

## Year 6: Planning for Mastery

### Autumn Term

Number and place value (including algebra)

Fractions including decimals

Measures and statistics included in practice activities

### Spring Term

Addition, subtraction, multiplication and division

Geometry

Measures and statistics included in practice activities

### Summer Term

Recap all work for SATs and give time to test practice

Recap of all work and preparation activities to ensure a good start in Year 7

### Measurement and statistics to include in number work:

- 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 ( $\text{cm}^3$ ) and cubic metres ( $\text{m}^3$ ), and extending to other units [for example,  $\text{mm}^3$  and  $\text{km}^3$ ].
- interpret and construct pie charts and line graphs and use these to solve problems
- calculate and interpret the mean as an average.

Count in steps of the multiplication tables that you want the children to rehearse, decimal and fraction steps and steps that help children with mental calculation strategies such as 25, 50 and 75. Link this to linear number sequences in algebra.

It is also helpful to count in positive and negative integers across zero.

Rehearse telling the time on analogue and digital clocks including clocks with Roman numerals. Roman numerals regularly during these times

Rehearse mental calculation strategies.

**Weeks are flexible: keep going until all children have mastered the area being taught**

**Number and place value**

**Fractions**

**Autumn  
Term**

Place Value: positional, multiplicative, additive, base 10. Teach the terms and use alongside teaching. Positional: where digit is placed, multiplicative: multiply the digit by its position to get true value, additive: add all the values together to get the whole number. Explore place value from thousandths to ten million. Use partitioning cards, Dienes, Place value counters, place value grids and digit cards for this. Base 10: our number system increases and decreases in powers of 10. Practice multiplying/dividing by powers of 10 on Gettegno charts. Find one million/100 000/10 000/1000 etc. more/less include decimals. Recap zero as place holder. Link to measurement- practical activities with length, mass, capacity, money. Ordering and comparing, greater than, less than, equals, rounding to nearest hundredths, tenth, 1, 10, 100, 1000, 10 000, 100 000 and million. Ensure all above is done with tenths, hundredths and thousandths as well as whole numbers. Converting between kilograms and grams, litres and millilitres, kilometres and metres. With money, the dot separates the pounds and pence. It should not be referred to as a decimal point because of the way we say money: £3.45, three pounds forty-five not three point four five pounds. Solving missing number problems and linking to algebra: finding pairs of numbers that satisfy an equation with two unknowns, e.g.  $a + b = 360$ ,  $a - 129 = b$ . How many solutions can children find? Include other aspects of algebra, e.g. enumerate possibilities of combinations of two variables (ice creams, clothes). Negative numbers within the context of temperature using thermometers with different scales, land below sea level and money.

Correct vocabulary: vinculum, denominator, numerator. Children should have mastered, the part/whole model for fractions, finding fractions of quantities, numbers and shape, comparing and ordering fractions with the same denominator and unit fractions with different denominators, finding equivalent fractions, converting between mixed numbers and improper fractions and adding and subtracting fractions with the same denominator, denominators with similar denominators and random fractions by finding common denominators. So, in theory, light touch revision is all that should be needed. Review that fractions are areas so show shapes that are equal fractions but not identical. Children should have mastered multiplying fractions including mixed numbers by whole numbers and know the generalisation for this. In Year 6, they multiply fractions by fractions. Do this simply with grids and strips of paper. For example,  $\frac{1}{4} \times \frac{1}{2}$  fold a strip of paper into half and then into quarters, answer is  $\frac{1}{8}$ . Don't just teach the rule, they need to understand why this works. They develop the generalisation through observing what is happening. They divide unit and then non-unit fractions by whole numbers (sharing model). This should be done visually and a generalisation found. Focus on finding percentages of numbers by finding 10% and playing around with it. Fraction, decimal and percentage equivalences. They will be familiar with ratio through scaling. Continue this. Make links to measures. Plenty of problem solving for fractions, percentages (including pie charts) and ratio **using bar model**.

### Addition, subtraction, multiplication and division

Vocabulary: augend add addend = sum, minuend subtract subtrahend = difference, multiplicand multiplied by multiplier = product, dividend divided by divisor = quotient

#### Spring Term

Reinforce commutativity and inverse. Check addition using subtraction, subtraction using addition, multiplication using division and division using multiplication. Estimate answers first.

Focus on mental calculation strategies from previous years for several weeks.

- Using number pairs for all numbers to 1/10 (hundredths), 1 (tenths), 10, 20 and 100
- Near doubles (1250 + 1260, 3214 + 3215)
- Counting on and counting back
- Bridging 10 (1376 + 1284 = 1380 + 1280 then 1400 + 1260)
- Sequencing e.g.  $2145 + 1132 = 2145 + 1000 + 100 + 30 + 2 = 3275$
- Add/subtract near multiples of 10/100/100 by +/- the multiple and adjusting
- Using known number facts, e.g.  $105 + 114 = 119$ ,  $210 + 228 = 238$
- Same difference, different calculation,  $3263 - 2129$  becomes  $3264 - 2130$
- Tables facts for all numbers to 12 x 12. Counting in steps and learn the facts. Lots of chanting.
- Use known facts to generate others, e.g.  $6 \times 9 = 54$ ,  $60 \times 9 = 540$ ,  $60 \times 4.5 = 270$ , commutative and inverse facts, multiplying and dividing by 10, 100 and 1000, halving, doubling
- Doubling and halving
- Multiplying by 5 by multiplying by 10 and halving, dividing by 5 by dividing by 10 and doubling
- Multiplying by 20 by multiplying by 10 and doubling, dividing by 20 by dividing by 10 and halving
- Multiplying by 15, by multiplying by 10, halve it and add the two

Solve 2-step problems within the context all the different measures; bar charts (finding totals and differences), line graphs, pie charts; perimeter of rectangles and other shapes, using formula as appropriate; missing whole number problems linking to algebra. Convert units of measurements. Link in with finding areas and solid volumes and exploring the formulae for these – practically on squared paper and using interlocking cubes. Include numbers with up to 3 decimal places. Encourage children to decide which methods to use for different calculations. When practicing the written methods, choose numbers that can't be efficiently calculated using a mental calculation strategy.

Long division is new to Year 6 and needs teaching. There are various methods shown in the NC appendices. Ensure that all Year 6 teachers in school are using the same approach. Always estimate answer first, check with multiplication (using calculator). Continue dividing remainders for decimal quotient.

Create time/distance line graphs where scale goes up in multiples the children need to practice. Read and interpret time tables. Missing number problems linking to algebra.

Explore common factors, multiples, prime numbers, prime factors, non-composite numbers.

**Scaling up and scaling down:** link to ratio. Bar model problems, e.g. A gardener planted red and white roses in a ratio of 3:4. She planted 90 white roses. How many white roses did she plant?

## Geometric Reasoning

**Spring Term**

**3D shape:** Children should be familiar with these activities, so briefly revisit: use plasticine to make sphere, cube, cuboid, pyramid, exploring what doing to get each new shape and properties including naming face shapes, edges and vertices. When they make the pyramid they visualise its net, sketch and then make it. They then accurately make one, measuring the base and height of triangular faces. Repeat for cube, triangular and other prisms and pyramids. Explore which patterns make nets and which don't. Prism has named ends joined by rectangles. Pyramid has named face and triangular faces. Explore shapes in different orientations. Identify 3-D shapes from 2-D representations, e.g. circle could be sphere, cylinder, cone. Square could be cube, cuboid, square based pyramid, any prism. Sort into Venn and Carroll diagrams: whether polyhedral or not, whether prism or not, whether pyramid or not.

**2D shape:** compare, classify and draw regular and irregular polygons (any shape with 3 or more sides) according to properties, including symmetry and angles (acute, right, obtuse and reflex).

Recap names of quadrilaterals (rectangle, square, oblong, parallelogram, rhombus, trapezium, kite). Children draw different types. Rectangles have 4 right angles: oblongs and squares. Explore properties including vertical, horizontal, diagonal, parallel, perpendicular sides, angles and symmetry. Which shapes are rhombi, kites and parallelograms? (squares) What are the properties of each named quadrilateral, e.g. kite: two adjacent sides equal, at least one pair of opposite angles equal, diagonals bisect at right angles. Explore diagonals of other quadrilateral, how do they bisect? Use knowledge to find missing lengths and angles. Explore properties (as above) of named triangles (equilateral, right angled isosceles, isosceles, right angled scalene, scalene). Find perimeters and areas of quadrilaterals and triangles (using knowledge that triangles are half a rectangle). Sorting activities including Venn and Carroll diagrams.

Focus on measuring and identifying angles. Draw 2-D shapes using given dimensions and angles, focussing on how to use a protractor. Explore missing angles in triangles, quadrilaterals and regular polygons using formula, e.g.  $a = 180 - (b + c)$ . Drawing and measuring angles using a protractor.

Circles: radius, diameter, circumference. Explore the relationships between them: diameter is twice the radius, circumference is approximately 3 times the diameter. Could link to pie charts and fractions/percentages.

Explore angles where they meet at a point, on a straight line and vertically opposite – find missing angles and link to algebra.

**Position direction and movement:** reinforce positions on a 2-D grid as coordinates in the first quadrant. Extend to all four quadrants including negative numbers. Coordinate activity (from variation slides) is a really good one for this. Draw and label quadrilaterals and triangles specified by coordinates in the four quadrants.

Describe movements between positions as translations of a given unit to the left/right and up/down. Translate quadrilaterals and triangles on coordinate grids. Could describe algebraically, for example, translating  $(a, b)$  to  $(a-2, b+3)$ .

Explore reflections across 'mirror lines' which are horizontal, vertical and diagonal and also on coordinate grids.

**Summer  
Term**

SATs practice!

After SATs begin preparation for secondary school.

Continue work on fractions, decimals, percentages and ratio.

Convert units of measure.

Explore prime numbers, square numbers, square roots, triangular numbers.

Dig a little deeper into algebra!

Help the children become familiar with:

- Algebraic Fractions e.g.  $\frac{2}{\chi-3}$ . What could  $\chi$  be? What else?
- Expanding brackets in algebra, e.g.  $(\chi + 5)(\chi + 2) = \chi^2 + 2\chi + 5\chi + 10 = \chi^2 + 7\chi + 10$

Good investigation for this is proving odd number x odd number = odd number

e.g.  $5 \times 7 = 35$

$$\begin{array}{r|rr} & 4 & 1 \\ 6 & 24 & 6 \\ 1 & 4 & 1 \end{array}$$

There will always be 1, so product will always be odd

If  $n$  is a number, to ensure it is even it becomes  $2n$ , to ensure it is odd it becomes  $2n + 1$

$$(2n + 1)(2n + 1) = 4n^2 + 2n + 2n + 1 = 4n^2 + 4n + 1$$

Will always be 1 so we have proof that this is always true!

Could explore this for  $O \times E = E$ ,  $E \times E = E$ . Do the same for addition, subtraction and division.

- Similar shapes: same shape just a different size. Children could explore drawing shapes and then scaling them up and down to make similar shapes. This links to work already covered.
- Probability: there are some great investigations for this. See Nrich.  
Could work on probabilities of throwing two dice: probability of throwing one = 0,  $2 = 1$  (1, 1),  $3 = 2$  (1, 2) (2, 1),  $4 = 3$  (1, 3) (3, 1) (2, 2),  $5 = 4$  (1, 4) (4, 1) (2, 3) (3, 2) and so on. Most common is 7 which could be thrown in six possible ways (1, 6) (6, 1) (2, 5) (5, 2) (3, 4) and (4, 3). There are 36 ways to throw the numbers to 12. The probability of throwing 7 is  $6/36$  or one out of every 6 throws. Test it out!
- Properties of numbers: commutative, associative and distributive. Children know about commutative so explore this again. Explore the associative property:  $1 + 6 + 3 = (1 + 6) + 3 = 1 + (6 + 3) = 10$ ,  $4 \times 2 \times 5 = (4 \times 2) \times 5 = 4 \times (2 \times 5) = 40$ . Explore the distributive property:  $3 \times (6 + 2) = (3 \times 6) + (3 \times 2) = 24$