Year 6 Progression Long Term Plans Key Concepts

National Curriculum 2014

Purpose of Study – National Curriculum 2014

Mathematics is a creative and highly inter-connected discipline that has been developed over centuries, providing the solution to some of history's most intriguing problems. It is essential to everyday life, critical to science, technology and engineering, and necessary for financial literacy and most forms of employment. A high-quality mathematics education therefore provides a foundation for understanding the world, the ability to reason mathematically, an appreciation of the beauty and power of mathematics, and a sense of enjoyment and curiosity about the subject.

Aims

The National Curriculum for mathematics aims to ensure that all pupils:

- become **fluent** in the fundamentals of mathematics, including through varied and frequent practice with increasingly complex problems over time, so that pupils have conceptual understanding and are able to recall and apply their knowledge rapidly and accurately to problems
- **reason mathematically** by following a line of enquiry, conjecturing relationships and generalisations, and developing an argument, justification or proof using mathematical language
- can **solve problems** by applying their mathematics to a variety of routine and non-routine problems with increasing sophistication, including breaking down problems into a series of simpler steps and persevering in seeking solutions.

Who is this book for?

The purpose of this booklet is to outline the expected progression for each year group from the new framework for mathematics. It is important that this is used to ensure that the correct pitch of lessons is achieved alongside suitable differentiation for learning. It is designed to support the 2014 National Curriculum for Mathematics at Key Stages 1 and 2.

This booklet will be relevant and useful for all the following at Brodetsky Jewish Primary School:

- Class Teacher
- Teaching Assistants/Learning Support Assistants
- Volunteers
- Supply Staff
- Parents

Resources

In Years 3-6 planning will be based on the White Rose Maths Hub mastery schemes of learning, which combines the Singapore pedagogy with leading UK expertise and is correlated to the new National Curriculum.

Overview of Progression in Year 6

Number and place value

Children work with numbers up to 10,000,000, using knowledge of place value to work out the value of digits. They continue working with negative numbers in different contexts, and work out intervals across zero.

Addition, subtraction, multiplication and division Children continue to practise using efficient written and mental methods for all four operations, working with larger numbers and increasingly complex calculations, and confidently using number facts from the multiplication and division tables. They learn about the correct order of operations, understanding that (for example) to work out (7 + 8) ÷ 3 they need to tackle the operation in brackets first.

Fractions (including decimals and percentages)

Children begin to add and subtract fractions with different denominators. They multiply pairs of simple proper fractions together, and divide proper fractions by whole numbers.

Children begin to multiply and divide numbers with two decimal places by one-digit and two- digit whole numbers. They are introduced to this in practical contexts such as measures and money (for example, multiplying 1.80 metres by 2, or dividing £1.80 by 3).

Children extend their work on percentage and decimal equivalents of fractions, begun in Year 5. They work out simple percentages of whole numbers, and encounter equivalences between fractions, decimals and percentages in different contexts.

Ratio and proportion

In Year 6, children are introduced to the concepts of ratio and proportion and use these to compare quantities and sizes; for example, understanding that mixing sugar and flour in a ratio of 1:2 means using 1 part of sugar for every 2 parts of flour, and that the proportion of sugar in the mixture is 1 out of 3 parts, which is $^1/_3$.

Algebra

Children begin to form an understanding of algebra by encountering the use of symbols and letters to represent unknown elements, for example using letters to represent missing numbers in missing number problems. They also describe and generate number sequences and patterns. They begin to use simple formulae expressed in words, such as 'the perimeter of a rectangle is two times the length plus two times the width.

Measurement

Children extend their Year 5 work on calculating area and estimating volume and capacity to calculate the area of parallelograms and triangles, and work out the volume of cubes and cuboids using standard units. They convert measurements from miles to kilometres.

Geometry: properties of shapes

This year, children make nets to build simple 3D shapes, and work out unknown angles in triangles, quadrilaterals and regular polygons. They draw and name the different parts of a circle (radius, diameter and circumference).

Geometry: position and direction

Extending their work with coordinate grids, children learn to describe positions on all four quadrants of the grid, including using negative numbers. They translate simple shapes on the coordinate plan, reflecting them in the axes.

Statistics

Children continue working with line graphs and also learn how to use pie charts, linking this with their work on angles, percentages and fractions. Children learn how to work out the mean of a set of data and understand when it might be appropriate to calculate the mean, and why.

Year 6 Long Term Planning

Number and place value

- Children should use the whole number system - saying, reading and writing numbers accurately.

Fractions (including decimals and percentages)

- Children should practise, use and understand the addition and subtraction of fractions with different denominators by identifying equivalent fractions with the same denominator. They should start with fractions where the denominator of one fraction is a multiple of the other and progress to varied and increasingly complex problems.
- Children should use a variety of images to support their understanding of multiplication with fractions. They 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. They practise with simple fractions and decimal fraction equivalents to aid fluency, including listing equivalent fractions to identify fractions with common denominators.
- Children can explore and make conjectures about converting a simple fraction to a decimal fraction. For simple fractions with recurring decimal equivalents, children should learn about rounding the decimal to three decimal places, or other appropriate approximations depending on the context.
- Children also develop their skills of rounding and estimating as a means of predicting and checking the order of magnitude of their answers to decimal calculations.

Algebra

- Children should be introduced to the use of symbols and letters to represent variables and unknowns in mathematical situations that they already understand, such as:
  - missing numbers, lengths, coordinates and angles
  - formulae in mathematics and science
  - arithmetical rules (e.g. a + b = b + a)
  - generalisations of number patterns
  - number puzzles

Geometry: properties of shapes

- Children should draw shapes and nets accurately, using measuring tools and conventional markings and labels for lines and angles.
- Children should describe the properties of shapes and explain how unknown angles and lengths can be derived from known measurements. These relationships might be expressed algebraically.

Geometry: position and direction

- Children should draw and label a pair of axes in all four quadrants with equal scaling.
- Children draw and label rectangles, parallelograms and rhombuses, specified by coordinates in the four quadrants, predicting missing coordinates using the properties of shapes.

Addition, subtraction, multiplication and division

- Children should practise addition, subtraction, multiplication and division for larger numbers, using the efficient written methods of columnar addition and subtraction, short and long multiplication, and short and long division (see Appendix 1).
- They should undertake mental calculations with increasingly large numbers and more complex calculations.
- Children should continue to use all the multiplication tables to calculate mathematical statements in order to maintain their fluency.
- Children should round answers to a specified degree of accuracy.
- Children explore the order of operations using brackets.
- Common factors can be related to finding equivalent fractions.

Ratio and proportion

- Pupils recognise proportionality in contexts when the relations between quantities are in the same ratio.
- Pupils link percentages or 360° to calculating angles of pie charts.
- Children should consolidate their understanding of ratio when comparing quantities, sizes and scale drawings by solving a variety of problems. They may use the notation a: b to record their work.
- Children should solve problems involving unequal quantities. These problems are the foundation for later formal approaches to ratio and proportion.

Measurement

- Using the number line, children should use, add and subtract positive and negative integers for measures such as temperature.
- They should know approximate conversions and be able to tell if an answer is sensible.
- They should relate the area of rectangles to parallelograms and triangles, and be able to calculate their areas, understanding and using the formula to do this.
- Children could be introduced to other compound units for speed, such as miles per hour, and apply their knowledge in science or other subjects as appropriate.

Statistics

- Children should connect their work on angles, fractions and percentages to the interpretation of pie charts.
- Children should both encounter and draw graphs relating two variables, arising from their own enquiry and in other subjects.
- They should connect conversion from kilometres to miles in measure to its graphical representation.
- Children should know when it is appropriate to find the mean of a data set.

Key Maths Concepts in Year 6

Ratio and Proportion: solving problems involving unequal sharing

Children will already know that if they want to work out how to share, for example, 20 sweets equally between two people, they can use straightforward division: they can calculate 20 ÷ 2 = 10. However, what if they need to find out how to share 20 sweets between two people in a ratio of 1:3; in other words, where Person A receives three sweets for every one sweet received by Person B?

Children will need to understand that the ratio 1:3 implies that there are 4 'shares' to be parcelled out between the two people (1 + 3 = 4). If 20 sweets = 4 shares, then each share is worth 5 sweets (20 ÷ 4 = 5), so Person A gets one share, consisting of 5 sweets in total, and lucky Person B gets three shares, consisting of 15 (3 × 5 = 15) sweets in total.

When working with ratios and proportions, children will need to understand the distinction between ratio and proportion. A ratio compares part of the whole with another part of the whole; for instance, shortbread might be made using flour, butter and sugar in a ratio of 4:3:2, with four parts of flour and three parts of sugar for every two parts of butter. However a proportion is used to describe a part of the whole in relation to the whole itself; so in this fictional shortbread, the proportion of butter is 3 out of 9 parts, or one third.

Working out the size of the sectors in pie charts

Children will need to understand that in order to create a pie chart, they first need to work out the fraction of the total that each sector represents. They can then convert this fraction to an angle, and draw sectors with the correctly sized angles.

So, for example, imagine the following data set needs to be represented by a pie chart:

- Number of children travelling to school by car: 15
- Number of children travelling to school by bike: 10
- Number of children walking to school: 5

Children would need first to work out the total number of children in the group (30). They can then work out the fraction of the total which makes up each category – so 'car' accounts for 15 out of the 30 children, or $^1/_2$ of the total; 'bike' accounts for 10 out of 30, or $^1/_3$; and 'walk' accounts for 5 out of 30, or $^1/_6$ of the total.

Children will know that there are 360° in a full turn, and this means they can work out the angle needed for each segment by multiplying the fraction by 360°. (In this example, since the numerator of each fraction is 1, you can just divide 360 by the denominator of each fraction.) This gives the following angles for each segment of the pie:

- car 180°
- bike 120°
- walk 60°

Children can then use these angles to draw the sectors on the pie chart