why the calculation was used</p>	9-11 Year 5-6



Rounding and Approximation	<p>Round any number upto 1 000 000 to the nearest 10, 100, 1000, 10 000 or 100 000</p> <p>Use rounding to check answers to calculations and determine, in the context of a problem levels of accuracy</p>	9-11 Year 5-6
Written Numerals	<p>Explore a variety of written numerals including the origin of Hindi and Roman Numerals.</p> <p>Learn Arabic Numerals and how to read numbers upto 1 000 000</p> <p>Learn to read Roman Numerals to 1000 (M) and recognise years written in Roman Numerals</p>	9-11 Year 5-6
The Power of Numbers	<p>The Classes of Numbers</p> <p>Formation of Powers</p>	9-11 Year 5-6
Number Bases	<p>Explore bases upto 9 and their place value systems e.g. Base 2 and base 16 - Computing</p> <p>Explore bases and number systems used in other cultures e.g. Base 60 - Babylonian Mathematics</p>	9-11 Year 5-6
Multiples	<p>Concept of Multiples</p> <p>Table of Multiples</p> <p>Prime Numbers and Composite Numbers</p> <p>The Sieve of Aratosthenes</p> <p>Lowest Common Multiple (LCM)</p> <p>Highest Common Factor (HCF) Research on Peg Board</p> <p>Using Set Theory to find LCM and HCF</p> <p>Factors and Prime factors in Factor Trees</p>	9-11 Year 5-6



	<p>Prime Factors including Computing sets of Prime Factors and writing Prime Factors as Powers</p> <p>Abstracting Rules for finding LCM and HCF</p>	
Divisibility	<p>Divisibility by two</p> <p>Divisibility by four</p> <p>Divisibility by five</p> <p>Divisibility by twenty-five</p> <p>Divisibility by nine</p> <p>Divisibility by nine, considering nine as ten minus one</p> <p>Divisibility by nine, considering ten as nine plus one</p> <p>The Proof of nine in subtraction</p>	<p>9-11</p> <p>Year 5-6</p>
Squaring and Algebra	<p>Activities for the memorisation of multiplication</p> <p>The square of the binomial with the ten-square</p> <p>The square of the binomial with the graph paper</p> <p>The square of the binomial using letters in place of numerals with the ten-square</p> <p>The square of the binomial using letters in place of numerals with graph paper</p> <p>The square of the trinomial with the ten-square</p> <p>The square of the trinomial with the graph paper</p> <p>The square of the trinomial using letters in place of numerals with the ten-square</p> <p>The square of the trinomial using letters in place of numerals with graph paper</p> <p>Passage from one square to a successive square with bead bars</p> <p>Passage from one square to a successive square with graph paper</p> <p>Passage from one square to a successive square using letters in place of numerals with bead bars</p>	<p>9-11</p> <p>Year 5-6</p>



	<p>Passage from one square to a successive square using letters in place of numerals with graph paper</p> <p>Passage from one square to a non-successive square with bead bars</p> <p>Passage from one square to a non-successive square with graph paper</p> <p>Passage from one square to a non-successive square using letters in place of numerals with bead bars</p> <p>Passage from one square to a non-successive square using letters in place of numerals with graph paper</p> <p>Passage from one square to a non-successive square greater than ten with bead bars</p> <p>Binomials with four different factors using bead bars</p> <p>Binomials with four different factors using graph paper</p> <p>Binomials with four different factors using letters in place of numerals with bead bars</p> <p>Multiplication of binomials greater than ten with bead bars</p> <p>Multiplication of binomials greater than ten with graph paper</p> <p>Squaring of binomials greater than ten with bead bars</p> <p>Squaring of binomials greater than ten with graph paper</p> <p>From the real square root to the symbolic square with the peg board</p> <p>Squaring of binomials with the peg board</p> <p>The algebraic binomial on the peg board</p> <p>Squaring of trinomials with the peg board</p> <p>The square guides (binomial and trinomial guides)</p>	
Square Root	<p>Concept of the square root</p> <p>Square constructed of units only</p> <p>Further exercises for the concept of the square root</p> <p>From the symbolic square root to its side</p> <p>Finding the side of the square using golden bead material</p> <p>Square root with hierarchical materials</p>	<p>9-11</p> <p>Year 5-6</p>



	<p>Confirmation of the square by the last digit</p> <p>Square root the writing</p> <p>Square root of a quadrinomial</p> <p>Abstraction in square root: the angular layout</p> <p>Particular cases of square root</p> <p>From a special square to its root</p> <p>A Trinomial</p> <p>A Trinomial with a Zero</p> <p>Square Root of 41,209</p> <p>Another Special Case</p> <p>Square Root of 52,900</p>	
Addition and Subtraction	Add and subtract whole numbers with more than 4 digits using formal written methods including columnar addition and subtraction	9-11 Year 5-6
Multiplication and Division	<p>Multiply and Divide large numbers upto 6 digits by a 2 or 3 digit number using a formal written method including long multiplication or division</p> <p>Interpret Remainders appropriately for the context.</p> <p>Multiply and Divide whole numbers and those involving decimals by 10, 100 and 1000 (upto 100 000 as an extension)</p>	9-11 Year 5-6
Mental Arithmetic	Use the four operations to perform mental arithmetic using increasingly large numbers	9-11 Year 5-6
Negative Numbers	<p>Understand the position of Negative Numbers and their value in the contexts in which they are used such as temperature</p> <p>Introduction to the Negative Number Line</p>	9-11 Year 5-6



	Simple Addition and Subtraction of Negative Numbers where a positive number is subtracted from or added to either a positive or negative number. e.g. $1-8$, $-5-8$, $-9+6$	
Decimals - Parts of a whole and place value	<p>Numeration</p> <p>The Concept of Decimal Numbers</p> <p>First Presentation of the Symbols</p> <p>The Decimal Materials</p> <p>Formation and Reading of Quantities (numbers)</p> <p>Second Presentation of the Symbols</p> <p>Formation and Reading of the Symbols</p> <p>Visual Aids to Emphasize the Centrality of the Unit</p> <p>Union of Quantity (number) and Symbol</p> <p>Games With the Quantities and Symbols</p> <p>Activities to Reinforce the Concepts of Numeration Parallel</p> <p>Analysis of Whole and Decimal Number</p> <p>Comparing and Ordering Decimal Numbers in Order of Size</p>	9-11 Year 5-6
Operations With the Decimals	<p>Addition</p> <p>Subtraction</p> <p>Rounding Off Decimal Numbers to the Nearest Tenth</p> <p>Rounding Off Decimal Numbers to the Nearest Hundredth</p> <p>Rounding Off Decimal Numbers to the Nearest Thousandth</p> <p>The Changing of Ordinary Fractions to Decimal 33</p> <p>Multiplication With Decimal Numbers: Powers of Ten</p> <p>Multiplication With Decimal Numbers: the Three Types</p> <p>The Decimal Checkerboard</p> <p>a. Building the Decimal Checkerboard</p> <p>b. Exploration of the Decimal Checkerboard</p> <p>c. Multiplication on the Decimal Checkerboard</p> <p>Division With Decimal Numbers</p>	9-11 Year 5-6



Fractions	<p>Equivalence</p> <p>addition of Fractions With the Same Denominator</p> <p>addition of Fractions With the Same Denominator: Summing to More Than One Whole</p> <p>addition of Fractions With the Same Denominator Subtraction of Fractions With the Same Denominator</p> <p>subtraction of Fractions With the Same Denominator</p> <p>multiplication of Fractions by a Whole Number</p> <p>multiplication of Fractions by a Whole Number: Product Requires Equivalence</p> <p>multiplication of Fractions by a Whole Number: Product Requires More Than One Whole</p> <p>multiplication of Fractions by a Whole Number (second Level):</p> <p>Division of Fractions by a Whole Number</p> <p>division of Fractions by a Whole Number (second Level):</p>	9-11 Year 5-6
Types of Fractions	<p>Writing Fractions in Lowest Terms</p> <p>Adding Fractions With Unlike Denominators: Four Cases</p> <p>Adding Fractions With Unlike Denominators: Graph Paper</p> <p>Adding Fractions With Unlike Denominators: Mixed Numbers</p> <p>Subtracting Fractions With Unlike Denominators</p> <p>Subtracting Fractions With Unlike Denominators: Mixed Numbers</p> <p>Subtracting Fractions With Unlike Denominators: Mixed Numbers: Special Cases</p> <p>Adding and Subtracting Fractions With Unlike Denominators: passage to Abstraction</p> <p>Comparing and Ordering Fractions</p> <p>Comparing Fractions Abstractly</p> <p>Multiplication of a Whole Number by a Fraction</p> <p>Multiplication of a Fraction by a Fraction</p> <p>Graphic Method of Multiplying a Fraction by a Fraction</p> <p>Factoring in Multiplying a Fraction by a Fraction</p>	9-11 Year 5-6



	Multiplying Mixed Numbers Reciprocals Dividing a Whole Number by a Fraction Dividing a Fraction by a Fraction	
Percentages	Basic percentages as a fraction out of 100 Common equivalence of fractions, decimals and percentages Finding a percentage from a ratio or fraction	9-11 Year 5-6
Cross Multiplication	Review of the Checkerboard Checkerboard and Chart First, Second and Final Passage Abstract (No Checkerboard)	9-11 Year 5-6
Ratio and Proportion	Understand simple ratios of A to B of A+B items (e.g. Ratio of Blue to Red Marbles) Understand simple proportion (e.g. The number of Blue Marbles out of the total number of marbles as a fraction) Finding Percentage/Fractional amounts (e.g. One third of 36, of 24% of £500) Percentages and fractions for comparison Simple Enlargement and Reduction: Scaling of Measurements Using simple rates of change Solving problems of unequal sharing using ratios	9-11 Year 5-6
Simple Algebra	Learn the Rules of Algebra Use Simple Formulae Introduction to Simple Equations Express Missing Number Problems Algebraically	9-11 Year 5-6



Number Patterns and Sequences	<p>Explore patterns within number sequences including those involving fractions and decimals</p> <p>Recognise and describe linear number sequences through finding the term to term rule</p> <p>Generate and describe linear number sequences</p>	9-11 Year 5-6
Graphs - Cartesian Coordinates	<p>Learn about the Coordinate Grid in one and four Quadrants, Axes, and the Origin</p> <p>Draw a Coordinate Grid, marking Axes and the Origin</p> <p>Learn how to use coordinates to mark an X,Y point</p> <p>Describe positions on the full coordinate grid (All four quadrants) Use a game like Mathematical Battleships</p> <p>Drawing a shape using cartesian coordinates</p>	9-11 Year 5-6

Geometry: Length, Area, Volume, Solids, Shapes, Congruence, Construction, Measurement, Transformations

Area	Topic	Recommended Age and Stage
Calculating Area	<p>The Study of the Area of the Rectangle</p> <p>The Study of the Area of the Parallelogram</p> <p>The Study of the Area of the Triangle</p> <p>The Study of the Area of the Square</p> <p>The Study of the Area of the Rhombus</p> <p>Finding the Area of the Rhombus With Known Diagonals</p> <p>Area of the Rhombus Using Insets</p> <p>Equivalence in Modern Geometry Texts: Trapezoid</p> <p>The Study of the Area of the Trapezoid</p> <p>The Study of the Area of Regular Polygons</p> <p>The Study of the Area of Irregular Polygons</p> <p>The Study of the Area of a Circle: Measurement of the Circumference of a Circle, Area of the Circle, Sector of the Circle, Area of the Circle Working from the Sector</p>	9-11 Year 5-6



Perimeter	<p>Exploring Perimeters of Shapes using materials - string/scissors</p> <p>Exploring issues of Accuracy</p> <p>Measuring the Perimeter of Rectangles, Squares and irregular Rectilinear Shapes in cm, m</p> <p>Understand that shapes with the same area can have different perimeters</p> <p>Calculating the Perimeter of any Shape</p>	9-11 Year 5-6
Volume	<p>Revision of Names of Solids</p> <p>Making Solids - Using Nets of Solids</p> <p>Exploring the Volume of Solids - Practical using hollow solids and water to understand capacity.</p> <p>Use of ml to measure volume.</p> <p>Convert ml to l and l to ml.</p> <p>Estimating the Capacity and Volume of Solids</p> <p>Estimating/Finding the volume of a cube or cuboid using cm cubes and a visual m cube as a measure</p> <p>Explore mm cubed and km cubed</p> <p>Discovering the Formulae for the Volume of Simple Solids</p> <p>Using Formulae to calculate the Volume of Simple Solids</p>	9-11 Year 5-6
Surface Area	<p>Exploring the Surface Area of Solids - Practical</p> <p>Estimating and measuring to find the Surface Area of Solids</p> <p>Discovering the Formulae for the Surface Area of a Solid</p> <p>Using Formulae to calculate Surface Area.</p>	9-11 Year 5-6
Units of Measurement	<p>Measure using measuring equipment to find lengths, areas and volume.</p> <p>Convert between two units of metric measure: (km, m, cm, mm, g, kg, l, ml) in problems involving length, mass, volume and time. From larger to smaller units and smaller to larger.</p>	9-11 Year 5-6



	<p>understand and use appropriate equivalences between metric units and common imperial units such as inches, pounds and pints, miles,</p> <p>Units of Measurement of Temperature including negative numbers</p> <p>Solve problems of converting between units of time</p> <p>Solve problems using four operations to solve problems involving measure e.g. length, mass, volume, money using decimal notation and involving scaling.</p> <p>Solve problems involving the calculation and conversion of units of measure using decimal notation upto 3 decimal places.</p>	
Geometry	<p>Classified Nomenclature</p> <p>Basic Concepts - Point, Line, Surface, Solid</p> <p>Study of the Line</p> <p>Study of Angles</p> <p>Measurement of Angles</p> <p>Fraction/degree/type of Angle Chart</p> <p>Measurement of Angles With a Regular Protractor</p> <p>The Formation of Regions - Simple Closed Curve Figures and Polygons</p> <p>Study of the Triangle</p> <p>Study of Triangles According to Sides</p> <p>Study of Triangles According to Angles</p> <p>Study of Triangles According to Angles and Sides</p> <p>The Right Triangle</p> <p>The Equilateral Triangle</p>	<p>9-11</p> <p>Year 5-6</p>



	<p>The Height or Altitude of a Triangle</p> <p>Orthocenter of a Triangle</p> <p>Construct Triangles With a Compass</p> <p>Study of Quadrilaterals According to Sides and Angles</p> <p>The Height or Altitude of a Quadrilateral</p> <p>Polygons - Regular and Irregular</p> <p>Study of Quadrilaterals - Equiangular and Equilateral</p> <p>Study of Triangles - Equiangular and Equilateral</p> <p>The Diagonal</p> <p>The Transversal and Its Angles</p> <p>Alternate Angles Are Equal</p> <p>Interior Angles on the Same Side of the Transversal</p> <p>Exterior Angles on the Same Side of the Transversal</p> <p>Angles on the Same Side of the Transversal</p> <p>Corresponding Angles</p> <p>Adjacent Angles</p> <p>Vertical Angles</p> <p>Two Parallel Straight Lines Cut by a Transversal</p> <p>Eratosthenes' Great Discovery: the Circumference of the Earth</p> <p>the Circle:</p> <p style="padding-left: 40px;">Nomenclature and Properties</p> <p style="padding-left: 40px;">Relationship of a Straight Line and Circumference - External</p> <p style="padding-left: 40px;">Relationship of a Straight Line and Circumference -</p> <p>Tangential</p> <p style="padding-left: 40px;">Relationship of a Straight Line and Circumference - Secant</p> <p style="padding-left: 40px;">Relative Position of Two Circumferences - External</p> <p style="padding-left: 40px;">Relative Position of Two Circumferences - Internal</p> <p style="padding-left: 40px;">Relative Position of Two Circumferences - Externally</p> <p>Tangent</p> <p style="padding-left: 40px;">Relative Position of Two Circumferences - Internally</p> <p>Tangent</p> <p style="padding-left: 40px;">Relative Position of Two Circumferences - Secant</p> <p style="padding-left: 40px;">Relative Position of Two Circumferences - Concentric</p>	
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	Study of Congruence Metal Inset Squares Metal Inset Triangles	9-11 Year 5-6
	Study of Similarities and Equivalence Sequence of Activities The Triangle Box The Green Triangles from the Triangle Box Transitive Quality of Equivalencies Relationship of Sides of the Triangle and Sides of the Halves Large Hexagon Box - Triangle as the Point of Reference Relationship of Sides of Triangle and Sides of Rhombus Large Hexagon Box - Hexagon as the Point of Reference Inscribing a Triangle in a Hexagon Circumscribing a Triangle by a Hexagon Relationship of Lines in a Hexagon Constructed by Six Triangles The Small Hexagon The Small Hexagon Box Terms of the Differences and the Ratios Between the Figures Ratios Between the Two Hexagons: H1 and H2 The Difference Between the Hexagons, H1 and H2 Equivalence of Red Obtuse Triangles & Red Equilateral Triangle Ratio Between an Equilateral Triangle and Another built on its Height Equivalence of the Green Trapezoid and the Yellow Triangle Relationship Between Inscribed and Circumscribed Figures Theorem of Pythagoras First Extension of the Theorem of Pythagoras The Theorem of Pythagoras First Inset for the Theorem of Pythagoras	9-11 Year 5-6



	Second Inset for the Theorem of Pythagoras Third Inset for the Theorem of Pythagoras The Theorem of Pythagoras: the Construction	
	Equivalence Equivalence from the Triangle to the Rectangle Equivalence from the Rhombus to the Rectangle Equivalence of the Parallelogram and Rectangle Equivalence of the Trapezoid and Rectangle Regular Polygons Study of Apothem	9-11 Year 5-6
Construction and Geometry	Construct 2D shapes using given dimensions and angles Construct angles Construct simple flower using circles, hexagon Construct 6 point geometrical patterns in Islamic Art Construct 8 point geometrical patterns in Islamic Art	9-11 Year 5-6
Transformations in the 2D Plane	Mirror Symmetry Reflections Rotational Symmetry Rotations Draw and Translate Simple Shapes using positional vectors Reflect Shapes in the X, Y axes Identify, describe and represent the position of a shape following a reflection or translation and see that the shape has not changed	9-11 Year 5-6

Statistics and Logic: Collecting, Recording, Representing and Interpreting Data, Drawing Charts, the Mean

Area	Topic	Recommended Age and Stage
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Collecting and Recording Data	Drawing Tables Drawing Tally Charts Asking Important Questions and Finding Answers Conducting and Designing Simple Surveys Collating Results of Surveys Conducting Experiments and taking Regular Measurements	9-11 Year 5-6
Representing and Interpreting Data	Represent discrete and continuous data using appropriate Graphical Methods, including Bar Charts and Line Graphs Interpret and Construct Pie Charts Solve Comparison, Sum and Difference Problems Using Information presented in Bar Charts, Pictograms, Tables and Line Graphs Interpreting Data shown in Charts and Graphs to Answer Questions Pupils Understand and use a Greater Range of Scales in their Representations Pupils begin to relate the Graphical Representation of Data to Recording Change over Time	9-11 Year 5-6
Reading and Interpreting Data	Complete, Read and Interpret information in Tables including Timetables	9-11 Year 5-6
Averages	Calculate and Interpret the Mean as an Average	9-11 Year 5-6
Logic	Introduction to Logic Critical Thinking The Art of Argument and Reasoning Logical Deduction	9-11 Year 5-6



	Logic Problems and Puzzles	
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