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| **Links with Statutory Requirements across KS2 – Mathematics** | | | | |
| ***Numbers and Place Value*** | | | | |
| Y3 | Y4 | Y5 | Y6 | *notes (in italics)* |
| N&PV: count from 0 in multiples of 4, 8, 50 and 100; find 10 or 100 more or less than a given number | N&PV: count in multiples of 6, 7, 9, 25 and 1000  N&PV: find 1000 more or less than a given number | N&PV: count forwards or backwards in steps of powers of 10 for any given number up to 1 000 000 | *Continue revising the content from previous year groups.* | *Daily counting opportunities. Look for patterns and general statements i.e. which digits stay the same…* |
| N&P: recognise the place value of each digit in a three-digit number (hundreds, tens, ones) | N&PV: recognise the place value of each digit in a four-digit number (thousands, hundreds, tens, and ones) | N&PV: read, write, order and compare numbers to at least 1 000 000 and determine the value of each digit | N&PV: read, write, order and compare numbers up to 10 000 000 and determine the value of each digit | *Ensure children understand how base ten works i.e. ones are grouped into tens then tens of tens etc.; the digit in the ones place is what is ‘left over’.* |
| N&P: read and write numbers up to 1000 in numerals and in words | *Read and write four-digit numbers.* |
| N&P: compare and order numbers up to 1000 | N&PV: order and compare numbers beyond 1000 |
| *When counting back to zero, begin to experience counting below zero.* | N&PV: count backwards through zero to include negative numbers | N&PV: interpret negative numbers in context, count forwards and backwards with positive and negative whole numbers, including through zero | N&PV: use negative numbers in context, and calculate intervals across zero | *Ensure there is an opportunity to use a thermometer outside during winter to see negative temperatures. Ensure zero is included when counting.* |
| N&P: identify, represent and estimate numbers using different representations | N&PV: identify, represent and estimate numbers using different representations | N&PV: represent amounts by adapting values i.e. each bead on a hundred bead string could be worth 100 | *Continue revising the content from previous year groups.* | *Any piece of equipment can have any value. Establish values with the children before you use them.* |
| *Look at the tens and hundreds boundaries either side of a number and decide which is closer.* | N&PV: round any number to the nearest 10, 100 or 1000 | N&PV: round any number up to 1 000 000 to the nearest 10, 100, 1000, 10 000 and 100 000 | N&PV: round any whole number to a required degree of accuracy | *In year 6 this will include rounding decimal numbers.* |
| N&P: solve number problems and practical problems involving these ideas. | N&PV: solve number and practical problems that involve all of the above and with increasingly large positive numbers | N&PV: solve number problems and practical problems that involve all of the above | N&P: solve number and practical problems that involve all of the above. | *All children can be working on problems commensurate with their age-group expectations.* |
| M: seeing an analogue clock that uses Roman numerals from I to XII on the wall in the classroom | N&PV: 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. | N&PV: read Roman numerals to 1000 (M) and recognise years written in Roman numerals. | *Write the date as Roman Numerals every day.* | *Roman numerals can be linked to history topic. Teach children that England used them until about 1200 then we adopted the Hindu-Arabic Place Value system.* |
| *The value of a digit is determined by its position in a number. Place value is based on unitising, treating a group of things as one ‘unit’. This generalises to 3 units + 2 units = 5 units (where the units are the same size).* | *Imagining the position of numbers on a vertical number line helps us to order them: the number to above on a number line is the larger number. So 5 is greater than 4, as 5 is above 4. But –4 is greater than –5 as –4 is above –5. Rounding numbers in context may mean rounding up or down. Buying packets of ten cakes, we might round up to the nearest ten to make sure everyone gets a cake.*  *We think of place value in additive terms: 456 is 400 + 50 + 6, and in multiplicative terms: one hundred is ten times as large as ten.* | *Large numbers of six digits are named in a pattern of three: hundreds of thousands, tens of thousands, ones of thousands, mirroring hundreds, tens and ones.*  *It is helpful to relate large numbers to real-world contexts, for example the number of people that a local sports arena can hold.* | *For whole numbers, the more digits a number has, the larger it must be: any 4-digit whole number is larger than any 3-digit whole number. But this is not true of decimal numbers: having more digits does not make a decimal number necessarily bigger. For example, 0·5 is larger than 0·35. When ordering numbers we look at the digits in matching places in the numbers, starting from the place with the highest value i..e from the left. The number with the higher different digit is the higher number. For example, 256 is greater than 247 because 256 has 5 tens but 247 has only 4 tens. Similarly 1·0843 is smaller than 1·524 because 1·0843 has 0 tenths but 1·524 has 5 tenths.* | *The advice on this row is taken from the ‘Big Ideas’ section of the NCETM Mastery Booklets.* |
| ***Addition and Subtraction*** | | | | |
| Y3 | Y4 | Y5 | Y6 | *notes (in italics)* |
| A&S: add and subtract numbers mentally, including:  a three-digit number and ones; a three-digit number and tens; a three-digit number and hundreds | *Continue to decide with children which calculations can be done using mental skills and number facts and which need to be done using a written method.* | A&S: add and subtract numbers mentally with increasingly large numbers | A&S: use their knowledge of the order of operations to carry out calculations involving the four operations  A: Express missing number problems algebraically | *Work on mental skills such as using bonds and additive place value calculation questions.*  *‘A’ is from the Algebra domain.* |
| A&S: add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction | A&S: add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate | A&S: add and subtract whole numbers with more than 4 digits, including using formal written methods (columnar addition and subtraction) | A&S: Pupils practise addition and subtraction, for larger numbers, using the formal written methods of columnar addition and subtraction, | *Remember to encourage the use of bonds and doubles with the ‘small numbers’ in each place value column when completing written methods.* |
| A&S: estimate the answer to a calculation and use inverse operations to check answers | A&S: estimate and use inverse operations to check answers to a calculation | A&S: use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy | A&S: use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy. | *Knowing how close numbers are to ‘round numbers’ helps with estimation.* |
| A&S: solve problems, including missing number problems, using number facts, place value, and more complex addition and subtraction. | A&S: solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why. | A&S: solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why. | A&S: solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why  A: Enumerate possibilities of combinations of two variables  A: Find pairs of numbers that satisfy an equation with two unknowns | *Give opportunities, mental and written, to use addition and subtraction in a range of word problems and puzzles and problems.*  *‘A’ is from the Algebra domain.* |
| *Relating numbers to 5 and 10 helps develop knowledge of the number bonds within 20. For example, given 8 + 7, thinking of 7 as 2 + 5, and adding the 2 and 8 to*  *make 10, then the 5 to 15. This should then be applied when calculating with larger numbers. Subtraction bonds can be thought of in terms of addition: for example, in answering 15 – 8, thinking what needs to be added to 8 to make 15. ‘Counting on’ for subtraction is a useful strategy that can also be applied to larger numbers.* | *It helps to round numbers before carrying out a calculation to get a sense of the size of the answer. For example, 4786 – 2135 is close to 5000 – 2000, so the answer will be around 3000. Looking at the numbers in a calculation and their relationship to each other can help make calculating easier. For example, 3012 – 2996. Noticing that the numbers are close to each other might mean this is more easily calculated by thinking about subtraction as difference.* | *Before starting any calculation is it helpful to think about whether or not you are confident that you can do it mentally. For example, 3689 + 4998 may be done mentally, but 3689 + 4756 may require paper and pencil. Carrying out an equivalent calculation might be easier than carrying out the given calculation. For example 3682 – 2996 is equivalent to 3686 – 3000 (constant difference).* | *Deciding which calculation method to use is supported by being able to take apart and combine numbers in many ways. For example, calculating 8·78 + 5·26 might involve calculating 8·75 + 5·25 and then adjusting the answer. The associative rule helps when adding three or more numbers: 367 + 275 + 525 is probably best thought of as 367 + (275 + 525) rather than (367 + 275) + 525.* | *The advice on this row is taken from the ‘Big Ideas’ section of the NCETM Mastery Booklets.* |
| ***Multiplication and Division*** | | | | |
| Y3 | Y4 | Y5 | Y6 | *notes (in italics)* |
| M&D: recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables | M&D: recall multiplication and division facts for multiplication tables up to 12 × 12  M&D: recognise and use factor pairs and commutativity in mental calculations | M&D: identify multiples and factors, including finding all factor pairs of a number, and common factors of two numbers  M&D: know and use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers  M&D: establish whether a number up to 100 is prime and recall prime numbers up to 19  M&D: recognise and use square numbers and cube numbers, and the notation for squared (2) and cubed (3)  M&D: solve problems involving multiplication and division including using their knowledge of factors and multiples, squares and cubes | M&D: identify common factors, common multiples and prime numbers  A: Generate and describe linear number sequences  R&P: solve problems involving unequal sharing and grouping using knowledge of fractions and multiples. | *Ensure the children understand what the multiplication tables mean (i.e. that they are about scaling up) by getting them to build the multiples with cubes, sketch the pictures of the cubes and describe what they see. Also that numbers can be sorted into types of numbers based on their properties i.e. odd and even as well as multiples and factors of other numbers. Also that numbers are related to other numbers i.e. 8 is double four; 6 is a factor of 18; 24 is a multiple of 8; etc.*  *‘A’ is from the Algebra domain.*  *‘R&P’ is from the Ratio and Proportion domain.* |
| **M&D: 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** | M&D: 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 | M&D: multiply and divide numbers mentally drawing upon known facts  M&D: multiply and divide whole numbers and those involving decimals by 10, 100 and 1000 | M&D: perform mental calculations, including with mixed operations and large numbers  A: Express missing number problems algebraically  M&D: use their knowledge of the order of operations to carry out calculations involving the four operations | *‘A’ is from the Algebra domain.* |
| M&D: 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** | M&D: multiply two-digit and three-digit numbers by a one-digit number using formal written layout | M&D: 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  M&D: 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 | M&D: multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication  F: multiply one-digit numbers with up to two decimal places by whole numbers  M&D: 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    F: use written division methods in cases where the answer has up to two decimal places  M&D: 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  R&P: solve problems involving the relative sizes of two quantities where missing values can be found by using integer multiplication and division facts | *Fractions domain in year 6 as it fits with written methods – just extending to decimal numbers.*  *Fractions domain in year 6 as it fits with written methods – just extending to decimal numbers.*  *‘R&P’ is from the Ratio and Proportion domain.* |
| M&D: 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. | M&D: 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. | M&D: solve problems involving multiplication and division, including scaling by simple fractions and problems involving simple rates.  M&D: solve problems involving addition, subtraction, multiplication and division and a combination of these, including understanding the meaning of the equals sign | M&D: use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy.  M&D: solve problems involving addition, subtraction, multiplication and division  S: calculate and interpret the mean as an average.  A: Enumerate possibilities of combinations of two variables  A: Find pairs of numbers that satisfy an equation with two unknowns | *Give opportunities, mental and written, to use multiplication and division in a range of word problems and puzzles and problems.*  *‘S’ is from the Statistics domain*  *‘A’ is from the Algebra domain.* |
| *It is important for children not just to be able to chant their multiplication tables but also to understand what the facts in them mean, to be able to use these facts to figure out others and to use in problems. It is also important for children to be able to link facts within the tables (e.g. 5× is half of 10×).*  *They understand what multiplication means, see division as both grouping and sharing, and see division as the inverse of multiplication.* | *It is important for children not just to be able to chant their multiplication tables but to understand what the facts in them mean, to be able to use these facts to figure out others and to use them in problems.*  *It is also important for children to be able to link facts within the tables (e.g. 5× is half of 10×).*  *They understand what multiplication means and see division as both grouping and sharing, and to see division as the inverse of multiplication.*  *The distributive law can be used to partition numbers in different ways to create equivalent calculations. For example, 4 × 27 = 4 × (25 + 2) = (4 × 25) + (4 × 2) = 108.*  *Looking for equivalent calculations can make calculating easier. For example, 98 × 5 is equivalent to 98 × 10 ÷ 2 or to (100 × 5) – (2 × 5). The array model can help show equivalences.* | *Pupils have a firm understanding of what multiplication and division mean and have a range of strategies for dealing with large numbers, including both mental and standard written methods. They see the idea of factors, multiples and prime numbers as connected and not separate ideas to learn.*  *They recognise how to use their skills of multiplying and dividing in new problem solving situations.*  *Fractions and division are connected ideas: 36 ÷ 18 = 36/18 = 2; 18/36 = ½ .*  *Factors and multiples are connected ideas: 48 is a multiple of 6 and 6 is a factor of 48.* | *Standard written algorithms use the conceptual structures of the mathematics to produce efficient methods of calculation.*  *Standard written multiplication method involves a number of partial products. For example, 36 × 24 is made up of four partial products 30 × 20, 30 × 4, 6 × 20, 6 × 4.*  *There are connections between factors, multiples and prime numbers and between fractions, division and ratios.* | *The advice on this row is taken from the ‘Big Ideas’ section of the NCETM Mastery Booklets.* |
| ***Fractions The requirements have been sorted into three sets:***  ***1) fractions as numbers (size and ordering); 2) adding and subtracting fractions; 3) multiplying and dividing with fractions*** | | | | |
| Y3 | Y4 | Y5 | Y6 | *notes (in italics)* |
| 1)F: recognise and use fractions as numbers: unit fractions and non-unit fractions with small denominators | 1)F: recognise and write decimal equivalents of any number of tenths or hundredths  1)F: recognise and write decimal equivalents to ¼ , ½ , ¾ | 1)F: 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 ] | 3)F: use common factors to simplify fractions; use common multiples to express fractions in the same denomination | *These requirements are about knowing fractions and decimals as numbers: how to draw them, how to write them, how to convert and simplify them.* |
| 1)F: recognise and show, using diagrams, equivalent fractions with small denominators | 1)F: recognise and show, using diagrams, families of common equivalent fractions | 1)F: identify, name and write equivalent fractions of a given fraction, represented visually, including tenths and hundredths | 1,2&3)F: recall and use equivalences between simple fractions, decimals and percentages, including in different contexts. |
| 1)F: 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 | 1)F: count up and down in hundredths; recognise that hundredths arise when dividing an object by one hundred and dividing tenths by ten. | 1)F: read and write decimal numbers as fractions [for example, 0.71 = 71/100]  1)F: 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 | 3)F: associate a fraction with division and calculate decimal fraction equivalents [for example, 0.375] for a simple fraction [e.g. 3/8 ] | *These requirements are about understanding what tenths and hundredths are and how hundredths relate to percentages.* |
| *Understand how to multiply and divide whole numbers by 10 (moving the digits left and right and not ‘adding a zero’)* | 3)F: 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 | 1)F: recognise and use thousandths and relate them to tenths, hundredths and decimal equivalents  1)F: read, write, order and compare numbers with up to three decimal places  1,2&3)F: solve problems involving number up to three decimal places | 3)F: identify the value of each digit in numbers given to three decimal places and multiply and divide numbers by 10, 100 and 1000 giving answers up to three decimal places | *These requirements are about how decimal numbers relate to their place value in Base Ten.* |
| 1)F: compare and order unit fractions, and fractions with the same denominators | 1)F: compare numbers with the same number of decimal places up to two decimal places | 1)F: compare and order fractions whose denominators are all multiples of the same number | 3)F: compare and order fractions, including fractions > 1 | *These requirements are about ordering and comparing (using the < = > symbols) fractions and decimals.* |
| *Be aware that there are 10 tenths in a whole one and whether a tenths number is closer to 1 or 0.* | 1)F: round decimals with one decimal place to the nearest whole number | 1)F: round decimals with two decimal places to the nearest whole number and to one decimal place | 1)F: solve problems which require answers to be rounded to specified degrees of accuracy. | *These requirements are about rounding decimals. This could be taught in a place value Unit of work.* |
| 2)F: add and subtract fractions with the same denominator within one whole [for example, 5/7 + 1/7 = 6/7 ] | 2)F: add and subtract fractions with the same denominator | 2): add and subtract fractions with the same denominator and denominators that are multiples of the same number | 2)F: add and subtract fractions with different denominators and mixed numbers, using the concept of equivalent fractions | *These requirements are about adding and subtracting fractions where fractions are numbers in their own right.* |
| 3)F: recognise, find and write fractions of a discrete set of objects: unit fractions and non-unit fractions with small denominators  1,2&3)F: solve problems that involve all of the above | 1,2&3)F: solve simple measure and money problems involving fractions and decimals to two decimal places.  1,2&3)F: 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 | 3)F: multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams  1,2&3)F: 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 | 3)F: multiply simple pairs of proper fractions, writing the answer in its simplest form [for example, ¼ × ½ = 1/8]  3)F: divide proper fractions by whole numbers [for example, 1/3 ÷ 2 = 1/6 ]  R&P: solve problems involving the calculation of percentages [for example, of measures, and such as 15% of 360] and the use of percentages for comparison R&P: solve problems involving unequal sharing and grouping using knowledge of fractions and multiples. | *These requirements link to multiplication and division and involve: finding fractions of things in LKS2 (and percentages of as well in UKS2) by dividing and multiplying; multiplying fractions by whole numbers (UKS2) and multiplying two fractions together (Y6 only); dividing fractions by whole numbers (Y6 only)* |
| *Fractions are equal parts of a whole.*  *Equal parts of shapes do not need to be congruent but need to be equal in area.*  *Decimal fractions are linked to other fractions.*  *The number line is a useful representation that helps children to think about fractions as numbers.* | *Fractions arise from solving problems, where the answer lies between two whole numbers.*  *Fractions express a relationship between a whole and equal parts of a whole. Children should recognise this and speak in full sentences when answering a question involving fractions. For example, in response to the question ‘What fraction of the chocolate bar is shaded?’ the pupil might say ‘Two sevenths of the whole chocolate bar is shaded.’*  *Equivalency in relation to fractions is important. Fractions that look very different in their symbolic notation can mean the same thing.* | *Representations that may appear different sometimes have similar underlying ideas. For example ¼, 0·25 and 25% are used in different contexts but are all connected to the same idea.* | *Fractions express a relationship between a whole and equal parts of a whole. Pupils should recognise this and speak in full sentences when answering a question involving fractions. For example, in response to the question ‘What fraction of the journey has Tom travelled?’ the pupil might respond, ‘Tom has travelled two thirds of the whole journey.’ Equivalent fractions are connected to the idea of ratio: keeping the numerator and denominator of a fraction in the same proportion creates an equivalent fraction.*  *Putting fractions in place on the number lines helps understand fractions as numbers in their own right.* | *The advice on this row is taken from the ‘Big Ideas’ section of the NCETM Mastery Booklets.* |
| ***Measurement*** | | | | |
| Y3 | Y4 | Y5 | Y6 | *notes (in italics)* |
| *Look at how many centimetres there are in a metre and how many millimetres in a centimetre using rulers. Use scales on other measuring equipment to notice how many of the ‘smaller’ units are equal to the ‘larger’ units.* | M: Convert between different units of measure [for example, kilometre to metre; hour to minute] | M: convert between different units of metric measure (for example, kilometre and metre; centimetre and metre; centimetre and millimetre; gram and kilogram; litre and millilitre)  M: understand and use approximate equivalences between metric units and common imperial units such as inches, pounds and pints (Use this for GD?) | M: 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  M: convert between miles and kilometres *(use this for GD only?)* | *Converting between metric and imperial units could be reserved for children working at GD* |
| M: measure the perimeter of simple 2-D shapes | M: measure and calculate the perimeter of a rectilinear figure (including squares) in centimetres and metres | M: measure and calculate the perimeter of composite rectilinear shapes in centimetres and metres | M: calculate the area of parallelograms and triangles  M: recognise that shapes with the same areas can have different perimeters and vice versa  M: recognise when it is possible to use formulae for area and volume of shapes  A: Use simple formulae | *Connect perimeter to addition and doubling.* |
| *Year 3 children can be doing the same as Y4 children (see right)* | M: find the area of rectilinear shapes by counting squares | M: calculate and compare the area of rectangles (including squares), and including using standard units, square centimetres (cm2) and square metres (m2) and estimate the area of irregular shapes | *Connect area to multiplication and factors.*  *‘A’ is from the Algebra domain.* |
| *Year 3 children can be building with blocks of the same shape and size, taking about what they are building. They can be using water to compare capacity.* | *Year 4 children can be building with blocks of the same shape and size, taking about what they are building. They can be using water to compare capacity.* | M: estimate volume [for example, using 1 cm3 blocks to build cuboids (including cubes)] and capacity [for example, using water] | M: calculate, estimate and compare volume of cubes and cuboids using standard units, including cubic centimetres (cm3) and cubic metres (m3), and extending to other units [for example, mm3 and km3].  M: recognise when it is possible to use formulae for area and volume of shapes | *Connect finding the volume to the multiplication of three numbers.* |
| M: add and subtract amounts of money to give change, using both £ and p in practical contexts | M: estimate, compare and calculate different measures, including money in pounds and pence | *Calculate with money* | *Calculate with money* | *Converting between, and calculating with different currencies could be used with children working at Greater Depth.* |
| M: tell and write the time from an analogue clock, including using Roman numerals from I to XII, and 12-hour and 24-hour clocks  M: 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  M: know the number of seconds in a minute and the number of days in each month, year and leap year  M: compare durations of events [for example to calculate the time taken by particular events or tasks]. | M: read, write and convert time between analogue and digital 12- and 24-hour clocks  M: solve problems involving converting from hours to minutes; minutes to seconds; years to months; weeks to days. | M: solve problems involving converting between units of time | *Calculate with time (including reading a time table such as bus and train time tables)* | *Use ‘Time Team’ as part of your daily routines to teach children the skill of reading the clock.*  *Ensure they know that an analogue clock has a short hour hand because it points to the inner circular scale as it moves and the minute hand is long because it points to the outer circular scale on the clock.* |
| M: measure, compare, add and subtract: lengths (m/cm/mm); mass (kg/g); volume/capacity (l/ml) | *Use measurement contexts for addition and subtraction as well as multiplication and division.* | M: use all four operations to solve problems involving measure [for example, length, mass, volume, money] using decimal notation, including scaling. | M: solve problems involving the calculation and conversion of units of measure, using decimal notation up to three decimal places where appropriate | *‘Weave’ measurement tasks and questions through your other units of work involving place value, calculating and fractions.* |
| *Developing benchmarks to support estimation skills is important as pupils become confident in their use of standard measures. The height of a door frame, for example, is approximately 2 metres, and a bag of sugar weighs approximately 1 kilogram.* | *The smaller the unit, the greater the number of units needed to measure (that is, there is an inverse relationship between size of unit and measure).* | *The relationship between area and perimeter is not a simple one. Increasing or decreasing area does not necessarily mean the perimeter increases or decreases respectively, or vice versa.*  *Area is measured in square units. For rectangles, measuring the length and breadth is a shortcut to finding out how many squares would fit into each of these dimensions.* | *To read a scale, first work out how much each mark or division on the scale represents.*  *The unit of measure must be identified before measuring. Selecting a unit will depend on the size and nature of the item to be measured and the degree of accuracy required.* | *The advice on this row is taken from the ‘Big Ideas’ section of the NCETM Mastery Booklets.* |
| ***Geometry (properties and position and direction)*** | | | | |
| Y3 | Y4 | Y5 | Y6 | *notes (in italics)* |
| G: draw 2-D shapes and make 3-D shapes using modelling materials; recognise 3-D shapes in different orientations and describe them | G: compare and classify geometric shapes, including quadrilaterals and triangles**,** based on their properties and sizes *(and 3D shapes)* | G: identify 3-D shapes, including cubes and other cuboids, from 2-D representations | G: recognise, describe and build simple 3-D shapes, including making nets  R&P: solve problems involving similar shapes where the scale factor is known or can be found | *As the children get older their 2D drawings should become more mathematically accurate and sophisticated.* |
| G: recognise angles as a property of shape or a description of a turn  G: 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 | G: identify acute and obtuse angles and compare and order angles up to two right angles by size | G: know angles are measured in degrees: estimate and compare acute, obtuse and reflex angles  G: draw given angles, and measure them in degrees    G: identify:   * angles at a point and one whole turn (total 360°) * angles at a point on a straight line and ½ a turn (total 180°) * other multiples of 90° | G: recognise angles where they meet at a point, are on a straight line, or are vertically opposite, and find missing angles.    G: compare and classify geometric shapes based on their properties and sizes and find unknown angles in any triangles, quadrilaterals, and regular polygons | *Have angles on the floor marked in 10 degree steps under doors for children to interact with regularly.* |
| G: identify horizontal and vertical lines and pairs of perpendicular and parallel lines | G: identify lines of symmetry in 2-D shapes presented in different orientations  G: complete a simple symmetric figure with respect to a specific line of symmetry. | G: use the properties of rectangles to deduce related facts and find missing lengths and angles  G: distinguish between regular and irregular polygons based on reasoning about equal sides and angles. | G: illustrate and name parts of circles, including radius, diameter and circumference and know that the diameter is twice the radius | *Straight lines can be described as vertical, horizontal and diagonal. Polygons only contain straight lines. Curved lines are found in circles and semi-circles etc.* |
| *G: sketching 2-D shapes (on plain paper, squared paper and isometric paper)* | G: describe positions on a 2-D grid as coordinates in the first quadrant  G: plot specified points and draw sides to complete a given polygon.  G: describe movements between positions as translations of a given unit to the left/right and up/down *(translating shapes)* | G: 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. *(on squared paper)* | G: draw 2-D shapes using given dimensions and angles  G: describe positions on the full coordinate grid (all four quadrants)  G: draw and translate simple shapes on the coordinate plane, and reflect them in the axes. | *Use squared paper and co-ordinates to draw 2D shapes. Teach the children how to put dots where lines intersect on the squared paper to help understand where the vertices are; where the lines meet.* |
| *During this year there is an increasing range of shapes that pupils are familiar with. The introduction of symmetrical and non-symmetrical polygons and the requirement that pupils should be able to draw them will give rise to discussions about lengths of sides and sizes of angles. Pupils need to appreciate these features as properties of shapes as well as the number of sides and vertices.*  *Pupils recognise that angles are about the amount of turn – the lengths of the lines used to represent angles do not affect the size of the angle.*  *Pupils recognise that relationships are at the heart of properties of shapes, not particular measurements. For example, the opposite sides of any rectangle will always be equal, not that rectangles have a pair of long sides and a pair of short sides.* | *During this year, pupils increase the range of 2-D and 3-D shapes that they are familiar with. They know the correct names for these shapes, but, more importantly, they are able to say why certain shapes are what they are by referring to their properties, including lengths of sides, size of angles and number of lines of symmetry.*  *The naming of shapes sometimes focuses on angle properties (e.g. a rectangle is right-angled), and sometimes on properties of sides (e.g. an equilateral triangle is an equal sided triangle).*  *Shapes can belong to more than one classification. For example, a square is a rectangle, a parallelogram, a rhombus and a quadrilateral.* | *During this year, pupils increase the range of 2-D and 3-D shapes that they are familiar with. With 3-D shapes they think about the faces as well as the number of vertices and through considering nets think about the 2-D shapes that define the 3-D shapes.*  *Pupils learn about a range of angle facts and use them to describe certain shapes and derive facts about them.*  *Regular shapes have to have all sides and all angles the same. Although non-square rectangles have four equal angles, the fact that they do not have four equal sides means that they are not regular.*  *Some properties of shapes are dependent upon other properties. For example, a rectangle has opposite sides equal because it has four right angles. A rectangle is defined as a quadrilateral with four right angles. It does not have to be defined as a quadrilateral with four right angles and two pairs of equal sides.* | *Variance and invariance are important ideas in mathematics, particularly in geometry. E.G. A set of quadrilaterals may vary in many ways in terms of area, length of sides and the size of individual angles but there are a set of invariant properties which remain common to all quadrilaterals: they have four sides & their internal angles sum to 360°. Some of these properties emerge from naturally occurring constraints, such as the sum of the internal angles will always sum to 360°; they can do nothing else! The questions ‘What’s the same?’ & ‘What’s different?’ can draw pupils’ attention to variance and invariance. Shapes can be alike in essentially two different ways: congruent and similar. Congruent shapes are alike in all ways: they could occupy exactly the same space. Similar shapes share identical geometrical properties but can differ in size. All equilateral triangles are similar, but only identically sized ones are congruent. Not all isosceles triangles are similar. Angle properties are a mix of necessary conditions and conventions. It is a necessary condition that angles on a straight line combine to a complete half turn. That we measure the half turn as 180° is conventional.* | *The advice on this row is taken from the ‘Big Ideas’ section of the NCETM Mastery Booklets.* |
| ***Statistics*** | | | | |
| Y3 | Y4 | Y5 | Y6 | *notes (in italics)* |
| S: interpret and present data using bar charts, pictograms and tables | S: interpret and present discrete and continuous data using appropriate graphical methods, including bar charts and time graphs. | S: complete, read and interpret information in tables, including timetables. | S: interpret and construct pie charts and line graphs and use these to solve problems | *Different graphs can be modelled by the teacher and used by the children during daily routines and in other curriculum subjects.* |
| S: 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. | S: solve comparison, sum and difference problems using information presented in bar charts, pictograms, tables and other graphs. | S: solve comparison, sum and difference problems using information presented in a line graph | S: calculate and interpret the mean as an average. |  |
| *Data needs to be collected with a question or purpose in mind.*  *Tally charts are used to collect data over time (cars passing the school, birds on the bird table). They can also be used to keep track of counting.* | *In mathematics the focus is on numerical data. These can be discrete or continuous. Discrete data are counted and have fixed values, for example the number of children who chose red as their favourite colour (this has to be a whole number and cannot be anything in between). Continuous data are measured, for example at what time did each child finish the race? (Theoretically this could be any time: 67·3 seconds, 67·33 seconds or 67·333 seconds, depending on the degree of accuracy that is applied.) Continuous data are best represented with a line graph where every point on the line has a potential value.* | *Different representations highlight different aspects of data.*  *It is important to be able to answer questions about data using inference and deduction, not just direct retrieval.* | *Pie charts visually display relative proportions, for example, that the proportion of pupils at School A liking reading is greater than the proportion at School B.* | *The advice on this row is taken from the ‘Big Ideas’ section of the NCETM Mastery Booklets.* |
| *Advice from the NCETM Mastery Booklet for Year 6 on Ratio and Proportion* | *It is important to distinguish between situations with an additive change or a multiplicative change (which involves ratio). For example, if four children have six sandwiches to share and two more children join them, although two more children have been added, the number of sandwiches then needed for everyone to still get the same amount is calculated multiplicatively.* | | | |
| *Advice from the NCETM Mastery Booklet for Year 6 on Algebra* | *A linear sequence of numbers is where the difference between the values of neighbouring terms is constant. The relationship can be generated in two ways: the sequence-generating rule can be* ***recursive****, i.e. one number in the sequence is generated from the preceding number (e.g. by adding 3 to the preceding number), or*  ***ordinal****, i.e. the position of the number in the sequence generates the number (e.g. by multiplying the position by 3, and then subtracting 2).*  *Sometimes sequence generating rules that seem different can generate the same sequence: the ordinal rule ‘one more than each of the even numbers, starting with 2’ generates the same sequence as the recursive rule ‘start at 1 and add on 2, then another 2, then another 2, and so on’.*  *Sequences can arise from naturally occurring patterns in mathematics and it is exciting for pupils to discover and generalise these. For example adding successive odd numbers will generate a sequence of square numbers.*  *Letters or symbols are used to represent unknown numbers in a symbol sentence (i.e. an equation) or instruction. Usually, but not necessarily, in any one symbol sentence (equation) or instruction, different letters or different symbols represent different unknown numbers.*  *A value is said to* ***solve*** *a symbol sentence (or an equation) if substituting the value into the sentence (equation)* ***satisfies*** *it, i.e. results in a* ***true statement****. For example, we can say that 4* ***solves*** *the symbol sentence (equation) 9 – = + 1 (or 9 – x = x + 1) because it is a* ***true statement*** *that 9 – 4 = 4 + 1. We say that 4* ***satisfies*** *the symbol sentence (equation) 9 – = +1 (or 9 – x = x + 1).* | | | |

Key principles: Use concrete resources and pictorial approaches to ensure that they understand what they are learning. Where appropriate, begin lessons with the requirement from the youngest year group then ‘leave’ children from that year group to continue to rehearse that. Move the children from the next year group to their requirements. SO – teacher models the teaching with concrete resources and the children copy the teacher. Then the teacher sketches a picture of the concrete resources and the children draw their resources. Talk and write (adults scribe if needed) about the learning. At other times, you might start a lesson with one of the year groups together whilst the other year group(s) are doing something from before and then leave the first year group you worked with to get on with follow-up and then teach rest the next thing. At other times, do some teaching tasks with everyone i.e. there might be children in a lower year group who are able to understand requirements from older year groups etc.