South Farnborough Junior School

Year 6 Long Term Planning

Topic	Objectives / Key concepts	Misconceptions
Number: Place Value	• 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 • read, write, order and compare numbers up to 10 000 000 and determine the value of each digit • use negative numbers in context, and calculate intervals across zero • identify common factors, common multiples and prime numbers round any whole number to a required degree of accuracy	• Some pupils confuse factors and multiples. • Some pupils can confuse the language of large (and small) numbers since the prefix 'milli- means 'one thousandth' (meaning that there are 1000 millimetres in a metre for example) while one million is actually a thousand thousand. • Some pupils may not realise that degrees (°) and degrees Celsius (°C) are two different and distinct units of measurement • Some pupils may think that 1 is a prime number
Number: Addition, Subtraction, Multiplication and Division	• perform mental calculations, including with mixed operations and large numbers • solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why • multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication • solve problems involving addition, subtraction and multiplication • use their knowledge of the order of operations to carry out calculations • divide numbers up to 4 digits by a two-digit whole number using the formal written method of long division; 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 • use written division methods in cases where the answer has up to two decimal places solve problems involving division	• Some pupils may write statements such as 140 - 190 = 50 • When subtracting mentally some pupils may deal with columns separately and not combine correctly; e.g. 180 – 24: 180 – 20 = 160. Taking away 4 will leave 6. So the answer is 166. • The use of BIDMAS (or BODMAS) can imply that division takes priority over multiplication, and that addition takes priority over subtraction. This can result in incorrect calculations. • Some pupils may write statements such as 12 ÷ 132 = 11 • Formal written methods of addition, subtraction and multiplication work from right to left. Formal division works from left to right. • When using short division many pupils will at first struggle to deal correctly with any division where the divisor is greater than the first digit of the dividend; for example: 0 10 7 r 5 8 | 3 ^{8}6 ^{6}1 3 ÷ 8 = 0 remainder 3, and so the 3 should be moved across. Instead, the 8 has been 'moved across' and therefore everything that follows has been correctly carried out based on an early misunderstanding.
Number: Fraction	• use common factors to simplify fractions; use common multiples to express fractions in the same denomination • compare and order fractions, including fractions > 1 • associate a fraction with division and calculate decimal fraction equivalents [for example, 0.375] for a simple fraction [for example, $^{3}/_{8}$] • recall and use equivalences between simple fractions, decimals and percentages, including in different contexts • 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, $^{1}/_{4} \times {}^{1}/_{2} = {}^{1}/_{8}$] divide proper fractions by whole numbers [for example, $^{1}/_{3} \div 2 = {}^{1}/_{6}$]	• A fraction can be visualised as divisions of a shape (especially a circle) but some pupils may not recognise that these divisions must be equal in size, or that they can be divisions of any shape. • Some pupils may think that you simply can simply add/subtract the whole number part of mixed numbers and add/subtract the fractional art of mixed numbers when adding/subtracting mixed numbers, e.g. $3\frac{1}{3} - 2\frac{1}{2} = 1\frac{-1}{6}$ • Some pupils may make multiplying fractions over complicated by applying the same process for adding and subtracting of finding common denominators. Some pupils may think that simplifying a fraction just requires searching for, and removing, a factor of 2 (repeatedly)

South Farnborough Junior School

Year 6 Long Term Planning

Geometry: Position and Direction	• 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	• When describing or carrying out a translation, some pupils may count the squares between the two shapes rather than the squares that describe the movement between the two shapes. • When reflecting a triangle some students may draw a translation • When carrying out a reflection some pupils may think that the object and image should be an equal distance from the edge of the grid, rather than an equal distance form the mirror line. • Some pupils will confuse the order of x-coordinates and y-coordinates When constructing axes, some pupils may not realise the importance of equal divisions on the axes
Number: Decimals and Percentages	• multiply one-digit numbers with up to two decimal places by whole numbers solve problems involving the calculation of percentages [for example, of measures, and such as 15% of 360] and the use of percentages for comparison	• Some pupils may think that as you divide by 10 to find 10%, you divide by 15 to find 15%, divide by 20 to find 20%, divide by 100 to find 100%, etc. • Pupils may not make the connection that a percentage is a different way of describing a proportion
Number: Algebra	• use simple formulae • convert between miles and kilometres • enumerate possibilities of combinations of two variables • express missing number problems algebraically find pairs of numbers that satisfy an equation with two unknowns	• Some pupils may apply the order of operations incorrectly when working with two step formulae • Units must be consistent when using formulae. For example, a mobile phone plan might charge £15 per month plus 5p for every text. The formula 'Monthly cost = 15 + 5 × number of texts is wrong because amounts in both pounds and pence are involved. Monthly cost (in pence) = 1500 + 5 × number of texts is one correct way of writing the formula. • It is not advisable to abbreviate the formula 'kilometres = miles × 1.6' using letters. 'm' is the normal abbreviation for metres and 'k' can represent £1000. If 'km' is used it could even be interpreted as 'k × m'. • Some pupils may think that variables have a set value, such as $a = 1$, $b = 2$, $c = 3$, $d = 4$, etc. (especially if they have done lots of poorly designed treasure hunts/codes) – this will lead to problems such as thinking 'b^2 ' is the same as '$2b$' because when $b = 2$, $b^2 = 4$ and $2b = 4$. • Using the idea of 'apples' and 'bananas' to explain $a + b = 14$ can lead to misconceptions about the use of letters as variables. Some students may think that the variables have to be positive integers (whole numbers)
Measurement: Converting Units	• 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	• Some pupils may apply an incorrect understanding that there are 100 minutes in a hour when solving problems • Some pupils may struggle when converting between 12- and 24-hour clock notation; e.g. thinking that 15:00 is 5 o' clock • Some pupils may apply incorrect beliefs about place value, such as 2.3 × 10 = 2.30. Many conversions within the metric system rely on multiplying and dividing by 1000. The use of centimetres as an 'extra unit' within the system breaks this pattern. Consequently there is a frequent need to multiply and divide by 10 or 100, and this can cause confusion about the connections that need to be applied.

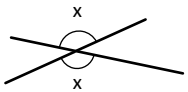
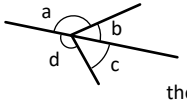
South Farnborough Junior School

Year 6 Long Term Planning

Measurement: Area, Perimeter and Volume	• recognise that shapes with the same areas can have different perimeters and vice versa • 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] • recognise when it is possible to use formulae for area and volume of shape solve problems involving the calculation and conversion of units of measure, using decimal notation up to three decimal places where appropriate	• Some pupils may use the sloping height when finding the areas of parallelograms and triangles • Some pupils may think that the area of a triangle is found using area = base × height Some pupils may think that you multiply all the numbers to find the area of a shape
Number: Ratio	• solve problems involving the relative sizes of two 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	• Many pupils will want to identify an additive relationship between two quantities that are in proportion and apply this to other quantities in order to find missing amounts • When finding a fraction of an amount some pupils may try to use a rule formed without the necessary understanding. As a result they will muddle the operations, dividing by the numerator and multiplying by the denominator. When constructing an enlargement some pupils may only apply the scale factor in one dimension; for example, 'enlarging' a 2 by 4 rectangle by a scale factor of 2 and drawing a 2 by 8 rectangle.
Statistics	• interpret and construct pie charts and line graphs and use these to solve problems calculate and interpret the mean as an average	• Some pupils may think the larger the size of the pie chart, the greater the total frequency • Some pupils may think if two pie charts have the same section then the amount of data the section represents is the same in each pie chart.' • Some pupils may confuse the fact that the sections of the pie chart total 100% and 360° • Some pupils may think that a line graph is appropriate for discrete data • Some pupils may think that each square on the grid used represents one unit • If using a calculator some pupils may not use the '=' symbol (or brackets) correctly; e.g. working out the mean of 2, 3, 4 and 5 as 2 + 3 + 4 + 5 ÷ 4 = 10.25. • Some pupils may think the average is always the middle number • Some pupils may think that the mean must be a whole number Some pupils may not realise that the mean must lie within the range of the data set.

South Farnborough Junior School

Year 6 Long Term Planning

Geometry: Properties of Shape	• recognise angles where they meet at a point, are on a straight line, or are vertically opposite, and find missing angles • draw 2-D shapes using given dimensions and angles • recognise, describe and build simple 3-D shapes, including making nets • Construct 2D shapes • Investigate 3D shapes Explore nets of 3D shapes	• Some pupils may think that these angles are not equal as they are not 'vertical'.  • Some pupils may think that angles that are 'roughly' opposite are always equal, e.g. a = c •  • Some pupils will read the wrong way round the scale on a typical semi-circular protractor, therefore using 180° - required angle • Some pupils may measure from the end of a ruler, rather than the start of the measuring scale • Some pupils may think that several repeats of a shape in any pattern constitutes a tessellation • When given a net of a 3D shape some pupils may think that the number of vertices of the 3D shape is found by counting the number of 'corners' on the net • Some pupils may think that a 'regular' polygon is a 'normal' polygon • Some pupils may think that all polygons have to be regular • Some pupils may think that a square is only square if 'horizontal', and even that a 'non-horizontal' square is called a diamond The equal angles of an isosceles triangle are not always the 'base angles' as some pupils may think