Number, place value ordering - Year group: 3

Programme Of Study	Pupils are taught to (National Curriculum Objectives)	Notes and Guidance
Number, place value ordering **Vocabulary** thousand (s) four digit exact position order most least more than greater than less than estimate position hundreds, tens, ones estimate position hundreds, tens, ones	• count from 0 in multiples of 4, 8, 50 and 100; find 10 or 100 more or less than a given number • recognise the place value of each digit in a three-digit number (hundreds, tens, ones) • compare and order numbers up to 1000 • identify, represent and estimate numbers using different representations e.g. positioning them on a number line and concrete representations • read and write numbers up to 1000 in numerals and in words • solve number problems and practical problems involving these ideas. • Develop strategies for doubling and halving • compare two given numbers, say which is more or less (including the use of < > =), and give a number lying between them e.g. what number is halfway between 7 and 8 • Round 2 digit or 3 digit numbers to the nearest 10 or 100	Ensure pupils continue to practise counting in units, tens and hundreds, so that they become fluent in the order and place value of numbers to 1000.

Fluency	Reasoning	Problem Solving
• understand and use the vocabulary of estimation and approximation, and give a sensible estimate for a number of objects or a calculation • Count forwards and backwards in steps of different sizes to 1000 • Count in multiples of 4, 8, 50 and 100 • Compare and order numbers up to 1000 using different representations • Understand that 847 is 8 hundreds, 4 tens and 7 ones and this gives the additive value of the whole number • Understand the position of 0 as a place holder • Understand the positional place value of each digit	• Understand that in the number 847 we can find the multiplicative place value of each digit by multiplying each digit by the column it is in eg 8 x 100 = 800 to use sensible estimates and justify why • Explain and reason about patterns in number sequences • Identify the missing number in a sequence • Use mathematical language when comparing numbers • Explain and justify statements about positions of digits • Convince a friend of the value of each digit in a three-digit number • Explain why 640 is ten times bigger than 64	• Solve problems in context (using language such as greater, less than etc) • Recognise mathematical connections between numbers and patterns of numbers • Decide how to check if your conjecture is correct • Use understanding of the value and position of digits to solve problems • Work systematically to find patterns in numbers • Use apparatus to represent problems and organise thinking

BLACK = NC Objectives BLUE= Missing Objectives, tested in national assessments

	Probing Questions - Number, place value, ordering – YEAR 3			
	Show me…	**Convince me…**	**What's the same? What's different?**	**Always, sometimes, never…**
	...the number six hundred and thirty-two in symbols **...the number 405 in words** **...how we can represent the number 351 using** **- base 10/dienes rods/place value counters/other objects e.g. coins/ the number line** **...where 350 would be on this blank paper strip that goes from 0-1000? And now where it would be if the strip went from 0-500? 0 -400?** **... the number that is ten more than 397? ten less than 548?** **... which is the greatest? the least? 243, 342, 432, 234, 423, 324?** **... a number that could complete 567 > .....;** **.... a number that could complete 456 < ..... < 516**	**... that 324 is less than 342 ... that 567 is represented by 5 hundreds, 6 tens and 7 ones in this apparatus** **... that 300 + 100 + 50 + 10 + 2 is a correct partitioning of 462**	**…761, 167, 176, 671, 716, 617** **…1, 10, 100, 1000** **…three hundred and five, five hundred and thirty, three hundred and fifty.** **…654 < 765 ; 714 > 704 ; 914 < 940; 435 > 453**	**…There is one way to partition a three digit number** **…There is a 'best way' to partition a three digit number.** **…If you take a three digit number and reverse its digits, you will get a bigger number than you started with.** **…If you take three digits, there are six different three-digit numbers that you can make with them.**

Addition and Subtraction - Year group: 3

Programme Of Study	Pupils are taught to (National Curriculum Objectives)	Notes and Guidance
Addition and Subtraction **Vocabulary** add and more make sum total altogether score double one more how many more? take (away) leave how many left? Less fewer difference between equals is the same as two (ten) more plus equals hundred ten one exchange column digit	* add and subtract numbers mentally, including: a 3-digit no and 1s, 10s, 100s. * add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction * estimate the answer to a calculation and use inverse operations to check answers * solve problems, including missing number problems, using number facts, place value, and more complex addition and subtraction.	Ensure pupils continue to practise the use of column addition and subtraction with increasingly large numbers, using carrying for addition and borrowing for subtraction. For mental calculations with 2-digit numbers, answers should exceed 100.

Fluency	Reasoning	Problem Solving
* show that the addition of two numbers can be done in any order (commutative) and subtraction of one number from another cannot addition and subtraction facts for all numbers to 20, e.g. 9 + 8, 17 – 9, drawing on knowledge of inverse operations * sums and differences of multiples of 10, e.g. 50 + 80, 120 – 90 * derive and recall number pairs that total 100 pairs of two -digit numbers with a total of 100, e.g. 32 + 68, * addition doubles for multiples of 10 to 100, e.g. 90 + 90 * Adapt methods of calculation to suit the numbers allowing efficient and flexible calculation * Use doubles and near doubles * Use near tens and near hundreds * Use jottings when needed * Use known facts to work out unknown facts Mentally add and subtract single digits and multiples of 10 to three digit numbers * Use number bonds to calculate * Partition numbers to add and subtract * Choose and use appropriate strategies for addition and subtraction * Understand and use the inverse operation	• Explain and justify statements about strategies for calculating mentally • Use the vocabulary of doubles, near doubles, tens and near tens, partitioning to reason about numbers • Compare methods • Use rounding and approximation to estimate answers and make decisions • Use trial and improvement to make decisions and justify * Explain and correct mistakes within a calculation * Use the mathematical language for addition and subtraction	* Use a range of strategies e.g. reorder numbers when adding, identify pairs totalling 10 or multiples of 10, partition: add tens and ones separately, then recombine, * partition: count on in tens and ones to find the total, * * partition: count on or back in tens and ones to find the difference, * partition: add or subtract 10 or 20 and adjust, partition: double and adjust, * partition: count on or back in minutes and hours, bridging through 60 (analogue times) use the 4 operations to calculate efficiently to reach a target number * recognise there might be more than one possible solution and find them * solve problems in different ways and discuss which is the most efficient for you • solve problems involving number, money and measures • Choose and use appropriate operations and strategies • Use different representations to solve problems e.g. Bar Model

BLACK = NC Objectives BLUE= Missing Objectives, tested in national assessments

	Probing Questions - Addition and Subtraction – YEAR 3			
	Show me…	**Convince me…**	**What's the same? What's different?**	**Always, sometimes, never…**
	... two numbers with a sum of 220 ... two numbers with a sum of 170 ... two numbers with a sum of 500 ... two numbers with a difference of 200 ... how you could check whether 281 + 376 = 657 using another calculation ... the four number facts that this bar model shows ... the other calculations that you know the answer to if I tell you that 348 + 417 = 765 ... two numbers that are easy to add ... two numbers that are hard to add ... two numbers that are easy to subtract ... two numbers that are hard to Subtract ...two numbers with a sum of 530 - and another two ... ... 435 + 100? + 200? + 500? ... 256 + 99? + 9? ... how you can add 567 + 678 - using dienes rods? - using place value counters? - using column method? ... two numbers with a sum of 20 and a difference of 12	**... that if I add a multiple of 100 to this number, the tens and ones digits will stay the same.** **... that 4 hundred and thirty-fourteen is worth the same as 444** **... that addition and subtraction are opposites** **... that 123 + 456 gives the same answer as 156 + 423** **... that order matters when you are subtracting** **... 491 – 274 does not equal 223 (90 - 70 - 20, 4 - 1 =3)** **...2 three digit numbers with a sum of 473**	**…130, 250, 360, 135** **…addition; subtraction** **…285; 367; 652; 285 + 367; 367 + 285; 652 – 285; 652 – 367; 367 – 285** **564 - 213;** **563 - 212;** **562 - 211;** **554 - 203** **… addition; subtraction**	**…A three digit number add a three digit number gives a six digit number** **…A three digit number subtract a three digit number gives a double digit number** **…The sum of two odd numbers is even.** **…The sum of three odd numbers is even.** **…Adding 5 to a number that ends in 6 will result in a number that ends in 1.** **…Adding 8 to a number that ends in 2 will result in a multiple of 10.** **…Addition makes a number larger** **…Subtraction makes a number smaller** **…Two numbers will have the same difference if you increase one by 7 and decrease the other by 7**

Multiplication and division - Year group: 3

Programme Of Study	Pupils are taught to (National Curriculum Objectives)	Notes and Guidance
Multiplication And division **Vocabulary** count from ... count in forwards/backwards pattern / number 10 more/less 100 more/less tenth missing number times table multiplication division multiple array row column groups multiplication division repeated addition scaling multiplied lots of/groups of/sets of ... times larger/smaller product	• recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables • write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods • solve problems, including missing number problems, involving multiplication and division, including positive integer scaling problems and correspondence problems in which n objects are connected to m objects. *write mathematical statements using the multiplication (x), division (÷), and equals (=) signs • double any multiple of 5 up to 100, e.g. double 35 * halve any multiple of 10 up to 200, e.g. halve 170 * Multiply and divide one digit and 2 digit numbers by 10 and 100	Ensure pupils continue to practise regularly the mental recall of multiplication tables when they are calculating mathematical statements until they are confident to use them. Ensure pupils develop efficient mental methods. For example, pupils should use commutativity (e.g. 4 x 12 x 5 = 4 x 5 x 12 = 20 x 12 = 240) and multiplication and division facts (e.g. using 3 x 2 = 6, 6 ÷ 3 = 2 and 2 = 6 ÷ 3 to calculate 30 x 2 = 60, 60 ÷ 3 = 20 and 20 = 60 ÷ 3). [105] Ensure pupils develop reliable written methods for multiplication and division, starting with calculations with 2-digit by 1-digit numbers and progressing to formal written methods. This helps prepare pupils for long multiplication from Year 4 and short and long division in Years 5 and 6.

Fluency	Reasoning	Problem Solving
* show that the multiplication of two numbers can be done in any order (commutative) and division of one number by another cannot * multiplication facts for the 2, 3, 4, 5, 6 and 10 times tables, and corresponding division facts * doubles of multiples of 10 and 5 to 100, e.g. double 90, and corresponding halves * Adapt methods of calculation to suit the numbers allowing efficient and flexible calculation * Use doubles and near doubles * Use near tens and near hundreds * Use jottings when needed * Count in multiples of 2,3,4,5,8 and 10 *Know or quickly derive multiplication and division facts for these tables * Represent multiplication and division facts as arrays * Use inverses to check and find a missing number * Multiply a 2 digit by 1 digit number	• Use known facts to work out unknown facts • Explain and justify statements about strategies for calculating mentally • Use the vocabulary of doubles, near doubles, tens and near tens, partitioning to reason about numbers • Compare methods • Explain how multiples and factors support multiplication and division • Use the language of multiplication • Use apparatus and pictures to explain thinking	• solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in context • Strategies: partition: when doubling, double the tens and ones separately, then recombine, partition: when halving, halve the tens and ones separately, then recombine, use knowledge that halving and doubling are inverse operations, recognise that finding a unit fraction is equivalent to dividing by the denominator and use knowledge of division facts, recognise that when multiplying by 10 or 100 the digits move one or two places to the left and zero is used as a place holder • Use the 4 operations to calculate efficiently to e.g. reach a target number • Recognise there might be more than one possible solution and find them • Solve problems in different ways and discuss which is the most efficient for you • Solve problems involving measures and money in context • Be able to derive all 8 facts in a fact family

BLACK = NC Objectives BLUE= Missing Objectives, tested in national assessments

Probing Questions - Multiplication and division – YEAR 3			
Show me…	**Convince me…**	**What's the same? What's different?**	**Always, sometimes, never…**
…10 more than 57/97/403/999 ... 10 less than 43/103/1001 ... 100 more than 432/709/999 ... 100 less than 432/709/2007 ...the fact family for 4x3 ... the 8 times table ... the fact family for 6 x 5 ... the missing number: 3 x ☐ = 18, ☐ x 2 = 24, 20 ÷ ☐ = 5, ☐ ÷ 3 = 7 ... how you could represent 13 x 5 with an array ... the fact family for 17 x 3 ... how you can represent this problem visually: Jane is drawing a picture of a flower. Her picture is 4cm tall. The real flower is 3 times as tall as this. How tall is the real flower? ... how you can represent this problem visually: Alice has 6 boxes. In each box there are 4 sweets. How many sweets does Alice have altogether? ... how you can represent this problem visually: Jay has 18 hats. He shares the hats equally into 3 bags. How many hats will there be in each bag?	...that 267 is ten more than 257 ...the sequence eight tenths, nine tenths, ten tenths could be said as eight tenths, nine tenths, one ... 4x8 gives me the same answer as 8x4 ... 15 x 10 = 150 ... 23 x 4 is the same as 20 x 4 + 3 x4 ... when you know a times table fact, you actually know 4 facts	…4, 3, 12, 8 …3x2, 2x3, 6÷2, 6÷3 …16, 24, 32, 44 …7 x 3, 3 x 7 , 3 x 21, 21 ÷ 3, 21 ÷ 7, 21 x 7, 7 ÷ 3, …14 x 2, double 14, the number twice as big as 14, 28 …multiply, lots of , groups of, divide, …product, shared by, shared between, grouped into, quotient	…When I find 10 more than a number, only one digit will change …Multiples of three have digits that add up to 3, 6 or 9 …Numbers that end in 4 or 8 are multiples of 4. ... multiplying is the opposite of dividing ... every times table fact has two related division facts ... the opposite of multiplying by 3 is finding a third ... if you know that a x b = c then you also know that a ÷ b = c

Fractions - Year group: 3

Programme Of Study	Pupils are taught to (National Curriculum Objectives)	Notes and Guidance
Fractions **Vocabulary** fraction part whole denominator numerator proportion out of sharing half third quarter fifth sixth seventh eighth ninth tenth shared between unit fraction non-unit fraction represent bead string number line position bar array	• count up and down in tenths; recognise that tenths arise from dividing an object into 10 equal parts and in dividing one-digit numbers or quantities by 10 • recognise, find and write fractions of a discrete set of objects: unit fractions and nonunit fractions with small denominators • recognise and use fractions as numbers: unit fractions and non-unit fractions with small denominators • recognise and show, using diagrams, equivalent fractions with small denominators • add and subtract fractions with the same denominator within one whole [for example, 5/7+ 1/7 = 6/7] • compare and order unit fractions, and fractions with the same denominators • solve problems that involve all of the above. • Read and write proper fractions interpreting the denominator as the parts of a whole and the numerator as the number of parts	Ensure pupils develop an increasing fluency with fractions, for example they should continue to practise naming, reading and writing fractions so they can write mathematical statements accurately. Ensure pupils continue to recognise fractions in the context of: parts of a whole, numbers, measurements, equal parts of a shape, or as a division of a quantity.

Fluency	Reasoning	Problem Solving
• Recognise fractions as numbers • Count in steps of ½, 1/3, ¼, 1/10 • Represent fractions in different ways • Compare and order fractions • Estimate positions between whole numbers on a number line • Write fractions in words and numbers • Add and subtract fractions with the same denominator	• Discuss why 'the smaller the denominator, the larger the fraction' • Use apparatus to explain why might be smaller than ¼ • Use fractions vocabulary of numerator, denominator, part-whole and whole • Use apparatus to explain addition and subtraction of fractions • Make and test conjectures about fractions	• Solve equivalence problems using concrete and pictorial representations • Find a variety of ways to make a whole • Solve word problems using fractions in real life contexts

BLACK = NC Objectives BLUE= Missing Objectives, tested in national assessments

	Probing Questions - Fractions – YEAR 3			
	Show me…	**Convince me…**	**What's the same? What's different?**	**Always, sometimes, never…**
	... 1/3 of 21 ... how you can represent 3/4 in as many different ways as possible ... how you could use an array to find 1/5 of 30? ... how you could use a bar model to find 1/5of 30? ... if this strip represents 24, where ½ would be? .....how you find 1/4 of 28 counters .....how you could use an array to find 2/3 of 24 .....how you can add 2/8 to 3/8 .....how you can subtract 2/6 from 5/6	... that 1/3 > 1/5 ...that ¼ is less than 1/3 ...that ¼ of 8 pound coins is more than 1/5 of 10 x 50p ...that 3/5 + 2/5 = 5/5 or 1 whole ... finding 1/6 is the same as dividing by 6 ... that there are at least 10 different ways to represent 1/6 ... that you can see the whole fraction family using an array ... that 2/10 is worth the same as 1/5 ... that a unit fraction sits on the number line between 0 and 1	1/5, 2/5, 3/5, 4/5 1/2, 1/3, 1/4, 1/5 1/3, 2/6, 1/2, 3/6 3/4, 1/4 , 6/8 1/2, 2/4, 3/4	…Unit fractions cannot be greater than 1/2 …You cannot compare fractions with different denominators …You can order fractions with the same denominator by just putting the numerators in order …There is no equivalent fraction to 4/5 …3/3 is the same as one whole …A fraction is a number AND a proportion of a shape …Fractions will always sit below 1 on the number line …The larger the denominator the bigger the fraction …When adding or subtracting fractions you need to add both the denominator and the numerator

Algebra - Year group: 3

Programme Of Study	Pupils are taught to (National Curriculum Objectives)	Notes and Guidance	
Algebra **Vocabulary** multiply divide place value decimal places rounding remainder problem solve context missing number order of operations value equation expression algebra variable unknown solution satisfy pairs of values	**Fluency** • Understand and use the equal sign as the balance of an equation • Recognise symbols/letters can represent numbers • Use mathematical representations to notice, continue and generate patterns • Recognise cyclical and linear patterns	**Reasoning** • Describe and explain patterns, leading to predictions • Give another, and another and another example • Use vocabulary such as repeating pattern, replace, missing, insert • Generalise and specify • Represent the information in a puzzle or problem using numbers, images or diagrams; use these to find a solution and present it in context, where appropriate using £.p notation or units of measure	**Problem Solving** • Solve problems involving equivalence • Solve missing number and shape problems • Solve problems that result in finding a generalisation

Probing Questions

Show me…	Convince me…	What's the same? What's different?	Always, sometimes, never…
… the missing number: 3 x ☐ = 18, ☐ x 2 = 24, 20 ÷ ☐ = 5, ☐ ÷ 3 = 7 … how you can represent this problem visually: Jane is drawing a picture of a flower. Her picture is 4cm tall. The real flower is 3 times as tall as this. How tall is the real flower? … how you can represent this problem visually: Alice has 6 boxes. In each box there are 4 sweets. How many sweets does Alice have altogether? … how you can represent this problem visually: Jay has 18 hats. He shares the hats equally into 3 bags. How many hats will there be in each bag? … a number that is in the 3 and 4 times tables but not in the 8 times tables … and another … and another … a number sentence that includes the numbers 3, 4, 8 and 20	… that 120 ÷ 3 and 121 ÷ 3 have the same answer to the nearest whole number …that there are an infinite number of solutions to x + y = 12. … why 6×100 and 60×10 give the same answer	x + y = 10 x + y = 7 2x + 2y =20 3 + y = 10 2x + y = 17 4x = 20 3x + 2y = 29 8x + 4y = 68	… There are an infinite number of possible values for: x + y = 11 x + 5 = 20 2x + y = 10 … Algebra always uses x and y. … x and y are whole numbers.

BLACK = NC Objectives BLUE= Missing Objectives, tested in national assessments

Properties of shape - Year group: 3		
Programme Of Study	**Pupils are taught to (National Curriculum Objectives)**	**Notes and Guidance**
Properties of shape **Vocabulary** angle turn movement full turn complete whole half turn quarter turn three quarter turn direction left/right clockwise anticlockwise right angle shape vertex greater than less than close to position horizontal line vertical line parallel lines pair perpendicular lines at right angles distance	• draw 2-D shapes and make 3-D shapes using modelling materials; recognise 3-D shapes in different orientations and describe them • recognise angles as a property of shape or a description of a turn • identify right angles, recognise that two right angles make a half-turn, three make three quarters of a turn and four a complete turn; identify whether angles are greater than or less than a right angle • Identify horizontal and vertical lines and pairs of perpendicular and parallel lines. • Draw and complete shapes with reflective symmetry; draw the reflection of a shape in a mirror line along one side	In Year 3, teachers should extend pupils' knowledge of the properties of shapes, using more precise mathematical vocabulary including polygon, non-polygon and polyhedron. Ensure pupils extend their use of the properties of shapes. They should be able to describe the properties of 2-D and 3-D shapes using accurate vocabulary, including acute and obtuse angles, turns and lines. Ensure pupils practise measuring and drawing straight lines in centimetres and millimetres, and circles of different sizes with a given radius using a compass. Ensure they also understand the terms horizontal and vertical lines.

Fluency	**Reasoning**	**Problem Solving**
• Name and describe the properties of a wide range of 2D and 3D shapes • Link shapes and pictorial representations • Identify right, acute and obtuse angles	• Justify and explain thinking in the context of shapes • Know and use accurately the vocabulary of shape, including symmetry, edges, vertices, faces, shape names, right angel, parallel, perpendicular • Convince someone that a shape has been reflected accurately • Conjecture which shapes tessellate and which do not • What is the same and different between 2D and 3 D shapes	* Solve problems in the context of shape * Systemically sort shapes in a variety of ways

	Probing Questions - Properties of shape – YEAR 3			
	Show me…	**Convince me…**	**What's the same? What's different?**	**Always, sometimes, never…**
	... a vertical line ... a horizontal line in this picture ... some parallel lines ... two lines or faces that are perpendicular to each other ... a shape which has both parallel lines and perpendicular lines ... a shape with a right angle? Exactly one right angle? no right angle? ... a quarter turn clockwise/to the right ... a square with sides of length 5 squares ... a rectangle with 2 sides of 10cm and 2 sides of 4cm ... a right angled triangle ... a cuboid made out of playdough ... a triangle cut out of paper ... a sphere in the room ... all the different shapes you can make from 4 straws (when you are allowed to cut them to adjust lengths!) ... all the shapes you can think of with 6 faces	... that this is a quarter turn to the left ... that this shape has no right angles ... that this shape has more than 6 right angles ... that this angle is more than a right angle ... that a triangle cannot have two parallel sides. ... parallel lines can be curved ... that a square cannot have different length sides ... that a triangle can have a point facing down ... that a rectangle can be turned around to face any direction ... that there is more than one 3D shape that looks like a square from above	…parallel and perpendicular …horizontal and vertical …circle, triangle, square, sphere …right, left, clockwise, anticlockwise addition; subtraction; total; change total; sum; difference; less; more than; altogether; change square, hexagon, pentagon, triangle circle, sphere, cylinder, cube right angled, isosceles, scalene, equilateral	…2 lines can be parallel and perpendicular at the same time …There are no shapes with exactly one right angle …Perpendicular lines are horizontal and vertical …If I make a triangle by halving a rectangle, the triangle's perimeter is half of the rectangle's perimeter … The bottom of a square can be horizontal, vertical or diagonal. … Cylinders have 2 circular faces

Position, direction and movement - Year group: 3

Programme Of Study	Pupils are taught to (National Curriculum Objectives)	Notes and Guidance
Position, directions and movement **Vocabulary** transformation object original image coordinate point vertex axes x-axis y- axis origin reflection mirror line line of reflection translation congruent	• Read and record the vocabulary of position, direction and movement, using the four compass directions to describe movement about a grid • Draw and complete shapes with reflective symmetry; draw the reflection of a shape in a mirror line along one side	

Fluency	Reasoning	Problem Solving
* Recognise angles as a measure of a turn	* Convince someone that a shape has been reflected accurately	* Solve problems involving position and direction

Probing Questions

Show me…	Convince me…	What's the same? What's different?	Always, sometimes, never…
... the point (3, 0) ... the point (0, 3) ... the point (0, 0) ... the point that will form a square with these three points ... where the shape will go if translated 3 squares up ... the new shape after a translation of 2 squares across and 3 squares up ... the new co-ordinates after a translation of 2 squares to the left ... four co-ordinates that form a parallelogram	... that the coordinates in the first quadrant will always be positive … a translated shape cannot be a reflection of the original object ... if you translate a shape 3 squares to the right then all the coordinates increase by 3 in the x coordinate.	(3, 4); (3, 2); (3, 6); (1, 3); (3, 0); (3, 3); (5, 3) translation across 2; translation up 2; translation down 2; translation right 2; translation left 2 (6, 2); (4, 2); (5, 3); (5, 0)	... a coordinate in the first quadrant can be negative ... coordinates on the axes contain a 0 ... coordinates on a vertical line have the same y-coordinate ... a translated shape will be the same size as the original ... a translation moves shapes further away from the origin

Measurement - Year group: 3		
Programme Of Study	**Pupils are taught to (National Curriculum Objectives)**	**Notes and Guidance**
Measurement Vocabulary perimeter length total sum area square units e.g. mm2 m2 cm2 base width breadth height parallelogram volume	* measure, compare, add and subtract: lengths (m/cm/mm); mass (kg/g); volume/capacity (l/ml) * measure the perimeter of simple 2-D shapes add and subtract amounts of money to give change, using both £ and p in practical contexts • tell and write the time from an analogue clock, including using Roman numerals from I to XII, and 12-hour and 24-hour clocks • estimate and read time with increasing accuracy to the nearest minute; record and compare time in terms of seconds, minutes and hours; use vocabulary such as o'clock, a.m./p.m., morning, afternoon, noon and midnight • know the number of seconds in a minute and the number of days in each month, year and leap year • compare durations of events [for example to calculate the time taken by particular events or tasks]. • Continue to measure using the appropriate tools and units, progressing to using a wider range of measures, including comparing and using mixed and simple equivalents of mixed units • Read to the nearest division and half division scales that are numbered or partially numbered; use the information to measure and draw to a suitable degree of accuracy	Ensure pupils continue to practise measuring using the appropriate tools and units of measure. They should progress to using a wider range of measures, including comparing and using mixed units accurately (e.g.1 kg and 200g) and simple comparisons of mixed units (e.g. 5m = 500cm). Ensure pupils use both analogue and digital clocks throughout the day so that they become fluent in telling the time. [131] Ensure pupils continue to practise recognising the value of coins, addition and subtraction of amounts, including compound units, and giving change using manageable amounts.

Measurement – Year 3

Fluency	Reasoning	Problem Solving
• Convert quickly between e.g mm, cm and m, ml and l and g and kg • Accurately use a range of measuring equipment • Compare and order a variety of measures • Tell the time to the minute	• Justify and explain thinking about measures • Use the vocabulary associated with measures • Convince a friend why you need to use measuring equipment accurately • Use multiplication facts to read scales	• Solve problems (in the context of measure) including missing number problems, using number facts, place value, and more complex addition and subtraction. • Solve problems in real life context • Use coins and notes to find different amounts of money • Solve practical problems with giving change • Decide on the correct equipment needed to solve a problem • Calculate time differences

Probing Questions

Show me…	Convince me…	What's the same? What's different?	Always, sometimes, never…
… a 7cm by 5cm rectangle from a piece of card … how you could accurately measure the size of an A4 sheet … a shape/rectangle with a perimeter of 20cm … all the rectangles with a perimeter of 24cm … how much change I would get from a £5 note for a bill costing £1.43 … five different ways that you could give change for a purchase of £7.60 using a £10 note … another way of writing 6pm … and another … how you would write the time 'midnight' using the 24 hour clock … using the 12 hour clock … how many seconds there are in 3 minutes … a month with more days in it than April … something that takes longer than one minute … and another … something which would be measured better in hours than minutes	….that a 6cm by 6cm square has the same perimeter as a 7cm by 5cm rectangle … that you can check your change using an addition … that IX is smaller than VIII … that there are not 100 seconds in a minute … that it would not take you an hour to eat a sandwich … that a programme starting at 17:10 and finishing at 17:40 lasts longer than a programme starting at quarter to four and finishing at five past four.	… a 10cm by 7cm rectangle and an L shape made by cutting a 3cm square from one corner of a 10x7 rectangle … 8x2 rectangle; 5x5 square; 6 x 4 rectangle …VI, 6, IV, 4 …the big hand at III and the little hand at …1200 minutes and 12 hours and half a day …midnight; noon; 00:00; 12:00; 12pm: 12am; 12 o'clock …year and a leap year	…If you cut a corner out of a rectangle, the perimeter of the new shape is the same as the old one. …. only one month has 28 days … there are three hands on a clock … time is only measured in hours, … there are 365 days in a year

Commented [KH1]:

Statistics - Year group: 3			
Programme Of Study	**Pupils are taught to (National Curriculum Objectives)**	**Notes and Guidance**	
Statistics **Vocabulary** data category(ies) pictogram key symbol represents tally bundle frequency frequency table total frequency scale interval bar chart how many more ... (less) difference total popular common rare more than fewer than	* interpret and present data using bar charts, pictograms and tables * solve one-step and two-step questions [for example, 'How many more?' and 'How many fewer?'] using information presented in scaled bar charts and pictograms and tables * Use Venn diagrams or Carroll diagrams to sort data and objects using more than one criterion	Ensure pupils use both horizontal and vertical representations as well as scales for pictograms, for example, where each picture represents 10 bags.	
	Fluency	**Reasoning**	**Problem Solving**
	* Interpret and present data using bar charts, pictograms and tables * Collect and sort information to create a range of charts and tables * Use simple scales	• Use the vocabulary associated with statistics • Interpret data and draw conclusions • Justify reasons for presenting data in a particular way • Justify choice of scale	* solve one-step and two-step questions [for example, 'How many more?' and 'How many fewer?'] using information presented in scaled bar charts and pictograms and tables * Collect and present data to solve a problem * Present data according to audience/ purpose * Follow a line of enquiry by deciding what information is important; make and use lists, tables and graphs to organise and interpret the information

	Probing Questions – statistics - YEAR 3			
	Show me…	**Convince me…**	**What's the same? What's different?**	**Always, sometimes, never…**
	… how you would represent three objects using this symbol (symbol worth 2, 4 etc.) … how many these symbols represent (pictogram symbols worth more than 1 inc partial symbols) … the frequency table for this data set … the frequency table that this bar chart came from … the tally chart that this pictogram may have come from	… that it is not a good idea to let my symbol represent 7 objects in my pictogram … that it is quicker to draw a pictogram when each symbol represents more than one object … that the most popular answer was … the best way to display the data is using a bar chart	bar chart and block graph tally and list 2s, 5s, 7s, 10s as amounts to go up in for scale	… the highest value on a bar chart is the best … a pictogram is easier to read than a tally chart … a tally chart is easier to read than a list … you can find the exact list of data that a bar chart came from

Number, place value and ordering - year 4

Programme Of Study	Pupils are taught to (National Curriculum Objectives)	Notes and Guidance
Number, place value ordering **Vocabulary** Roman Numerals numeral 1 I 2 II 3 III 4 IV 5 V 6 VI 7 VII 8 VIII 9 IX 10 X 50 L 100 C 500 D 1000 M place value thousand ten thousand represent estimate round integer compare order	* count in multiples of 6, 7, 9, 25 and 1000 * find 1000 more or less than a given number * count backwards through zero to include negative numbers * recognise the place value of each digit in a four-digit number (thousands, hundreds, tens, and ones) * order and compare numbers beyond 1000 * identify, represent and estimate numbers using different representations * round any number to the nearest 10, 100 or 1000 * solve number and practical problems that involve all of the above and with increasingly large positive numbers * read Roman numerals to 100 (I to C) and know that over time, the numeral system changed to include the concept of zero and place value. * Partition, round and order four-digit whole numbers; use positive and negative numbers in context and position them on a number line; state inequalities using the symbols < and > (e.g. – 3 > –5, –1 < +1) * Use the vocabulary of comparing and ordering numbers, and the symbols >, <, =; give a number lying between two given numbers and order a set of numbers * Multiply and divide whole numbers, then decimals, by 10, 100 or 1000 * Use the vocabulary of estimation and approximation; make and justify estimates and approximations of numbers * Recognise and order negative number	Ensure pupils continue to practise counting regularly so that they become fluent in the order and place value of numbers beyond 1000 and include regular practice counting in tens and hundreds. Ensure pupils read and write 4-digit numbers accurately, including the use of zero as a place holder. Ensure pupils are applying their mathematics, including completing number sequences and finding the difference. Roman numerals should be put in their historical context so pupils understand that there were different ways to write whole number and that Hindu-Arabic numerals introduced the important concept of zero and place value.

Fluency	Reasoning	Problem Solving
* Suggest a line of enquiry and the strategy needed to follow it; collect, organise and interpret selected information to find answers * Report solutions to puzzles and problems, giving explanations and reasoning orally and in writing, using diagrams and symbols * Use knowledge of rounding, number operations and inverses to estimate and check calculations * Add or subtract 1, 10, 100 or 1000 to/from whole numbers, and count on or back in tens, hundreds or thousands from any whole number up to 10000 * Recognise multiples and know some tests of divisibility	• Suggest a line of enquiry and the strategy needed to follow it; collect, organise and interpret selected information to find answers • Report solutions to puzzles and problems, giving explanations and reasoning orally and in writing, using diagrams and symbols • Recognise and extend number sequences formed by counting on and back in steps of any size, extending beyond zero when counting back • Recognise odd and even numbers and make general statements about them • Explain methods and reasoning about numbers orally and in writing • Solve mathematical problems or puzzles, recognise and explain patterns and relationships, generalise and predict. Suggest extensions by asking 'What if...?' • Make and investigate a general statement about familiar numbers or shapes by finding examples that satisfy it	• solve number and practical problems that involve all of the above and with increasingly large positive numbers • Represent a puzzle or problem using number sentences, statements or diagrams; use these to solve the problem; present and interpret the solution in the context of the problem • Suggest a line of enquiry and the strategy needed to follow it; collect, organise and interpret selected information to find answers. Suggest extensions by asking 'What if…?' • Report solutions to puzzles and problems, giving explanations and reasoning orally and in writing, using diagrams and symbols • Solve one-step and two-step problems involving numbers, money or measures, including time; choose and carry out appropriate calculations, using calculator methods where appropriate

BLACK = NC Objectives BLUE= Missing Objectives, tested in national assessments

	Probing Questions – Number, place value and ordering – YEAR 4			
	Show me…	**Convince me…**	**What's the same? What's different?**	**Always, sometimes, never…**
	… the number two thousand and thirty-four in symbols … the number 6903 in words … how we can represent the number … 3156 using place value counters … 4999 on a number line (marked or blank) … a number with a 3 in the hundreds column … where 2351 would be on this scale (blank strip) from 0-10000 2000 - 3000 2300 - 2500 2350 - 2360 … a number that would make this statement true 8134 >	… that there are exactly ten numbers between 2000 and 3000 with a tens digit of 4 and a ones digit of 9 … that 4671 < 4716 … that 6180 > 6159 … that 69 in Roman Numerals is LXVI … that 253 and 329 round to the same number to the nearest 100 … which is the correct representation of 99 in roman numerals? IC IX IX XCIX LXXXXIX	4562, 2654, 6452, 5246, 6254, 2456 1, 10, 100, 1000, 10000 VI, XVI, LVI, CVI 27, 34, 25, 39	… Numbers that contain a digit of 9 will be greater than those that do not … You cannot show decimals using Roman Numerals … If you take 4 digits, there are 24 different … 4-digit numbers that you can create from them (development - 4 different digits or no such restriction) … There are 9 integers '?' for which 3567 < ? < 3576

Addition and subtraction - year 4

Programme Of Study	Pupils are taught to (National Curriculum Objectives)	Notes and Guidance
Addition and Subtraction **Vocabulary** how many more? take (away) leave how many left? less fewer difference between equals is the same as minus number sentence order calculate column subtraction estimate inverse operation check add more make sum total altogether score double	* add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate estimate and use inverse operations to check answers to a calculation * Solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why. * Add or subtract 1, 10, 100 or 1000 to/from whole numbers, and count on or back in tens, hundreds or thousands from any whole number up to 10000 * Count on or back in repeated steps of 1, 10, 100, 1000 * Partition into hundreds, tens and ones * Add several numbers	Ensure pupils continue practising formal written methods and mental methods with increasingly large numbers, and include the terms 'sum' and 'difference'. For mental calculations, include increasingly large numbers, for example, 12,462 - 2,400 = 10,062 or 12,462 + 600 = 13,062. Ensure pupils say and write the numbers correctly and with precision, so that they are clear about place value and confident when working with mental calculations. This will prepare them for Year 5, when pupils are taught to calculate the sum and difference of two decimal numbers (up to 2 decimal places).

Fluency	Reasoning	Problem Solving
• estimate and use inverse operations to check answers to a calculation Use knowledge of addition and subtraction facts and place value to derive sums and differences of pairs of multiples of 10, 100 or 1000 • Know, with rapid recall, addition and subtraction facts • Find a difference by counting up through the next multiple of 10, 100 or 1000 • Identify near doubles • Add or subtract the nearest multiple of 10, 100 or 1000 and adjust • Use known number facts and place value to add or subtract a pair of numbers mentally • Develop and refine written methods for addition, building on mental methods • Develop and refine written methods for subtraction, building on mental methods	Suggest a line of enquiry and the strategy needed to follow it; collect, organise and interpret selected information to find answers • Report solutions to puzzles and problems, giving explanations and reasoning orally and in writing, using diagrams and symbols • Recognise and continue number sequences formed by counting on or back in steps of constant size • Understand the operation of addition and the associated vocabulary, and its relationship to subtraction • Understand the operation of subtraction and the associated vocabulary, and its relationship to addition • Use the relationship between addition and subtraction • Solve mathematical problems or puzzles, recognise and explain patterns and relationships, generalise and predict. Suggest extensions by asking 'What if...?'	* two-step problems in contexts, deciding which operations and methods to use and why. * Represent a puzzle or problem using number sentences, statements or diagrams; use these to solve the problem; present and interpret the solution in the context of the problem * Solve one-step and two-step problems involving numbers, money or measures, including time; choose and carry out appropriate calculations, using calculator methods where appropriate * Choose and use appropriate number operations and appropriate ways of calculating (mental, mental with jottings, written methods, calculator) to solve problems * Solve mathematical problems or puzzles, recognise and explain patterns and relationships, generalise and predict. Suggest extensions by asking 'What if...?'

BLACK = NC Objectives BLUE= Missing Objectives, tested in national assessments

	Probing Questions - Addition and subtraction – YEAR 4			
	Show me…	**Convince me…**	**What's the same? What's different?**	**Always, sometimes, never…**
	… two numbers with a sum of 4215 … two numbers with a sum of 2170 … two numbers with a sum of 5000 … two numbers with a difference of 2000 … how you could check whether 6281 + 2376 = 8657 using another calculation … the four number facts that this bar model shows … the other calculations that you know the answer to if I tell you that 2348 + 5417 = 7765 … two numbers that are easy to add … two numbers that are hard to add … two numbers that are easy to subtract … two numbers that are hard to subtract	… that if I add a multiple of 1000 to this number, the hundred, tens and ones digits will stay the same. … that forty-two hundred and thirty-fourteen is worth the same as 4244 … that addition and subtraction are opposites	1310, 2250, 3460, 1325 addition; subtraction 2285 + 3126; 3126 + 2285; 5411 – 2285; 5411 – 3126 3126 – 2285 2285 + 5411 3126 + 5411	… A four digit number add a four digit number gives an eight digit number … A four digit number subtract a four digit number gives a three digit number … The sum of two odd numbers is even. … The sum of three odd numbers is even. …Adding 5 to a number that ends in 6 will result in a number that ends in 1. ….Adding 8 to a number that ends in 2 will result in a multiple of 10. …Addition makes a number larger …Subtraction makes a number smaller

Multiplication and division - year 4

Programme Of Study	Pupils are taught to (National Curriculum Objectives)	Notes and Guidance
Multiplication And division **Vocabulary** Multiply product estimate round approximate formula term divide dividend divisor remainder fraction order of operations prime number composite number factor factor pair multiple common factor common multiple square number cubed number	* recall multiplication and division facts for multiplication tables up to 12 × 12 use place value, known and derived facts to multiply and divide mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together three numbers * recognise and use factor pairs and commutativity in mental calculations * multiply two-digit and three-digit numbers by a one-digit number using formal written layout * solve problems involving multiplying and adding, including using the distributive law to multiply two digit numbers by one digit, integer scaling problems and harder correspondence problems such as n objects are connected to m objects. *Multiply and divide whole numbers, then decimals, by 10, 100 or 1000 * Develop and refine written methods for multiplication * Develop and refine written methods for division	Ensure pupils continue to practise recalling and using multiplication tables and related division facts on a regular basis until they are confident using them mentally. [158] Ensure pupils continue to practise mental methods and extend this to 3-digit numbers to derive facts, for example 300 x 2 = 600 into 600 ÷ 3 = 200. Pupils should also use the distributive law to derive facts, for example, 30 x 7 + 9 x 7= 39 x 7.

Fluency	Reasoning	Problem Solving
•* use place value, known and derived facts to multiply and divide mentally * recognise and use factor pairs and commutativity in mental calculations * represent a puzzle or problem using number sentences, statements or diagrams * Identify the doubles of two-digit numbers; use these to calculate doubles of multiples of 10 and 100 and derive the corresponding halves * Derive and recall multiplication facts up to 12 × 12, the corresponding division facts and multiples of numbers to 10 up to the tenth multiple * Know by heart or derive rapidly doubles and halves * Use related facts and doubling or halving *Use factors * Use closely related facts already known * Check by doing the inverse operation * Approximate by rounding * Use knowledge of sums or products of odd or even numbers * Partition and use the distributive law * Use known number facts and place value to multiply or divide mentally * Recognise multiples and know and use some tests of divisibility * Understand the idea of a remainder, and when to round up or down after division * Use knowledge of rounding, number operations and inverses to estimate and check calculations	• Suggest a line of enquiry and the strategy needed to follow it; collect, organise and interpret selected information to find answers • Report solutions to puzzles and problems, giving explanations and reasoning orally and in writing, using diagrams and symbols • Suggest a line of enquiry and the strategy needed to follow it; collect, organise and interpret selected information to find answers • Solve mathematical problems or puzzles, recognise and explain patterns and relationships, generalise and predict. Suggest extensions by asking 'What if...?'	• Solve one-step and two-step problems involving numbers, money or measures, including time; choose and carry out appropriate calculations, using calculator methods where appropriate • Represent a puzzle or problem using number sentences, statements or diagrams; use these to solve the problem; present and interpret the solution in the context of the problem • Represent a puzzle or problem using number sentences, statements or diagrams; use these to solve the problem; present and interpret the solution in the context of the problem * Report solutions to puzzles and problems, giving explanations and reasoning orally and in writing, using diagrams and symbols * Choose and use appropriate number operations and appropriate ways of calculating (mental, mental with jottings, written methods, calculator) to solve problems * Solve one-step and two-step problems involving numbers, money or measures, including time; choose and carry out appropriate calculations, using calculator methods where appropriate

BLACK = NC Objectives BLUE= Missing Objectives, tested in national assessments

	Probing Questions – multiplication and division – YEAR 4			
	Show me…	**Convince me…**	**What's the same? What's different?**	**Always, sometimes, never…**
	...1000 more than 4567/12045 ....1000 less than 4567/12045 ... the fact family for ... ... a factor pair that makes 18 ... two factor pairs that make 20 ... a number with an odd number of Factors … and one digit number you can multiply to give an 8 in the ones column ... a three digit number and one digit number you can multiply to give a 5 in the ones column	... a x b gives me the same answer as b x a ... a fact family will always have four facts ... that if I start on 5 and count back 8 places I will end up at -3 ... that 14 x 6 will give a different answer to 16 x 4 ... that if I know that 468 / 4 is 117, then I can check I am right by calculating 4 x 117	1, 2, 3, 4 3, 6, 12, 18 167, 1167, 2167, 3167 3, 2, 1, 0, -1, -2, -3 4 × 30; 4 × 300 7 × 6; 7 × 2 × 3; 8 × 7; 2 × 4 × 7; 2 × 2 × 2 × 7 12 × 6; 13 × 6; 12 × 12; 13 × 12; 12 × 0 45x5, 25x9, 15x15, 10x20 45x9, 25x4, 15x7, 10x8	… When I find 1000 more than a number, only one digit will change …Multiples of 6 are also multiples of 2 and of 3 …Numbers in the nine times table have digits that add up to 9 …A number divided by 0 gives an answer of 0 …A number multiplied by 1 gives an answer of 1 …A number divided by 1 gives an answer of itself … A two digit number multiplied by a one … number gives an answer that is a two digit number. … A three digit number multiplied by a one number gives an answer that is a three digit number

Fractions - year 4

Programme Of Study	Pupils are taught to (National Curriculum Objectives)	Notes and Guidance
Proportionality **Fractions** **Vocabulary** fraction part whole denominator numerator equivalent simplify factor multiple common greater than less than improper mixed number decimal percentage % proportion tenths hundredths scaling proportion scaled up/down scale factor similar ratio per ... times as ... multiplier, divisor	* recognise and show, using diagrams, families of common equivalent fractions count up and down in hundredths; recognise that hundredths arise when dividing an object by one hundred and dividing tenths by ten. * solve problems involving increasingly harder fractions to calculate quantities, and fractions to divide quantities, including non-unit fractions where the answer is a whole number * add and subtract fractions with the same denominator * recognise and write decimal equivalents of any number of tenths or hundredths *recognise and write decimal equivalents to ¼, ½, 3/4 find the effect of dividing a one- or two-digit number by 10 and 100, identifying the value of the digits in the answer as ones, tenths and hundredths * round decimals with one decimal place to the nearest whole number * compare numbers with the same number of decimal places up to two decimal places * solve simple measure and money problems involving fractions and decimals to two decimal places.	Ensure pupils continue practising to add and subtract like fractions within one whole and extend this to equivalent fractions. Ensure pupils practise counting as often as possible using simple fractions and decimal fractions both forwards and backwards. Ensure pupils are taught decimal notation and vocabulary, including in the context of measurements. Ensure pupils are taught to make comparisons and order decimal amounts and quantities that are expressed to the same number of decimal places. Ensure pupils' understanding of decimal place value is extended to tenths and then hundredths. This will prepare them for Year 5 when they are taught how to relate the decimal notation to division of 2-digit numbers by 10 and later 100, and to the groups of fractions for 1/10 and later 1/100.

Fluency	Reasoning	Problem Solving
* recognise and show, using diagrams, families of common equivalent fractions * Use fraction notation and recognise the equivalence between fractions * recognise that hundredths arise when dividing tenths by ten. * recognise and write decimal equivalents of any number of tenths or hundredths * recognise and write decimal equivalents to ¼, ½, ¾ * round decimals with one decimal place to the nearest whole number * compare numbers with the same number of decimal places up to two decimal places *Find fractions of numbers or quantities *Use decimal notation, know what each digit in a decimal fraction represents and order a set of decimal fractions * Round decimal fractions to the nearest whole number or the nearest tenth * Recognise the equivalence between decimals and fractions * Use decimal notation for tenths and hundredths and partition decimals; relate the notation to money and measurement; position one-place and two-place decimals on a number line * Recognise the equivalence between decimal and fraction forms of one half, quarters, tenths and hundredths * Use diagrams to identify equivalent fractions (e.g. 6/8 and 3/4, or 70/100 and 7/10); interpret mixed numbers and position them on a number line (e.g. 31/2) * Identify pairs of fractions that total 1 * Find fractions of numbers, quantities or shapes (e.g. 1/5 of 30 plums, 3/8 of a 6 by 4 rectangle) * recognise and write decimal equivalents of any number of tenths or hundredths	* find the effect of dividing a one- or two-digit number by 10 and 100, identifying the value of the digits in the answer as ones, tenths and hundredths * Use the vocabulary of ratio and proportion to describe the relationship between two quantities (e.g. 'There are 2 red beads to every 3 blue beads, or 2 beads in every 5 beads are red'); estimate a proportion (e.g. 'About one quarter of the apples in the box are green')	• solve simple measure and money problems involving fractions and decimals to two decimal places. • solve problems involving increasingly harder fractions to calculate quantities, and fractions to divide quantities, including non-unit fractions where the answer is a whole number • Solve simple problems involving ratio and proportion

	Probing Questions - Fractions – YEAR 4			
	Show me…	**Convince me…**	**What's the same? What's different?**	**Always, sometimes, never…**
	… where 1/10 sits on the number line … what comes next 7/10, 8/10, 9/10, … how you can show 3/10 of this shape? of this number? on the number line? as a decimal? … an equivalent fraction to 2/10 … what comes next in this pattern: 3/10, 6/20, 9/30, 12/40, ... … a decimal that would make this statement true 5.6 < ....how you can use a bar model to add 3/8 to 7/8 ....how you could use a bar model to subtract 3/8 from 7/8 .... how to find 1/6 of £42 .....how to find 3/5 of £45 .....how to find 1/4 of £25 … the whole if this is 1/3 … two fractions with a sum of 5/7 … two fractions with a difference of 5/6 … what is wrong in this calculation: 2/3 of 36 is 6 because 36 ÷ 2 = 18 and 18 ÷ 3 = 6	…that 3/4 is equivalent to 0.75 … that 20/100 is equivalent to two tenths (in more than one way! … that 1/4 = 0.25 … that 0.8 > 0.59 …that 1/7 + 5/7 = 6/7 …that 2/3 of 24 is 16 …that 1/4 of 30 metres is 7.5m … that finding 1/10 of a quantity is the same as dividing by 10	7/10, 0.7, 70/100, 14/20 1/4, 1/2, 0.5, 0.25, 3/4, 2/4, 0.75 tenth, 1/10, 0.1, ÷ 10, 10/100 2.7, 3.4, 2.5, 3.9 1/2, 2/4, 4/8, 8/16 3/7, 6/7, 5/7, 8/7	Equivalent fractions form a number pattern when you write them in a list When you write a fraction with a denominator of 100 as a decimal, the decimal will have two decimal places If you have two decimals, the longer decimal will be worth more than the shorter decimal Fractions have to be smaller than 1 whole When adding or subtracting fractions you need to add both the denominator and the numerator When adding or subtracting fractions the denominators always need to be the same You find a tenth of a number by removing its final zero

Algebra - year 4

Programme Of Study	Pupils are taught to (National Curriculum Objectives)	Notes and Guidance
Algebra **Vocabulary** multiply divide place value decimal places rounding remainder problem solve context missing number order of operations value equation expression algebra variable unknown solution satisfy pairs of values	• solve problems involving multiplying and adding, including using the distributive law to multiply two digit numbers by one digit, integer scaling problems and harder correspondence problems such as n objects are connected to m objects. (MULTIPLICATION OBJ) • Partition, round and order four-digit whole numbers; use positive and negative numbers in context and position them on a number line;	

Fluency	Reasoning	Problem Solving
* state inequalities using the symbols < and > (e.g. –3 > –5, –1 < +1)		* Represent a puzzle or problem using number sentences, statements or diagrams; use these to solve the problem; present and interpret the solution in the context of the problem

Probing Questions

Show me…	Convince me…	What's the same? What's different?	Always, sometimes, never…
… how would you solve this problem: Milly is saving £2.75 a week to buy a pair of jeans. The jeans cost £37. For how many weeks does she need to save? … how you would solve this problem: In Sports 4 U, there are 18 large boxes each containing 136 footballs. How many footballs are there altogether?	… that 134 ÷ 7 and 132 ÷ 7 have the same answer to the nearest whole number …that there are an infinite number of solutions to x + y = 12. … why 6×100 and 60×10 give the same answer … what 0.6 would mean on a calculator display if the units were pounds, metres, hours, cars	x + y = 10 x + y = 7 2x + 2y = 20 3 + y = 10 2x + y = 17 4x = 20 3x + 2y = 29 8x + 4y = 68	…There are an infinite number of possible values for: x + y = 11 x + 5 = 20 2x + y = 10 …Algebra always uses x and y. x and y are whole numbers.

Properties of shapes - year 4			
Programme Of Study	**Pupils are taught to (National Curriculum Objectives)**	**Notes and Guidance**	
Properties of shape **Vocabulary** angles degrees measure construct draw accurately sketch visualise net 2-D 3-D protractor angle measurer regular properties lines net corners sides faces edges vertices base length width height depth isometric horizontal parallel	* compare and classify geometric shapes, including quadrilaterals and triangles, based on their properties and sizes * identify acute and obtuse angles and compare and order angles up to two right angles by size * identify lines of symmetry in 2-D shapes presented in different orientations complete a simple symmetric figure with respect to a specific line of symmetry • Draw polygons and classify them by identifying their properties, including their line symmetry • Describe and visualise 3-D and 2-D shapes; classify them according to their properties	Ensure pupils continue to classify shapes, extending to classifying different rectangles and triangles. Ensure pupils continue to practise drawing circles with a compass and use the related vocabulary.	
	Fluency	**Reasoning**	**Problem Solving**
	• compare and order angles up to two right angles by size • Make shapes and patterns with increasing accuracy	• compare and classify geometric shapes, including quadrilaterals and triangles, based on their properties and sizes • Visualise 3-D objects from 2-D drawings; make nets of common solids • Make and investigate a general statement about familiar numbers or shapes by finding examples that satisfy it	• Solve problems in the context of shape • Systemically sort shapes in a variety of ways

	Probing Questions – Properties of shape – YEAR 4			
	Show me…	**Convince me…**	**What's the same? What's different?**	**Always, sometimes, never…**
	... a shape that is symmetrical ... a shape that has 2 lines of symmetry ... a line of symmetry on a triangle ... a pattern that is symmetrical ... a shape that has 1 line of symmetry ... a picture that has some symmetry in it	... that a square has more than one line of symmetry ... that a rectangle doesn't have more than 2 lines of symmetry ... that an equilateral triangle has more than one line of symmetry ... that this image has not been completed correctly to produce a shape with a line of symmetry as shown (present your own diagram)	square, rectangle, rhombus, parallelogram circle, triangle, square hexagon, pentagon, octagon A 6cm by 6cm square and a 7cm by 5cm rectangle.	…Quadrilaterals have four lines of symmetry …The number of lines of symmetry is the …same as the number of sides on the shape ...A square is a rectangle.

Position, direction and movement - year 4

Programme Of Study	Pupils are taught to (National Curriculum Objectives)	Notes and Guidance
Position, directions and movement **Vocabulary** transformation object original image coordinate point vertex axes x-axis y-axis origin reflection mirror line line of reflection translation congruent	• describe positions on a 2-D grid as coordinates in the first quadrant • describe movements between positions as translations of a given unit to the left/right and up/down • plot specified points and draw sides to complete a given polygon. • Recognise horizontal and vertical line • Know that angles are measured in degrees and that one whole turn is 360°	Ensure pupils draw a pair of labelled axes in one quadrant and regularly read, write and use pairs of coordinates, e.g. (2, 5). Ensure pupils regularly practise recognising line symmetry in a variety of diagrams. Exclude rotational symmetry.

Fluency	Reasoning	Problem Solving
• compare and order angles less than 180° • Recognise reflective symmetry in 2-D shapes, reflections and translations • Recognise positions and directions, and use co-ordinates • Make turns; estimate, draw and measure angles; recognise rotations	• describe positions on a 2-D grid as coordinates in the first quadrant • describe movements between positions as translations of a given unit to the left/right and up/down • use the eight compass points to describe direction • describe and identify the position of a square on a grid of squares	* Solve problems involving position and direction

Probing Questions

Show me…	Convince me…	What's the same? What's different?	Always, sometimes, never…
… the point (3, 0) … the point (0, 3) … the point (0, 0) … the point that will form a square with these three points (give 3 vertices) … where the shape will go if translated 3 squares up … the new shape after a translation of 2 squares across and 3 squares up … the new co-ordinates after a translation of 2 squares to the left … four co-ordinates that form a parallelogram	… that the coordinates in the first quadrant will always be positive ,,, a translated shape cannot be a reflection of the original object … if you translate a shape 3 squares to the right then all the coordinates increase by 3 in the x coordinate.	(3, 4); (3, 2); (3, 6); (1, 3); (3, 0); (3, 3); (5, 3) translation across 2; translation up 2; translation down 2; translation right 2; translation left 2 (6, 2); (4, 2); (5, 3); (5, 0)	… a coordinate in the first quadrant can be negative … coordinates on the axes contain a 0 … coordinates on a vertical line have the same y-coordinate … a translated shape will be the same size as the original … a translation moves shapes further away from the origin

BLACK = NC Objectives BLUE= Missing Objectives, tested in national assessments

Measurement - year 4

Programme Of Study	Pupils are taught to (National Curriculum Objectives)	Notes and Guidance
Measurement **Vocabulary** perimeter length total sum area square units e.g. mm2 m2 cm2 base width breadth height volume cubed units	* Convert between different units of measure [for example, kilometre to metre; hour to minute] measure and calculate the perimeter of a rectilinear figure (including squares) in centimetres and metres * find the area of rectilinear shapes by counting squares * estimate, compare and calculate different measures, including money in pounds and pence * read, write and convert time between analogue and digital 12- and 24 hour clocks * solve problems involving converting from hours to minutes; minutes to seconds; years to months; weeks to days * Choose and use standard metric units and their abbreviations when estimating, measuring and recording length, weight and capacity; know the meaning of 'kilo', 'centi' and 'milli' and, where appropriate, use decimal notation to record measurements (e.g. 1.3 m or 0.6 kg) * Draw rectangles and measure and calculate their perimeters; find the area of rectilinear shapes drawn on a square grid by counting squares * Read time to the nearest minute; use am, pm and 12-hour clock notation; choose units of time to measure time intervals; calculate time intervals from clocks and timetables * Read the time from clocks, calendars and timetables	Ensure pupils continue, from Year 3, to practise calculating the perimeter of rectilinear and related composite shapes (rectangles and squares), including where one or more lengths have to be deduced using properties of the shape. [184] Ensure pupils are introduced to area, initially by counting squares (e.g. cm2 squares) and later using perimeter measurements to calculate areas.

Fluency	Reasoning	Problem Solving
• Convert between different units of measure [for example, kilometre to metre; hour to minute] • measure and calculate the perimeter of a rectilinear figure (including squares) in centimetres and metres • find the area of rectilinear shapes by counting squares • estimate, compare and calculate different measures, including money in pounds and pence • read, write and convert time between analogue and digital 12- and 24hour clocks • Interpret intervals and divisions on partially numbered scales and record readings accurately, where appropriate to the nearest tenth of a unit • calculate time intervals from clocks and timetables • Know and use relationships between familiar units • Measure and calculate the perimeter and area of simple shapes	• Suggest suitable units to estimate or measure length, mass or capacity • Suggest suitable measuring equipment, record estimates and readings from scales to a suitable degree of accuracy • Use the vocabulary related to time; suggest suitable units of time to estimate or measure	* solve problems involving converting from hours to minutes; minutes to seconds; years to months; weeks to days

BLACK = NC Objectives BLUE= Missing Objectives, tested in national assessments

	Probing Questions - Measurement – YEAR 4			
	Show me…	**Convince me…**	**What's the same? What's different?**	**Always, sometimes, never…**
	... a shape with a perimeter of 16cm. ... a shape with an area of 12 square cm ... two different rectangles with a perimeter of 18cm. ... all the shapes you can find with an area of 5cm2 ... how you would calculate the total cost of three pens that cost £1.29 each ... how you can share £7.80 between three people evenly ... the cost per book if 6 identical books cost £14.34 ... another way of writing 12 o'clock ... and another ... and another ... a time that is equivalent to 300 minutes	... that the area of a 4cm by 5cm rectangle is 20cm2, regardless of how you count .... that if you know the side lengths of a rectangles, you can work out its perimeter quickly without measuring. ... that you can find the width of a rectangle if you know its length and its perimeter ... that 20:40 is the same as 8:40pm ... that half an hour isn't the same as 50 minutes ... that there are 48 months in 4 years	Perimeter and Area Measure; Estimate; Calculate Total; Sum; Cost; Change; Difference; Altogether; More Than Change from £5 buying 3 pens costing 89p each; Price per magazine if four magazines cost £9.32 12-hour watch; 24-hour watch; analogue watch 30 days, a month, June, July (more than one answer/justify) 2 days, 20 hours, 48 hours	…The perimeter of a square is 4 times its length …A square has less area than a rectangle. …The area of a shape is an even number. …The perimeter of a shape is the same as its area. …Larger packs are better value than smaller packs …Four weeks is longer than a month

Statistics - year 4

Programme Of Study	Pupils are taught to (National Curriculum Objectives)	Notes and Guidance
Statistics **Vocabulary** pie chart proportion distribution scaled up/scaled down compare line graph axes scale prediction trend mean average	* interpret and present discrete and continuous data using appropriate graphical methods, including bar charts and time graphs. * solve comparison, sum and difference problems using information presented in bar charts, pictograms, tables and other graphs. * Use Venn diagrams or Carroll diagrams to sort data and objects using more than one criterion	Ensure pupils continue to practise interpreting a variety of bar graphs so that they can read, write, analyse and solve problems confidently in Year 4. They should continue to apply their knowledge in science and other subjects as appropriate. Ensure pupils use horizontal and vertical representations of bar graphs so that pupils are confidently able to interpret and write the variable on the horizontal axis (e.g. shoe size) and the frequency on the vertical axis (e.g. number of people).

Fluency	Reasoning	Problem Solving
	• Compare the impact of representations where scales have intervals of differing step size • interpret and present discrete and continuous data using appropriate graphical methods, including bar charts and time graphs • Use the language associated with probability to discuss events, including those with equally likely outcomes	* Solve a problem by collecting, organising, representing, extracting and interpreting data in tables, graphs and charts * Answer a question by identifying what data to collect; organise, present, analyse and interpret the data in tables, diagrams, tally charts, pictograms and bar charts, using ICT where appropriate

Probing Questions

Show me…	Convince me…	What's the same? What's different?	Always, sometimes, never…
… some data that is discrete/categorical/continuous … a sketch of a bar chart … a sketch of a frequency diagram … how you can sort this data out into classes/categories … which chart would be best to display: A person's height from age 0 to age 20. A person's pulse rate during the data. A class' favourite colour. The pupils' favourite music from a year group at school. The sales of ice creams at a shop over a month in July. Votes for all the celebrities in a tv talent contest for one show. Votes for one celebrity in a tv talent contest	… that these are equal class intervals … that a line graph is the best to use for this data (temperature each month)	… bar chart and frequency diagram … discrete and continuous data … bar chart and line graph	… when drawing a bar chart you want to make the step size as small as possible … bar charts have bars that do not touch … all data is discrete once we measure it

BLACK = NC Objectives BLUE= Missing Objectives, tested in national assessments

Number, place value and ordering - year 5

Programme Of Study	Pupils are taught to (National Curriculum Objectives)	Notes and Guidance
Number, place value ordering **Vocabulary** Hundreds Thousands Ten Thousands Millions tenths hundredths thousandths Place Value Order Compare Numerals Position Estimate Positive Negative Rounding Nearest Integers Decimal place	* read, write, order and compare numbers to at least 1 000 000 and determine the value of each digit * count forwards or backwards in steps of powers of 10 for any given number up to 1 000 000 * interpret negative numbers in context, count forwards and backwards with positive and negative whole numbers, including through zero * round any number up to 1 000 000 to the nearest 10, 100, 1000, 10 000 and 100 000 * solve number problems and practical problems that involve all of the above * read Roman numerals to 1000 (M) and recognise years written in Roman numerals * Recognise and describe linear number sequences including those involving fractions and decimals and find the term to term rule and express it in words * extend and apply understanding of the number system to the decimal numbers and fractions they have met so far * use the vocabulary on estimation and approximation. * make and justify estimates of large numbers, and estimate simple proportions such as 1/3, 7/10	Ensure pupils continue to practise reading and saying regularly the place value of each digit in up to six digit numbers, including decimals

Fluency	Reasoning	Problem Solving
* count forwards or backwards *order and compare numbers * represent numbers in different ways * identify the positional place value in large whole numbers and numbers up to 3 dec places * understand that in the number 63472 we can find the multiplicative place value of each digit by multiplying each digit by the column it is in e.g. 6 x 1000 * recognise the additive place values of each digit so that when the individual values of each digit are added together, they total the whole number. * use rounding to estimate the results of calculations * know when to use a mental strategy or jottings to work out answers to calculations. * use known facts to work out unknown facts	• complete sequences • find errors in sequences and explain answers • explain why digits belong in different positions in a number • show reasoning when rounding • Convince a friend of the value of each digit in integer and numbers • Explain why 2.85 x 100 – 285 and not 2.8500 • Use positional place value to reason about numbers between numbers, including decimals • Use understanding of place value to spot mistakes • Explain how you know when to use a mental strategy or j work out answers to calculations. • Give reasons for choices of methods • Explain why one calculation strategy is more efficient than another.	• strategies to solve word problems • Find multiple solutions to a problem and know when all solutions have been found or where there are an infinite number of solutions. • Have a range of strategies to solve any problem • Represent problems using apparatus to organise thinking

BLACK = NC Objectives BLUE= Missing Objectives, tested in national assessments

	Probing Questions – Number, place value and ordering – YEAR 5			
	Show me…	**Convince me…**	**What's the same? What's different?**	**Always, sometimes, never…**
	... the number 3 million four hundred and fifty-seven thousand, six hundred and fifty-four in symbols ... the number 2, 045, 678 in words ... where 345, 678 would be on this number strip that goes from - 0-1000,000 - 300,000 - 400,000 - 345,000 - 350,000 - 345,000 - 346,000 ... a number that rounds to 546,000 when rounded to the nearest 1000 ... a number that rounds to 567,800 when rounded to the nearest 100 ... a number that rounds to 2.6 when rounded to 1 decimal place ... a possible value for ? in 5.4 < ? < 5.51 .. a number between 0.12 and 0.17. Which of the two numbers is it closer to? How do you know? ... how you order these numbers 7.765, 7.675, 6.765, 7.756, 6.776	.... that 0.35 is greater than 0.035? ...that these numbers are in ascending order: 3.41, 3.419, 3.5, 3.507, 3.52 ... that both 567,501 and 568499 round to 568000 to the nearest thousand ...why might it not be possible to identify the first three places in a long jump competition if measurements were taken in metres to one decimal place ... that MMXVI is 2016 in Roman Numerals	72.344 and 72.346 -5, -50, 50, 5 -6, -5, -2, 4 5.67, 5.69, 5.73, 5.64 MMC, MCM, MMCM	… 3.5 is closer to 4 than it is to 3 … –36 is greater than –34 … 0 is greater than 9, so 0.10 is greater than 0.9 … There is only one pair of numbers with a sum of 3 and difference of 11

Addition and subtraction - year 5

Programme Of Study	Pupils are taught to (National Curriculum Objectives)	Notes and Guidance
Addition and Subtraction **Vocabulary** calculate mentally formal method column method integer decimal add plus sum total subtract take away difference represent estimate round approximate formula term	* add and subtract whole numbers with more than 4 digits, including using formal written methods (columnar addition and subtraction) * add and subtract numbers mentally with increasingly large numbers * use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy * solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why. * Addition – to reorder numbers in a calculation	Ensure pupils continue practising formal written methods with increasingly large numbers so they are fluent and precise. This will aid the introduction of adding and subtracting with decimals in this year. [197] Ensure pupils continue to practise fast responses for mental calculations with increasingly large numbers, for example: 12,462 – 2,300 = 10,162.

Fluency	Reasoning	Problem Solving
• Follow a set of instructions to calculate a mystery number • Understand and use commutativity and associativity in addition and subtraction • Find differences by counting up through next multiple of 10, 100 or 1000 e.g. calculate mentally issues such as 8,006-2,993. • Identify near doubles, such as 1.5+1.6= • Add or subtract the nearest multiple of 10 or 100 and then adjust • Add several numbers, e.g. 4 or 5 single digit numbers or multiples of 10, such as 40,50 and 80.	• Explain and correct mistakes that have been made in calculations • Make conjectures about the relationships between different calculations • Give reasons for choices of methods and strategies • Use the vocabulary of addition and subtraction	• Work systematically and logically • Use information given to find missing information without prompting • Solve two (or more) step problems that involve addition & subtraction. • Use different representations to understand and solve problems (e.g. bar model)

BLACK = NC Objectives BLUE= Missing Objectives, tested in national assessments

	Probing Questions - addition and subtraction – YEAR 5			
	Show me…	**Convince me…**	**What's the same? What's different?**	**Always, sometimes, never…**
	two numbers that are easy to add … two numbers that are hard to add … two numbers that are easy to subtract … two numbers that are hard to subtract … a calculation that is connected to 234 567 + 157 892 = 392 459 (and another….) … two numbers less than 10 with a difference of 3.56	… that 9 000 x 800 = 7 200 000 … that if I know 23 + 45 I can also find 2.3 + 4.5 … that 4.9 + 7 = 5.6 … 6.32 + 1.68 = 8 Make an estimate … …. Which number is the best estimate to 932.6—931.05? (1.3 1.5 1.7 1.9). Why?	When I round numbers to one decimal place and two decimals? How does it work for measurements of length? Money? What do you notice?	… Addition makes a number larger … Subtraction makes a number smaller

Multiplication and division - year 5		
Programme Of Study	**Pupils are taught to (National Curriculum Objectives)**	**Notes and Guidance**
Multiplication And division **Vocabulary** Multiply product represent estimate round approximate dividend divisor remainder brackets prime composite factor multiple squared cubed	* identify multiples and factors, including finding all factor pairs of a number, and common factors of two numbers * know and use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers establish whether a number up to 100 is prime and recall prime numbers up to 19 * multiply numbers up to 4 digits by a one- or two-digit number using a formal written method, including long multiplication for two-digit numbers * multiply and divide numbers mentally drawing upon known facts divide numbers up to 4 digits by a one-digit number using the formal written method of short division and interpret remainders appropriately for the context * multiply and divide whole numbers and those involving decimals by 10, 100 and 1000 * Apply all of the multiplication tables and related division facts frequently, commit them to memory and use them confidently to make larger calculations * Pupils interpret non-integer answers to division by expressing results in different ways according to the context, including with remainders, as fractions, as decimals or by rounding (e.g. 98 ÷ 4 = 24 r 2 = 24 ½ = 24.5 = 25) * Pupils use multiplication and division as inverses to support the introduction of ratio in Year 6, for example, by multiplying and dividing by powers of 10 in scale drawings or by multiplying or dividing by powers of 1000 in converting between units such as km and m * Distributivity can be expressed as a(b + c) = ab + ac * They understand the terms factor, multiple and prime, square and cube numbers and use them to construct equivalent statements (for example, 4 x 35 = 2 x 2 x 35; 3 x 270 = 3 x 3 x 9 x 10 = 9^2 x 10) * Pupils use and explain the = sign to indicate, equivalence, including missing number problems (for example, 13 + 24 = 12 + 25; 33 = 5 x □) * Know and apply tests of divisibility by 2,4,5,10 or 100. * Begin to use brackets * Use the principles of the arithmetic laws as they apply to multiplication. * To reorder numbers in a multiplication	Ensure pupils extend their use of written methods for multiplication to practise long multiplication. Also, ensure pupils continue to practise and apply all the multiplication tables and related division facts as often as possible to ensure they are committed to memory and can be used confidently to make larger calculations Ensure pupils record answers for non-integer division in different ways, including: with remainders, fractions, decimals or with rounding, for example: 98 ÷ 4 = 24 r 2 = 24½ = 24.5 = 25.

Multiplication and division – Year 5

Fluency	Reasoning	Problem Solving
• Identify factors & multiples of at least 12 x 12; recognising common factors and common multiples • Multiply and divide mentally using known facts • Use formal method to multiply and divide up to 4 digits • Recognise prime and composite numbers • Solve equations with missing numbers • Understand what letters represent in algebraic expressions • Doubling and halving starting from known facts. • Use closely related facts either by multiplying by 19 or 21, multiply by 20 and adjusting. • Partition e.g 47x6=(40x6)+(7x6)	• Decide which operations and methods to use and why • Explain and convince others how you know a number is a prime number • Justify why adding 2 odd numbers makes an even number • Conjecture answers using known facts • Explain and convince others how you know a number is a prime number • Justify why adding 2 odd numbers makes an even number • Conjecture answers using known facts • Apply to fractions, decimals and percentages • Use logic to decide how to manage remainders when dividing • Explain general rules for sequences e.g. the term-to-term rule • Verbalise general rules in mathematics • Give further examples to match one or more criteria • Generalise and express a rule to find any term • Use mathematical vocabulary when generalising	• Work systematically and logically • Use information given to find missing information • Solve problems which involve multiplication and division • Solve problems that involve division • Express missing measures algebraically • Solve missing term problems in sequences • Solve multi-step problems involving equations, including with more than one missing number • When solving problems use apparatus to combine terms

Probing Questions

Show me…	Convince me…	What's the same? What's different?	Always, sometimes, never…
… 10 more than ___, 100 more than ___, 1000 more than ___ … 10 less than ___, 100 less than ___, 1000 less than ___ … A square number … A cube number … A multiple of 5, 6, … … A factor of 60, … … A common factor of 24 and 40 … A prime number < 19 … A composite number	...4090 + 10 ≠ 5000 ...8 is a factor of 56 ...90 is a multiple of 3 ...2 is a prime number ...1 is not a prime number ... some numbers are cube numbers and square numbers	1, 3, 7, 11 2, 5, 10, 20 factor; multiple prime number; composite number 30 x 60; 300 x 6; 300 x 60; 3 x 600; 3 x 6	… A number has an even number of factors … A number has an even number of multiples … Pick a number, multiply by 6, add 1. The answer is a prime number. … Prime numbers are odd … Prime numbers can be a multiple of 4 … A number squared is less than the same number cubed.

BLACK = NC Objectives BLUE= Missing Objectives, tested in national assessments

Fractions - year 5		
Programme Of Study	**Pupils are taught to (National Curriculum Objectives)**	**Notes and Guidance**
Fractions **Vocabulary** fraction part whole numerator denominator percent mixed number improper equivalent compare decimal operator proportion simplify scale	* compare and order fractions whose denominators are all multiples of the same number * identify, name and write equivalent fractions of a given fraction, represented visually, including tenths and hundredths * recognise mixed numbers and improper fractions and convert from one form to the other and write mathematical statements > 1 as a mixed number [for example, 2/5 + 4/5 = 6/5 = 1 1/5 * multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams (related to scaling and problems involving simple rates) * round decimals with two decimal places to the nearest whole number and to one decimal place * read, write, order and compare numbers with up to three decimal places solve problems involving number up to three decimal places and are confident in checking the reasonableness of their answers to problems * Write % as a fraction and solve problems which require knowing percentage and decimal equivalents of ½, ¼, 1/5, 2/5, 4/5 and those fractions with a denominator of a multiple of 10 or 25. * read and write decimal numbers as fractions (for example, 0.71 = 71/100) * recognise and use thousandths and relate them to tenths, hundredths and decimal equivalents * add and subtract fractions with the same denominator and denominators that are multiples of the same number (Extend understanding to calculations that exceed 1 as a mixed number)	Ensure pupils continue to develop further their understanding of fractions as numbers, measures and operators by finding fractions of numbers and quantities, writing remainders as a fraction. Ensure pupils read and write proper fractions and mixed numbers accurately and continue to practise counting forwards and backwards with mixed fractions. Pupils should extend their understanding of adding and subtracting fractions to calculations that exceed 1 as a mixed number. Ensure pupils practise adding and subtracting decimals, initially calculating with the same number of decimal places, moving on to a mix of whole numbers and decimals with different numbers of decimal places. Ensure pupils recognise and use complements of 1 using addition and subtraction facts and place value; e.g. 0.83 + 0.17 = 1. Ensure pupils continue to practise counting forwards and backwards using decimal fractions, and mental addition and subtraction of tenths and 1 digit whole numbers and tenths. Ensure pupils say, read and write decimal fractions and related tenths, hundredths and thousandths with accuracy and ensure pupils Ensure pupils make connections between percentages, fractions and decimals. They should recognise that percentages are operators.

BLACK = NC Objectives BLUE= Missing Objectives, tested in national assessments

multiplier divisor	* recognise the per cent symbol (%) and understand that per cent relates to 'number of parts per hundred', and write percentages as a fraction with denominator 100, and as a decimal	

Fractions – year 5		
Fluency	**Reasoning**	**Problem Solving**
• Identify fractions, decimals and percentages of shapes, objects and quantities and move between them • Compare and order fractions, decimals and percentages using <, >, =, ≠ • Add & subtract different representations of fractions (including different denominators), decimals and percentages by converting them • Find missing fractions to complete calculations • Multiply fractions by whole numbers	• Explain why fractions, decimals and percentages can be compared • Reason about which fraction of something you would prefer • Explain how you can add fractions, decimals and percentages • Convince others that an answer is correct by explaining Explain your solutions and convince others of your methods.	• Work systematically and logically • Use information given to find missing information • Solve problems that involve comparing & ordering fraction, decimals and percentages • Work systematically and logically • Use information given to find missing information • Solve problems that involve comparing & ordering fraction, decimals and percentages. • Conjecture different patterns that can be seen and why when solving problems • Solve problems that involve multiplying fractions by whole numbers
Probing Questions		

Show me…	Convince me…	What's the same? What's different?	Always, sometimes, never…
... a fraction that is equivalent to 3⁄4 ... a fraction that is equivalent to 7/10 ... a mixed number, and another, ... a proper fraction, and another, ... an improper fraction, and another, ... as many different representations of 5/4 as you can (use symbols, writing, images and models) ... two fractions where one has a denominator that is a multiple of the other ... how you order: 3/10, 3/4, 1/5, 3/20 ... where you would position 3⁄4 and 3/8 on this number line..... ... what about 3/5? 3/6? 3/7? ....how you can use arrays to subtract fractions with same denominator ... two fractions with a sum of 7/9 ... two fractions with a difference of 2/11 ....how you can multiply 3/4 × 12 ....how you can multiply !!! × 12 ... a fraction and a whole number with a product of 8/12	... that ten thousandths is equivalent to one hundredth ... that 7/12 < 2/3 ... that 0.3 = 30/100 ... that 1/2 cannot be written as 1.2 ... 13/10 = 1 3/10 ... 0.1 = 10% ...1/5 + 1/10 = 3/10 ...that if 1/2 a bar of chocolate is eaten one day then 1/3 of a bar the next day then there will be 1/6 of a bar left	improper fraction; mixed number; proper fraction; unit fraction; non unit fraction; vulgar fraction; whole number …3/12 ,25/100, 4/16, 1/4 …1 1/8, 1 4/5, 45/25, 9/5 …3/10, 8/3, 3 1/10, 25/100 …0.1, 3/10, 0.25, 1/4 …0.2, 20%, 2/10, 2.1	…Percentages are fractions with a denominator of 100 …Every percentage can be written as a fraction …Every fraction can be written as a percentage …Improper fractions must be greater than 1 …Mixed numbers are better than improper fractions …You simplify a fraction by dividing the numerator and denominator by 2. …When adding or subtracting fractions you need to add both the denominator and the numerator. …The denominator needs to be the same when adding or subtracting fractions. …When you multiply a fraction by a whole number, you get an answer greater than 1.

Algebra - year 5		
Programme Of Study	**Pupils are taught to (National Curriculum Objectives)**	**Notes and Guidance**
Algebra **Vocabulary** multiply divide place value decimal places rounding	• Distributivity can be expressed as a(b + c) = ab + ac • Pupils use and explain the = sign to indicate, equivalence, including missing number problems (for example, 13 + 24 = 12 + 25; 33 = 5 x □) • Use the relations of perimeter or area to find unknown lengths. Missing measures questions such as these can be expressed algebraically, for example 4 + 2b = 20 for a rectangle of sides 2cm and b/cm and perimeter of 20cm	

remainder problem solve context missing number order of operations value equation expression algebra variable unknown solution satisfy pairs of values	Fluency	Reasoning	Problem Solving
	• Solve equations with missing numbers • Understand what letters represent in algebraic expressions	* Make and investigate a general statement about familiar numbers by finding examples that satisfy it. Explain a generalised relationship (formula) in words	

	Probing Questions			
	Show me…	**Convince me…**	**What's the same? What's different?**	**Always, sometimes, never…**
	… how you would solve this problem: Milly is saving £2.75 a week to buy a pair of jeans. The jeans cost £37. For how many weeks does she need to save? … how you would solve this problem: In Sports 4 U, there are 18 large boxes each containing 136 footballs. How many footballs are there altogether?	… that 134 ÷ 7 and 130 ÷ 7 have the same answer to the nearest whole number …that there are an infinite number of solutions to x + y = 12. … why 6×100 and 60×10 give the same answer … what 0.6 would mean on a calculator display if the units were pounds, metres, hours, cars	x + y = 10 x + y = 7 2x + 2y = 20 3 + y = 10 2x + y = 17 4x = 20 3x + 2y = 29 8x + 4y = 68	There are an infinite number of possible values for: x + y = 11 x + 5 = 20 2x + y = 10 Algebra always uses x and y. x and y are whole numbers.

Properties of shape - year 5		
Programme Of Study	**Pupils are taught to (National Curriculum Objectives)**	**Notes and Guidance**

Properties of shape **Vocabulary** angles degrees measure construct draw accurately sketch visualise net 2-D 3-D protractor angle measurer regular properties lines net corners sides faces edges vertices base length width height depth isometric horizontal parallel	• identify 3-D shapes, including cubes and other cuboids, from 2-D representations • know angles are measured in degrees: estimate and compare acute, obtuse and reflex angles • draw given angles, and measure them in degrees (o) • identify: angles at a point and one whole turn (total 360o), angles at a point on a straight line and ½ a turn (total 180o), other multiples of 90o • use the properties of rectangles to deduce related facts and find missing lengths and angles • distinguish between regular and irregular polygons based on reasoning about equal sides and angles • Pupils become accurate in drawing lines with a ruler to the nearest mm, and measuring with a protractor. They use conventional markings for parallel lines and right angles • Pupils use angle sum facts and other properties to make deductions about missing angles and relate these to missing number problems • Classify triangles (brackets isosceles, equilateral, scalene) using criteria such as equal sides, equal angles, lines of symmetry. • Recognise reflective symmetry in regular polygons. • Complete symmetrical patterns with two lines of symmetry at right angles (using squared paper or pegboard) • Make shapes with increasing accuracy. Visualise 3-D shapes from 2D drawings and identify different nets from an open cube.	Ensure pupils continue to practise regularly drawing lines with a ruler and measuring with a protractor and become confident with using conventional markings for parallel lines and right angles. Include the term 'diagonal' and related properties of diagonal with reference to angles and sides.

Fluency	Reasoning	Problem Solving
• Measure and draw angles, lines and shapes accurately using appropriate equipment • Find missing angles in triangles, quadrilaterals, at a point and on a line • Reflect shapes across horizontal, vertical & diagonal lines • Translate a shape from one place to another	• Explain how to calculate missing angles • Justify properties of shapes by using known facts and convince others of your findings • Explain where a shape will end up and why it ends up there • Understand vocabulary such as perpendicular, parallel, etc.	• Work systematically and logically • Use information given to find missing information • Solve problems that involve angles, shapes and/or direction • Solve problems that involve reflecting & translating shapes

Probing Questions

Show me…	Convince me…	What's the same? What's different?	Always, sometimes, never…
…an angle of roughly 50 degrees … a right angle, … an acute angle … an angle larger than 140 degrees but smaller than 180 degrees … how you line the protractor up to measure this angle … the net of a cube … a net that won't fold to make a cube	… that a triangle cannot have 2 obtuse angles … that quadrilaterals have 360 degrees … that this angle (*draw one*) is not 140° … how to measure a reflex angle using a 180° protractor. … that this is a the net of a cube (*draw one)*	acute, obtuse, right, reflex angle protractor, angle measurer 90, 180, 270, 360 degrees cube, cuboid, square based pyramid	… Triangles have 180 degrees … Pyramids have triangular faces … A prism has to have at least one rectangular face …There are 11 possible nets for a cube.

Position, direction and movement - year 5		
Programme Of Study	**Pupils are taught to (National Curriculum Objectives)**	**Notes and Guidance**

Position, directions and movement **Vocabulary** transformation object original image coordinate point vertex axes x-axis y- axis origin reflection mirror line line of reflection translation congruent	• identify, describe and represent the position of a shape following a reflection or translation, using the appropriate language, and know that the shape has not changed. • Pupils recognise and use reflection and translation **in** a variety of diagrams including continuing to use a 2D grid and coordinates in the first quadrant, moving on to 4 quadrants. Reflection should be in lines that are parallel to the axes	Ensure pupils recognise and use reflection and translation in a variety of diagrams, including continuing to use a 2-D grid and co-ordinates in the first quadrant, moving towards 4 quadrants

Fluency	Reasoning	Problem Solving

Probing Questions

Show me…	Convince me…	What's the same? What's different?	Always, sometimes, never…
… where this shape will be if it reflected in this line … if it is translated 2 units right and 1 unit up … the line of reflection that was used to get this image … how this shape was translated to get this image	… that the object is always the same size as the reflected image … that the object is always the same size as the translated image … that you can tell what the translation was from just one coordinate from the object and the image	Translate a shape and reflect the shape. Explain what is the same and what is different about the two transformed shapes translate then reflect; reflect then translate	… translated shapes will always rotate … translated shapes must always be the same size … translated shapes must always have the same orientation … translation takes the shape further away from the origin … mirror lines do not touch the original shape or its image … translations are easier than reflections

Measurement - year 5		
Programme Of Study	**Pupils are taught to (National Curriculum Objectives)**	**Notes and Guidance**

Measurement

Vocabulary
perimeter
length
total sum
area
square units e.g. mm2 m2 cm2
base
width
breadth
height
parallelogram
volume
cubed units e.g. km3 m3 cm3 mm3

- convert between different units of metric measure (for example, kilometre and metre; centimetre and metre; centimetre and millimetre; gram and kilogram; litre and millilitre). Understand and use approximate equivalences between metric units and common imperial units such as inches, pounds and pints
- measure and calculate the perimeter of composite rectilinear shapes in centimetres and metres
- calculate and compare the area of rectangles (including squares), and including using standard units, square centimetres (cm^2) and square metres (m^2) and estimate the area of irregular shapes
- estimate volume [for example, using 1 cm^3 blocks to build cuboids (including cubes) and capacity [for example, using water]
- solve problems involving converting between units of time (for example, days to weeks, expressing the answer as weeks and days). Use all four operations to solve problems involving measure [for example, length, mass, volume, money] using decimal notation, including scaling.
- Use the relations of perimeter or area to find unknown lengths. Missing measures questions such as these can be expressed algebraically, for example 4 + 2b = 20 for a rectangle of sides 2cm and b/cm and perimeter of 20cm
- Calculate the area from scale drawings using given measurements
- Use units of time; read the time on a 24-hour digital clock and use digital 24-hour clock notation such as 19:53

Ensure pupils' calculation of area is extended to include scale drawings in metres (m and m2) but without converting between cm2 and m2. Also ensure pupils' calculation of perimeter is extended to composite shapes.

Fluency	Reasoning	Problem Solving
• Tell the time using the 12-hour and 24 hour clock, both digital and analogue • Read a variety of scales accurately • Use apparatus to illustrate volume		

Probing Questions

Show me…	Convince me…	What's the same? What's different?	Always, sometimes, never…
... a shape with a perimeter of 12cm ... the perimeter of a rectangle of 3cm by 6cm ... the area of the same rectangle ... another rectangle with the same perimeter as mine ... another rectangle with the same area as mine ... a shape with a volume of 6 cm3 ... how many more cubes are needed to turn this shape into a cuboid	... that the area of a 3cm by 2cm rectangle is 600mm2. ... that cutting a corner (small rectangle) out from a rectangle does not change the perimeter	a 4 x 9 rectangle, a 6 x 6 square, a 3 x 12 rectangle and a 5 x 7 rectangle the perimeter of these two shapes: *(draw them)* volume; capacity; area; perimeter; length	… The area of a rectangle can be found by calculating the length x width. … A taller glass holds more liquid than a shorter glass. …A cube-shaped box with (internal) sides of 10cm will hold a litre of water.

Statistics - year 5

Programme Of Study	Pupils are taught to (National Curriculum Objectives)	Notes and Guidance
Statistics **Vocabulary** pie chart proportion distribution scaled up/scaled down compare line graph axes scale prediction trend mean average	• solve comparison, sum and difference problems using information presented in a line graph • complete, read and interpret information in tables, including timetables. • Pupils connect their work on coordinates and scales to their interpretation of line graphs • They begin to decide which representations of data are most appropriate and why	Ensure pupils regularly practise reading and interpreting so that pupils are confident in completing tables and bar graphs and using data diagrams, such as tally charts. Also ensure that pupils relate pie charts to angles and percentages.

Fluency	Reasoning	Problem Solving
• Collect and organise information in tables and/or graphs as appropriate • Answer literal questions involving line graphs & tables, including timetables	• Prove that your findings are accurate • Justify any conjectures you make using the information from the graph or table. • Reason why a graph might give the results it does.	• Interpret a variety of graphs and table to solve problems • Use logic to make up stories to fit graphs in a variety of forms

Probing Questions

Show me…	Convince me…	What's the same? What's different?	Always, sometimes, never…
… how you would find the temperature in May from this graph? … how you would find the difference between the temperature in June and in January using this graph? … how you would estimate the temperature in between Sep and Oct using this graph … a bus on this timetable that leaves before 7am … what time the 0815 bus gets to Crewe … the last train I can catch to get back home to Torquay by 1800	… there are two ways to find out how many results were greater than 40 from this graph … this bus is quicker than the one at 1805	sum, total, altogether, more, difference, how many fewer, how many more	…timetables are always read vertically … line graphs are more useful than bar charts because they tell you values in between your data

Number, place value and ordering - year 6

BLACK = NC Objectives BLUE= Missing Objectives, tested in national assessments

Programme Of Study	Pupils are taught to (National Curriculum Objectives)	Notes and Guidance
Number, place value ordering **Vocabulary** Hundred Thousand Ten thousand Million Tenths Hundredths Thousandths Place Value Partition Million Billion Positive Negative Integer Decimal Decimal Point Decimal Place(s) Round Greater than, > Less than, <	* read, write, order and compare numbers up to 10 million and determine the value of each digit * Count forwards or backwards in steps of powers of 10 for any given number up to 1 000 000. Round any number up to 1 000 000 to the nearest 10, 100, 1000, 10 000 and 100 000 * interpret negative numbers in context, count forwards and backwards with positive and negative whole numbers, including through zero * Read Roman numerals to 1000 (M) and recognise years written in Roman numerals. * say numbers accurately * round any number to a required degree of accuracy use negative numbers in context, * demonstrate understanding of multiplying or dividing a whole number or a decimal by 10, 100 or 1000 estimate calculations use negative numbers in a range of contexts [not just temperature] * describe, extend and explain number sequences and patterns with whole numbers and decimals * round decimals to a required degree of accuracy in a range of contexts	Ensure pupils regularly practise saying, reading and writing numbers accurately. Binary numerals should be introduced so pupils are familiar with the concept of place value using a different base.

Fluency	Reasoning	Problem Solving
* understand that multiplying by 1000 is equivalent to multiplying by 10, then by 10, then by 10, or is equivalent to multiplying by 10 and then by 100. * respond quickly to written or oral questions when multiplying or dividing by 10,100 or 1000 including missing numbers [for example 0.8 x 10 = …] * round any whole number to the appropriate unit [cm, km, kg etc] * recognise squared [²] and cubed [³] numbers count forwards and backwards in different powers on 10 * count forwards and backwards in any single digit number use the correct vocabulary associated with properties of number partition any number – including decimals * understand that in the number 7 328 621 we can find the multiplicative place value of each digit by multiplying each digit by the column it is in [for example 8 x 1000 = 8000]	• comment on the effect of multiplying or dividing by 10, 100 or 1000 and how it would alter the place value of the digit • be able to estimate and explain how you worked out the estimate, including the position on a number line • make general statements about odd or even numbers and/or give examples that match them • determine the value of each digit and explain its value find and explain errors in sequences • discuss finding all numbers between two other numbers • convince someone why 0.1 is bigger than 0.09 • show in words and numbers the difference between a variety of digits within numbers • use rounding to spot mistakes • use understanding to spot and correct mistakes	* sort numbers logically and systematically * represent problems using apparatus to organise thinking use place value to calculate intervals

	Probing Questions – number, place value and ordering – YEAR 6

BLACK = NC Objectives BLUE= Missing Objectives, tested in national assessments

	Show me…	Convince me…	What's the same? What's different?	Always, sometimes, never…
	... a number that is ten greater than 16,548,891 - a thousand greater - ten thousand greater - ten million greater ... two numbers with a difference of 3 ... two negative numbers with a difference of 3 ... two numbers, one negative and one positive, with a difference of 3 ...a length that rounds 4.3m to one decimal place ... 84,684,152.391 rounded to - 1 dp - the nearest integer - the nearest 1000 etc.	...that 0.048 > 0.0084 ... that 85,635,147 is less than one hundred million ... that -73 is less than -1 ... that there are infinite pairs of negative numbers with a difference of 5 … that 3 568 121 rounds to 4 million to the nearest million	4.152 and 41.52 -730, -73, -37, -7.3 -16, -24, -3, -12 one, thousand, **million**, billion	…when you multiply a number by 11000, you add three zeroes to the end. … Dividing a decimal by 10 gives you a decimal answer. … 0 is a positive number … -3.5 rounds to -4 to the nearest integer

Addition and subtraction - year 6

Programme Of Study	Pupils are taught to (National Curriculum Objectives)	Notes and Guidance
Addition and Subtraction **Vocabulary** calculate mentally formal method column method integer decimal add plus sum total subtract difference represent Estimate Round Approximate Formula term	perform mental calculations, including with mixed operations and large numbers use their knowledge of the order of operations to carry out calculations involving the four operations solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why solve problems involving addition, subtraction, multiplication and division use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy. use negative numbers in context and calculate intervals across zero find what to add to a decimal with units, 10ths and 100ths to make the next higher whole number or 10th	Ensure pupils continue to practise calculating addition, subtraction, multiplication and division using formal written methods. Extend application of written methods to larger numbers. Ensure pupils continue to practise fast responses for mental calculations with increasingly large numbers and more complex calculations. Ensure pupils continue to use all the multiplication tables to calculate mathematical statements to maintain fluency. Include rounding answers to a specified degree of accuracy. For the order of operations include the use of brackets, for example: 2 + 1 x 3 = 5 and (2 + 1) x 3 = 9.

Fluency	Reasoning	Problem Solving
• add and subtract decimals, percentages and fractions with different denominators • recall and derive number bonds to 1 and bonds to different powers of 10 find doubles of up to 4 digit numbers and decimals to 2 d.p. • use the correct vocabulary associated with addition and subtraction • understand and use all arithmetic laws (commutative, associative and distributive) for example using knowledge of inverse operations	• decide which operations and methods to use and why • use knowledge of the order of operations to carry out calculations involving the four operations • use estimation and rounding to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy • use simple formulae • generate and describe linear number sequences • express missing number problems algebraically • understand the associative and commutative law of addition • find pairs of numbers that satisfy an equation with two unknowns	• working systematically and logically to solve a problem • find possibilities within a problem • count and work backwards and forwards • solve problems involving the calculation and conversion of units of measure • use knowledge of place value and addition and subtraction facts to solve addition and subtraction problems recognising when to use the most efficient strategy

	Probing Questions - addition and subtraction – year 6

BLACK = NC Objectives BLUE= Missing Objectives, tested in national assessments

	Show me…	Convince me…	What's the same? What's different?	Always, sometimes, never…
	two numbers that are easy to add ... two numbers that are hard to add ... two numbers that are easy to subtract ... two numbers that are hard to subtract ... a calculation that is connected to 234 567 + 157 892 = 392 459 (and another....) ... two numbers less than 10 with a difference of 3.56	… that 9 000 + 800 = 7 200 000 ... that if I know 23 + 45 I can also find 2.3 + 4.5 ... that 4.9 + 7 = 5.6 … 6.32 + 1.68 = 8 Make an estimate … …. Which number is the best estimate to 932.6—931.05? (1.3 1.5 1.7 1.9). Why?	When I round numbers to one decimal place and two decimals? How does it work for measurements of length? Money? What do you notice?	Addition makes a number larger Subtraction makes a number smaller

Multiplication and division - year 6

St. Michael's V.A. Junior Maths MTP

BLACK = NC Objectives BLUE= Missing Objectives, tested in national assessments

Programme Of Study	Pupils are taught to (National Curriculum Objectives)	Notes and Guidance
Multiplication And division **Vocabulary** Multiply product represent estimate round approximate formula term divide dividend divisor remainder round fraction operations brackets equal	• multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication • divide numbers up to 4 digits by a two-digit whole number using the formal written method of long division, and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context • divide numbers up to 4 digits by a two-digit number using the formal written method of short division where appropriate, interpreting remainders according to the context • perform mental calculations, including with mixed operations and large numbers • identify common factors, common multiples and prime numbers • use their knowledge of the order of operations to carry out calculations involving the four operations • solve problems involving addition, subtraction, multiplication and division • use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy. • use brackets: know that they determine the order of operations, and that their contents are worked out first • use written division methods in cases where the answer has up to two decimal places	Ensure pupils continue to practise calculating addition, subtraction, multiplication and division using formal written methods. Extend application of written methods to larger numbers. Ensure pupils continue to practise fast responses for mental calculations with increasingly large numbers and more complex calculations. Ensure pupils continue to use all the multiplication tables to calculate mathematical statements to maintain fluency.

Fluency	Reasoning	Problem Solving
• recognise squared [^{2}] and cubed [^{3}] numbers • understand and use all arithmetic laws (commutative, associative and distributive) for example using knowledge of inverse operations know how to double and half • identify factors and multiples to at least 12 x 12 • recognise LCM and HCF • multiply 1 digit decimals by whole numbers • multiply 1 digit numbers with up to two decimal places by whole numbers • divide fractions by whole numbers • perform mental calculations including with mixed operations and large numbers • calculate the mean average • identify composite numbers	• decide which operations and methods to use and why • interpret remainders as whole number remainders, fractions, or by rounding • use knowledge of the order of operations to carry out calculations involving the four operations • understand the distributive, associative and commutative law of multiplication • use apparatus and pictures to explain thinking • use the language of multiply and divide • use simple formulae • generate and describe linear number sequences • express missing number problems algebraically • find pairs of numbers that satisfy an equation with two unknowns enumerate possibilities of combinations of two variables	• work systematically and logically • solve problems that include remainders • interpret and construct pie charts and line graphs and use these to solve problems • solve problems involving the calculation percentages {for example of measures, and such as 15% of 360) and the use of percentages for comparison • solve problems involving the calculation and conversion of units of measure

BLACK = NC Objectives BLUE= Missing Objectives, tested in national assessments

	Probing Questions – Year 6 – Multiplication and division			
	Show me…	**Convince me…**	**What's the same? What's different?**	**Always, sometimes, never…**
	... two numbers that are easy to multiply ... two numbers that are hard to multiply ... a four digit number and two digit number that can be multiplied without using long multiplication ... a calculation that is connected to 23 x 37 = 851 (and another...) ... two numbers with a product of 120	... that 9 000 x 800 = 7 200 000 ... that if I know 23 x 45 I can also find 2.3 x 4.5 ... that 4.9 x 7 = 34.65	4563x14, 3212x20, 4158x27, 6389x50 234 x 5; 2.34 x 5; 2340 x 5 214 x 79 and 200 x 80 753 x 1.8; 7.53 x 1800; 750 x 1.8 + 3x	…Multiplication makes a number larger …Long multiplication is needed to multiply four digit numbers by two digit numbers … x and y are two whole numbers less than 1000 … the difference between x and y is 1000 whole number

Commented [KH2]:

Fractions & Ratio and Proportion - year 6

Programme Of Study	Pupils are taught to (National Curriculum Objectives)	Notes and Guidance
Fractions **Vocabulary** Fraction part denominator numerator equivalent simplify factor multiple common compare greater than less than order improper fraction mixed number decimal percentage % proportion tenths Hundredths	• use common factors to simplify fractions; use common multiples to express fractions in the same denomination • compare and order fractions, including fractions > 1 • add and subtract fractions with different denominators and mixed numbers, using the concept of equivalent fractions multiply simple pairs of proper fractions, writing the answer in its simplest form [for example, ¼ x ½ = 1/8] • divide proper fractions by whole numbers [for example, 1/3 ÷ 2 = 1/6] • divide proper fractions by whole numbers [for example, 1/3 ÷ 2 = 1/6] associate a fraction with division and calculate decimal fraction equivalents [for example, 0.375] for a simple fraction [for example, 8/3] • identify the value of each digit to three decimal places and multiply and divide numbers up to three decimal place by 10, 100 and 1000 • multiply and divide numbers with up to two decimal places by 1-digit and 2-digit whole numbers. • use percentages for comparison and calculate percentages of whole numbers or measures such as 15% of 360 • recall and use equivalences between fractions, decimals and percentages. • reduce a fraction to its simplest form by cancelling common factors	Ensure pupils should use their understanding of the relationship between unit fractions and division to work backwards by multiplying a quantity that represents a unit fraction to find the whole quantity. For example, if ¼ of a length is 36cm then the whole length is 36 x 4 = 144cm. Ensure pupils practise working with simple fractions and decimal fraction equivalents. Include listing of equivalent fractions to identify fractions with common denominators. Denominators of given fractions should not exceed 12 with the exception of 100 and 1000. Pupils can use a calculator for a division calculation to convert a simple fraction to a decimal fraction; e.g. 3 ÷ 8 = 0.375. For simple fractions with infinite decimal equivalents, pupils should round the decimal to three decimal places. Ensure pupils multiply decimals by whole numbers starting with the simplest cases, such as 0.4 x 2 = 0.8, and practical contexts, such as measures and money. Ensure pupils are introduced to division of decimal numbers initially in practical contexts involving measures and money and by single digit whole numbers. They should recognise division calculations as the inverse of multiplication. Ensure pupils also develop their rounding and estimation skills as a means of predicting and checking the order of magnitude of their answers to decimal calculations. Include rounding off answers to a specified degree of accuracy and checking reasonableness of answers. Ensure pupils understand that calculating a percentage of a quantity is the same as calculating a fraction of a quantity.
Ratio & proportion **Vocabulary** scaling proportion scaled up/down scale factor similar ratio per ... times as ... multiplier, divisor times bigger/larger/longer	• use ratios to show the relative sizes of two quantities. • recognise equivalent ratios and reduce a given ratio to its lowest terms • recognise and use division in the context of fractions, percentages and ratio. • solve problems involving similar shapes where the scale factor is known or can be found • solve problems involving similar shapes where the scale factor is known or can be found	Ensure pupils are introduced to and use the ratio notation and symbol (a:b) in the context of comparing quantities, sizes and scale drawings. Ensure pupils practise solving a wide variety of problems so that pupils are taught to apply ratio and proportion flexibly.

Fractions & Ration and Proportion – Year 6		
Fluency	**Reasoning**	**Problem Solving**
• find fractions of numbers • find percentages of numbers • convert between mixed and improper fractions and know when it is appropriate to do so • convert between percentages, decimals and fractions • compare and order fractions, decimals and percentages using < > = ≠ • add & subtract fractions (with different denominators), decimals and percentages • find missing fractions to complete calculations • multiply fractions by whole numbers • multiply fractions by fractions • divide fractions by whole numbers • divide fractions by fractions • recognise ratio as comparing part with part and proportion as comparing part with whole * use apparatus to show the difference between ratio and proportion	• reason about which size of something you would prefer • use fraction vocabulary • explain how you can add fractions, decimals and percentages • move freely between representations explaining your reasoning • distinguish between situations with an additive change or a multiplicative change (which involves ratio) * recognise the link between ratio and proportion	• use information given to find missing information • solve problems that involve comparing and ordering fraction, decimals and percentages • solve problems that involve addition & subtraction of fractions, percentages and decimals • solve problems that involve multiplying fractions by whole numbers • solve problems involving the relative sizes of 2 quantities where missing values can be found by using integer multiplication and division facts • solve problems involving similar shapes where the scale factor is known or can be found • solve problems involving unequal sharing and grouping using knowledge of fractions and multiples

Probing Questions - Fractions & Ratio and Proportion – Year 6			
Show me…	**Convince me…**	**What's the same? What's different?**	**Always, sometimes, never…**
… a fraction that cannot be simplified … three ways that you could simplify 18/30 … three fractions that are equivalent to 2/7 … four possible common denominators for 3/5 and 7/20 … the equivalent decimal for 1/4, 7/20, 1/8, 4/25 …. how you can represent 11/4-1/2 using equivalent fractions	… how to simplify a fraction … how to order a set of fractions such as 2/3, 1/4, 5/6, 1/2 … what is wrong with 2/3 = 1/1.5 … that 8/5 > 3/2 … that there are an infinite number of fractions equivalent to 2/3	30%, 3/10, 0.3, 0.03, 3/100, 3% 1/5, 5%,1/20, 20% 20% of 25 and 25% of 20 14/21, 8/12, 20/30 2 1/3, 1 1/2, 2/3, 3 2/3	… you can have more than 100% … to cancel a fraction, you halve the numerator and denominator until you can't do it any more … you can always simplify a fraction … to find x% of a number, just divide it by x … you can do long division when the dividend is less than the divisor …Multiplying two fractions always results in a smaller number …When I divide a fraction by a whole number the fraction always gets smaller.

St. Michael's V.A. Junior Maths MTP

BLACK = NC Objectives BLUE= Missing Objectives, tested in national assessments

Algebra - year 6

Programme Of Study	Pupils are taught to (National Curriculum Objectives)	Notes and Guidance
Algebra **Vocabulary** multiply divide place value decimal places rounding remainder problem solve context missing number order of operations value equation expression algebra variable unknown solution satisfy pairs of values	• use simple formulae • generate and describe linear number sequences • express missing number problems algebraically • find pairs of numbers that satisfy an equation with two unknowns • enumerate possibilities of combinations of two variables • describe, extend and explain number sequences and patterns	Ensure pupils write some known arithmetical rules algebraically, such as a + b = b + a, and known relations such as p = 4s for the perimeter of a square. They should also interpret word problems as statements about number and record as a mathematical statement. Pupils should also write missing number problems algebraically; for example, 2x – 4 = 8 therefore 2x = 12 therefore x = 6 or finding missing lengths in perimeters and missing angles at a point. Pupils should also find possible solutions for equations with two unknown variables, for example x + y = 5 includes solutions x = 1 and y = 4, x = 2 and y = 3.

Fluency	Reasoning	Problem Solving
* rearrange and simplify expressions	• explain how a number can be described as nth term • justify how sometimes a range of numbers may solve an equation and sometimes it may only have one solution • explain the equals sign and reason that it doesn't simply mean "This is the answer" • recognise when it is possible to use formulae for area and volume of shapes • generate the nth term • use mathematical vocabulary when generalising	• use algebra to write a number sentence to a problem • be adept at adding numbers to an equation within a number problem • represent a real life situation in algebraic terms • solve number and shape puzzles • manipulate an equation to find a solution

BLACK = NC Objectives BLUE= Missing Objectives, tested in national assessments

Algebra – Year 6 - Probing Questions			
Show me…	**Convince me…**	**What's the same? What's different?**	**Always, sometimes, never…**
... how you would solve this problem: Milly is saving £2.75 a week to buy a pair of jeans. The jeans cost £37. For how many weeks does she need to save? ... how you would solve this problem: In Sports 4 U, there are 18 large boxes each containing 136 footballs. How many footballs are there altogether?	... that 134 ÷ 7 and 130 ÷ 7 have the same answer to the nearest whole number ...that there are an infinite number of solutions to x + y = 12. ... why 6×100 and 60×10 give the same answer ... what 0.6 would mean on a calculator display if the units were pounds, metres, hours, cars	x + y = 10 x + y = 7 2x + 2y = 20 3 + y = 10 2x + y = 17 4x = 20 3x + 2y = 29 8x + 4y = 68	… There are an infinite number of possible values for: x + y = 11, x + 5 = 20 2x + y = 10 … Algebra always uses x and y. … x and y are whole numbers.

Properties of shape - year 6

Programme Of Study	Pupils are taught to (National Curriculum Objectives)	Notes and Guidance	
Properties of shape **Vocabulary** angles degrees measure construct draw accurately sketch visualise net 2-D 3-D protractor angle measurer regular describe length width height depth	* draw 2-D shapes using given dimensions and angles * recognise, describe and build simple 3-D shapes, including making nets * compare and classify geometric shapes based on their properties and sizes and find unknown angles in any triangles, quadrilaterals, and regular polygons * illustrate and name parts of circles, including radius, diameter and circumference and know that the diameter is twice the radius * recognise angles where they meet at a point, are on a straight line, or are vertically opposite, and find missing angles * use properties such as perpendicular and parallel faces or edges * continue to name and describe shapes classify quadrilaterals using criteria such as parallel sides, equal angles, equal sides * identify, estimate, order, measure and calculate acute, obtuse, reflex and right angles	Ensure pupils practise drawing shapes and nets regularly and accurately, using measuring tools and conventional markings and labels for lines and angles. Ensure pupils also describe properties of shapes and explain how they derive unknown angles and lengths from known measurements.	
	Fluency	**Reasoning**	**Problem Solving**
	* recognise squared [^{2}] and cubed [^{3}] numbers * move fluently between concrete and pictorial representations * use a 180° protractor accurately to within 1° +/-	• use the correct vocabulary associated with properties of 2D and 3D shapes • make and test conjectures and provide mathematical proof where necessary	* Identify and draw a range of nets * Solve problems involving similar shapes where the scale factor is known or can be found * Use knowledge of the area of triangles to solve problems about the area of parallelograms

Properties of shape – Year 6 - Probing Questions			
Show me…	**Convince me…**	**What's the same? What's different?**	**Always, sometimes, never…**
... a square with 6 cm sides ... a rectangle with 2 sides of 12 cm and 2 sides of 4.5 cm ... a regular hexagon ... the net of a cuboid ... a 2D shape with a straight side and a curved side. ... a 2D shape with 5 corners .. a net of a cube ... and another ... a net that won't fold up to make a cube ... the net of a pentagonal prism	... that the corners of a pentagon cannot all be 90 degrees ... that a triangle cannot have 3 obtuse angles ... that cylinder has a circular face	face, edge, vertex, corner cone, square based pyramid, cylinder circle, oval, sphere, cylinder net; 3D shape sketch; construct; draw accurately net of a cube; net of a cuboid	… cubes have 6 square faces … A cuboid can have exactly 5 square faces … There are 11 different nets for a cube … Any four connected identical equilateral triangles will produce the net of a tetrahedron

Position, direction and movement - year 6

Programme Of Study	Pupils are taught to (National Curriculum Objectives)	Notes and Guidance
Position, directions and movement **Vocabulary** coordinate (x, y) x coordinate y coordinate quadrant negative axis x-axis y-axis first quadrant 2nd quadrant 3rd quadrant 4th quadrant origin horizontal vertical plot construct coordinate grid	• describe positions on the full coordinate grid (all four quadrants) • draw and translate simple shapes on the coordinate plane, and reflect them in the axes • plot positions on the full coordinate grid (all four quadrants) • Sketch the position of a simple shape after a rotation of 90° or 180° about a vertex	Ensure pupils practise drawing and labelling a pair of axes in all four quadrants and drawing pairs of axes. This extends pupils knowledge of one quadrant to all four quadrants, including the use of negative numbers. Ensure pupils draw and label rectangles, squares, parallelograms and rhombuses, specified by coordinates in the four quadrants, and that they measure the lengths of sides and diagonals, including calculating perimeters.

Fluency	Reasoning	Problem Solving
* use a 180° protractor accurately to within 1° +/-	* make and test conjectures and provide mathematical proof where necessary	* use knowledge of position and direction within problems on a computer program

Probing Questions

Show me…	Convince me…	What's the same? What's different?	Always, sometimes, never…
… a coordinate in the 1st quadrant, in the 2nd, in the 3rd, in the 4th … a coordinate that is horizontal to the coordinate (3, -2)… and another … and another … a coordinate that is vertical to (-2, -1) … and another … and another … a co-ordinate that lies on this line … four co-ordinates that will form a square/rectangle etc.	… that the distance from -2 to 2 is four … that (-2, 2) is different to (2, -2) … that (0,0) is a co-ordinate … that (-4, 5) is in the second quadrant	(0,2), (2,0), (-2,0), (0,-2) the origin, the x-axis, the y-axis (4, -3) and (-3, 4)	… the largest number appears first when writing coordinate pairs in brackets … if you reverse co-ordinates, you get a different point … the origin isn't in a quadrant

Measurement - year 6

Programme Of Study	Pupils are taught to (National Curriculum Objectives)	Notes and Guidance
Measurement **Vocabulary** perimeter length total sum area square units e.g. mm2 m2 cm2 base width breadth height parallelogram volume cubed units e.g. km3 m3 cm3 mm3	* solve problems involving the calculation and conversion of units of measure, using decimal notation up to three decimal places where appropriate use, read, write and convert between standard units, converting measurements of length, mass, volume and time from a smaller unit of measure to a larger unit, and vice versa, using decimal notation to up to three decimal places convert between miles and kilometres recognise that shapes with the same areas can have different perimeters and vice versa recognise when it is possible to use formulae for area and volume of shapes calculate the area of parallelograms and triangles calculate, estimate and compare volume of cubes and cuboids using standard units, including cubic centimetres (cm^3) and cubic metres (m^3), and extending to other units [for example, mm^3 and km^3] use, read and interpret timetables	Ensure pupils use, add and subtract positive and negative integers for measures such as temperature and money. Ensure pupils use the formula to calculate area of a triangle and a parallelogram. Include identifying the base and its corresponding height. Exclude finding the base or height of a triangle given its area. Pupils can be introduced to other compound units for speed such as miles per hour and apply their knowledge in science as appropriate.

Fluency	Reasoning	Problem Solving
* use a 180° protractor accurately to measure and draw angles within 1° +/- * convert between different units of metric measure understand and use approximate equivalences between metric units and common imperial units * choose units and suitable equipment to make measurements * tell the time using the 12-hour and 24 hour clock, both digital and analogue * read a variety of scales accurately	• estimate volume [for example, using 1 cm3 blocks to build cuboids (including cubes)] and capacity [for example, using water] and justify estimations • use standard units to explain how you found the volume of different cuboids • explain how an array helps support understanding of area and perimeter • suggest how you could measure… • suggest an imperial or metric unit to measure	* solve problems with rectilinear shapes where there are missing measures * find different perimeters for shapes with the same area compare the area of a variety of shapes * solve problems involving measure using decimal notation, including scaling. * solve 'story' problems involving units of time. Explain and record how the problem was solved.

Measurement – Year 6 - Probing Questions			
Show me…	**Convince me…**	**What's the same? What's different?**	**Always, sometimes, never…**
... how to find the area of a (specified) shape on a geoboard ... how to find the area of a (specified) triangular shape on a geoboard .. the area of this triangle/parallelogram etc ... a triangle with area 12cm2 ... a parallelogram with the same area as this rectangle ... the volume of this cuboid ... another cuboid with the same volume	... that the formula for the area of a parallelogram gives the same answer as counting squares. ... that every parallelogram can be rearranged to make a rectangle ... that you only need to know the base and the height of a triangle to find its area ... that any triangle is half a parallelogram ... that you can find the volume of a cuboid if you know its height and the area of its base.	Buying carpet, buying lawn seed, buying skirting board. rectangle; parallelogram; right-angled triangle; (general) triangle perimeter; area; volume	…Triangles are half a parallelogram. …If one box fits inside another, the inner box has a smaller volume than the outer box. …A box with volume 8cm3 will fit completely inside a box of 9cm3. …You find the volume by multiplying all the lengths together.

Statistics - year 6

Programme Of Study	Pupils are taught to (National Curriculum Objectives)	Notes and Guidance
Statistics **Vocabulary** pie chart proportion distribution scaled up/scaled down compare line graph axes scale prediction trend mean average	• interpret and construct pie charts and line graphs and use these to solve problems • calculate and interpret the mean as an average • calculate and interpret the median, mode and range • construct and interpret Venn and Carroll diagrams • begin to draw and interpret a line graph, in which intermediate values have meaning	

Fluency	Reasoning	Problem Solving
	• explain what a segment in a pie chart • make and test conjectures and provide mathematical proof where necessary • use the correct vocabulary associated with statistics • test a hypothesis by drawing and discussing a graphical representation where (discrete) data are grouped	* make a simple computer database and test hypotheses by interrogating the data in a prepared computer database, such as census data or data on road safety.

Probing Questions

Show me…	Convince me…	What's the same? What's different?	Always, sometimes, never…
... that if the mean height of a class is 150cm. What does this tell you about the tallest and shortest pupil? ... five numbers that have a mean of 6 and a range of 8.	...pie charts are easier to draw when the frequencies add up to a factor of 360 ... that pie charts can be misleading	bar chart, line graph, frequency diagram, pictogram, pie chart average, mean 1, 3, 3, 5 and 1, 2, 4 ,5 as data sets	... You can read the frequency from a pie chart ... You can read the proportion from a pie chart ... You can read the frequency from a bar graph .... If the section is the same size on two pie charts then the section represents the same frequency ... In order to interpret and compare two pie charts, you have to measure the angles on the pie charts.