Key Stage 4 scheme of work

Links to 10 key mathematical themes

			Key themes	Place value	Arithmetic without a calculator	Indices and roots	Combining operations	Equivalence and equality	Generalising using algebra	Co-ordinates and graphs	Multiplicative reasoning	Angles and symmetry	Perimeter, area and volume
	Unit	**Lessons**											
1	Integers and place value	4			✓								
	Decimals	3		✓	✓								
	Indices, powers and roots	5			✓		✓	✓					
	Factors, multiples and primes	4			✓	✓	✓						
2	Algebra: the basics	6				✓	✓	✓	✓				✓
	Expressions and substitution into formulae	5			✓	✓	✓	✓	✓				
3	Tables, charts and graphs	11								✓			
	Pie charts	3			✓			✓			✓	✓	
	Scatter graphs	4								✓			
4	Fractions, decimals and percentages	7		✓	✓		✓	✓			✓		
	Percentages	6		✓	✓		✓	✓			✓		
5	Equations and inequalities	9		✓	✓	✓		✓	✓			✓	✓
	Sequences	5				✓		✓	✓				
6	Properties of shapes, parallel lines and angle facts	7							✓			✓	
	Interior and exterior angles of polygons	4							✓			✓	
7	Statistics, sampling and the averages	7		✓							✓		
8	Perimeter, area and volume	10		✓	✓	✓			✓		✓		

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9	Real-life graphs	8							✓	✓		✓
	Straight-line graphs	6						✓	✓	✓	✓	
10	Transformations	11							✓	✓	✓	
11	Ratio	4		✓			✓			✓		
	Proportion	5		✓					✓	✓		
12	Pythagoras and trigonometry	5	✓		✓		✓			✓	✓	✓
13	Probability	12					✓			✓		
14	Multiplicative reasoning	7	✓	✓				✓				
15	Plans and elevations	5	✓							✓	✓	
	Constructions, loci and bearings	7									✓	
16	Quadratic equations: expanding and factorising	5		✓	✓	✓	✓	✓				
	Quadratic equations: graphs	4		✓		✓	✓	✓	✓			
17	Circles, cylinders, cones and spheres	6	✓		✓					✓		✓
18	Fractions and reciprocals	5					✓			✓		
	Indices and standard form	5	✓	✓	✓							
19	Similarity and congruence in 2D	7								✓	✓	✓
	Vectors	7							✓			
20	Rearranging equations	5			✓		✓	✓				
	Curved graphs			✓	✓				✓			
	Simultaneous equations			✓			✓	✓	✓			

Description of the 10 key themes

Place value in integers and decimals

- Place value in integers (e.g. that the '4' in 640 stands for 4 tens)
- Place value in decimals (e.g. that the '4' in 23.941 stands for 4 hundredths)
- Rounding to the nearest 1, 10, 100 etc, or using decimal places
- Rounding using significant figures
- Multiplying by 10 moves all digits one place to the left, and dividing by 10 moves them one place to the right
- Multiplying and dividing by powers of 10
- Metric system of units
- Standard form for very large and very small numbers

Arithmetic without a calculator

- Add and subtract integers
- Add and subtract decimals
- Multiplication and division facts up to 12 × 12
- 'Short' multiplication of integers
- Multiplication of decimal by integer (e.g. 1.48 × 4)
- Multiplication of decimal by decimal (e.g. 0.4 × 0.08)
- 'Long' multiplication of integers
- 'Short' division of integers
- Division of decimal by integer (e.g. 14.4 ÷ 6)
- Division of decimal by decimal (e.g. 2.92 ÷ 0.04)
- 'Long' division of integers

Indices and roots

- Notation for 'squared' and 'cubed'
- Use and understand index notation
- Understand square root as inverse operation
- Use and understand cube and higher roots
- Understand the laws of indices

Combining arithmetical operations

- Understand the hierarchy of operations (i.e. BIDMAS)
- Understand that addition is commutative and associative (e.g. 13 + 8 + 7 + 22 = (13 + 7) + (8 + 22) = 20 + 30 = 50)
- Understand that subtraction is neither commutative nor associative
- Understand that the order of addition and subtraction can be changed (e.g. 23 + 38 – 6 – 13 = 23 – 13 + 38 – 6 = 10 + 32 = 42)
- Use the fact that multiplication is commutative and associative (e.g. 4 × 13 × 5 = (4 × 5) × 13 = 20 × 13 = 260)
- Understand that division is neither commutative nor associative
- Understand that the order of multiplication and division can be changed (e.g. 24 × 9 ÷ 6 = (24 ÷ 6) × 9 = 4 × 9 = 36)
- Use the fact that multiplication and division are distributive over addition and subtraction (e.g. 23 × 6 = 20 × 6 + 3 × 6 = 120 + 18 = 138; 91 ÷ 7 = (70 + 21) ÷ 7 = 70 ÷ 7 + 21 ÷ 7 = 10 + 3 = 13)
- Dividing by a number is equivalent to multiplying by its reciprocal

Maintaining equivalence and equality

- Find equivalent fractions
- Find equivalent ratios
- Equivalence between fractions, decimals and percentages
- Negative numbers (e.g. 7 – (–2) = 7 + 2)
- Convert between mixed numbers and improper fractions
- Using laws of arithmetic to find equivalent and/or simpler algebraic expressions
- Know that applying the same operation to both sides of an equation maintains equality
- Adding and subtracting two equations preserves equality

Generalising using algebra

- Express a rule using words (e.g. A is two more than B)
- Express a simple rule symbolically (e.g. $A = B + 2$)
- Understand the language of algebra

Co-ordinates and graphs

- Work with co-ordinates in all four quadrants
- Understand the equations of vertical and horizontal lines
- Represent a simple relationship using a graph (e.g. $y = x + 1$)
- Interpret features of graphs arising from different contexts
- Calculate and interpret gradient

Multiplicative and proportional reasoning

- Solve simple problems by multiplication (e.g. cost of 4 items at £18 each)
- Solve simple problems by division (e.g. share £72 equally between 3 people)
- Use the unitary method to solve problems of direct proportion (e.g. given the cost for 4 people, work out the cost for 7 people)
- Share an amount in a given ratio
- 'Reverse' ratio problems
- Use multipliers to solve problems of direct proportion (e.g. use a multiplier of 1.5 to scale up the amounts in a recipe for 4 to a recipe for 6)

Angles and symmetry

- Recognise reflection symmetry
- Recognise rotation symmetry
- Use a protractor to measure or draw an angle
- Ideas of 'parallel' and 'perpendicular'
- Elementary angle rules (round a point, on a straight line, in a triangle)
- Angle and symmetry properties of triangles
- Angle and symmetry properties of quadrilaterals
- Angle properties of parallel and intersecting lines
- Angle and symmetry properties of polygons

Perimeter, area and volume

- Understand the idea of perimeter
- Understand the idea of area as the number of squares inside a shape
- Multiplication to find area of a rectangle
- Use and remember formulas to calculate areas of other plane shapes, including compound shapes
- Understand the idea of volume as the number of cubes inside a shape
- Multiplication to find the volume of a cuboid
- Understand the idea of surface area as the total of the areas of each face
- Use and remember formulas to calculate volumes of other solid shapes, including compound shapes