



Mathematics Policy

Written December 2018

Date approved by D&P Committee:

Signed by Chair of Governors:

Signed by Head Teacher:

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Priory Junior School Mathematics Policy 2018/19

Introduction

Mathematics teaches us how to make sense of the world around us through developing a child's ability to calculate, to reason and to solve problems. It enables children to understand and appreciate relationships and patterns in both number and space in their everyday lives. Mathematics is a key life skill necessary in whatever path an individual takes through life. Effective Learning takes place when students are given opportunities to solve problems by developing their understanding, making links between different areas of mathematics and applying skills. Teaching at Priory Junior School involves creating an appropriate environment in which our pupils can respond to high levels of expectation and challenge.

This policy outlines what we are aiming to achieve in respect of pupils' mathematical education. It also describes our agreed approach to the planning, delivery and assessment of the mathematics curriculum. The mathematics taught and the methods used reflect the recommendations outlined in the guidance contained in the documents:

- A. Curriculum Guidance for Teaching Mathematics from Year 3 to Year 6
- B. Maths No problem and White Rose medium term planning.

It provides information and guidance for teachers, governors and other interested parties.

1. Aims and objectives

The National Curriculum 2014 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.

Our aims at Priory Junior School are to:

- Promote enjoyment and enthusiasm for learning through practical activity, exploration and discussion;
- Develop mathematical skills and knowledge accompanied by the quick recall of basic facts;
- Use CPA (Concrete, Pictorial and Abstract) approach to develop mathematical skills;
- Promote confident, competent and independent mathematicians who can communicate their ideas and concepts using appropriate mathematical language;
- Use a range of conceptual and procedural variation to enable a mastery of each topic covered;
- Develop an awareness of mathematics beyond the classroom.

The objectives that will enable us to achieve these aims are to:

- Develop an understanding of number and the number system;

- Explore features of shape and space, and develop measuring skills in relation to everyday situations;
- Develop the ability to use manipulatives to support problem solving;
- Develop the ability to, and understand the importance of, solving problems through decision-making and reasoning in relation to everyday situations;
- Develop a practical understanding of the ways in which information is gathered and presented;
- Relate their mathematical skills to ICT effectively;
- Develop a positive attitude to mathematics;
- Use mathematics within our topic based work (using real-life contexts);
- Ensure investigative maths feeds into our everyday teaching.

2. Teaching and Learning Strategies

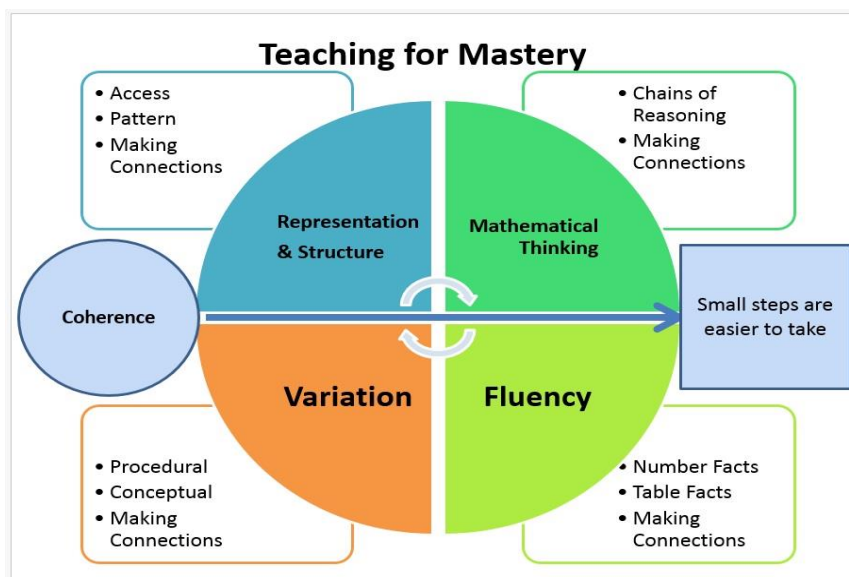
The school follows the National Framework for mathematics. Links, where appropriate, are made to other subjects where possible. In addition to this, we are beginning to adopt the PFEG financial learning framework to promote real-life links to maths across the curriculum. Priory Junior School uses a variety of teaching styles to cater for the variety of learning styles of pupils in mathematics lessons. The school embraces a thinking skills approach across the curriculum. Where appropriate, activities and ideas from the Thinking Skills policy will be used in mathematics.

Our principle aim is to develop children’s knowledge, skills, reasoning, fluency and understanding in mathematics. We do this through a daily lesson that has a high proportion of whole-class and group-direct teaching. During these lessons, we encourage children to ask as well as answer mathematical questions. They have the opportunity to use a wide range of concrete resources such as number lines, number squares, place value counters, and small apparatus to support their work. We also encourage the use of pictorial aids to support pupils’ mathematical learning, before moving on to the more abstract calculation based working.

Please refer to the calculation policy that has been reviewed in light of the new National Curriculum.

With regard to our mastery approach to the teaching of mathematics, we follow the 5 Big Ideas procedure for the planning and teaching of a sequence of lessons.

There are 5 “Big Ideas” which underpin the NCETM’s Teaching for Mastery:



1. Coherence:

- A comprehensive, detailed conceptual journey through the mathematics.
- Connecting new ideas to concepts that have already been understood, and ensuring that, once understood and mastered, new ideas are used again in next steps of learning, all steps being small steps.
- Small steps - the teacher provides the steps but the child takes and connects the steps, reasoning along the way.
- Opportunities for depth.
- Stem sentences to support reasoning.

For example:

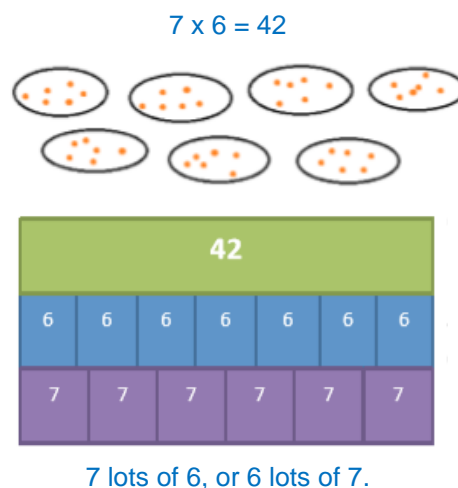
Before teaching the written algorithm for subtraction, pupils need to be able to:

- Be fluent in their number facts for single digit numbers
- Understand how numbers can be partitioned, e.g. 47 into 40 and 7 or 30 and 17.
- Understand that 47 is 4 tens and 7 ones

2. Representation and structure:

- Mathematics is an abstract subject, representations have the potential to provide access and develop understanding.
- Representations and resources help to build concepts, draw attention to and expose the structure of the concept being taught.
- Moves from concrete, to pictorial, to abstract.
- One of the keys to mastery is exposing structure, however, to stop artificial early success – we often assume that our ‘rapid-graspers’ can already do, so don’t need exposure to such things. In fact, it is only through such exposure that they are able to build a deep understanding.

For example:



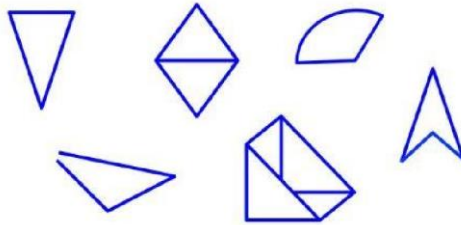
3. Variation:

- Conceptual variation draws attention to **what it is**, whereas non-conceptual variation draws attention to **what it is not**.

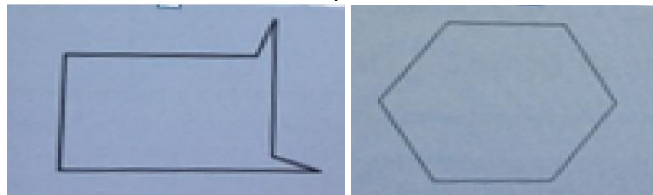
- Procedural variation draws attention to mathematical relationships and how they are connected through carefully chosen examples, which avoid mechanical repetition. Procedural variation is a careful choice of **what** to vary and careful choice of **what the variation will draw attention to**.
- This deepens their understanding further and allow them to create their own generalisations. This leads to intelligent practice.
- Research suggests that teaching through deliberate variation problems appears to be more effective than teaching through repeated explanations of a definition.
- Tasks should be designed in a way that avoids mechanical thinking so that children do not stop thinking. They should be taught to look for and recognise connections. Questions such as, What's the same? What's different? What do you notice?

For example:

Non - Conceptual variation – triangle or not a triangle?



Conceptual variation - standard and non-standard examples



Both are hexagons, however most hexagons are shown as the second (standard) example.

Procedural variation:

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$43 \times 3 = 129$

$44 \times 3 = ?$

What's the same and different about these two calculations?

43	43	43	$43 \times 3 = 129$
↓ + 1	↓ + 1	↓ + 1	
44	44	44	$44 \times 3 = ?$

$44 \times 3 = 43 \times 3 + ?$

This provides the opportunity to focus on relationships, not just the procedure and to make connections between problems by using one problem to work out the next.

4. Fluency:

- Quick and efficient recall of facts and procedures and the flexibility to move between different contexts and representations of mathematics.
- Key facts such as number facts and times tables must be learnt and practiced regularly in order to avoid cognitive overload in the working memory. This helps students to focus on new ideas and concepts.
- The ability to recognise relationships/structures and make connections in mathematics

For example:

Adding 1 and 2

Bonds to 10

Adding 10

Bridging/
compensating

Y1 facts

 Y2 facts

Doubles

Adding 0

Near doubles

Claire Christie

+	0	1	2	3	4	5	6	7	8	9	10
0	0+0	0+1	0+2	0+3	0+4	0+5	0+6	0+7	0+8	0+9	0+10
1	1+0	1+1	1+2	1+3	1+4	1+5	1+6	1+7	1+8	1+9	1+10
2	2+0	2+1	2+2	2+3	2+4	2+5	2+6	2+7	2+8	2+9	2+10
3	3+0	3+1	3+2	3+3	3+4	3+5	3+6	3+7	3+8	3+9	3+10
4	4+0	4+1	4+2	4+3	4+4	4+5	4+6	4+7	4+8	4+9	4+10
5	5+0	5+1	5+2	5+3	5+4	5+5	5+6	5+7	5+8	5+9	5+10
6	6+0	6+1	6+2	6+3	6+4	6+5	6+6	6+7	6+8	6+9	6+10
7	7+0	7+1	7+2	7+3	7+4	7+5	7+6	7+7	7+8	7+9	7+10
8	8+0	8+1	8+2	8+3	8+4	8+5	8+6	8+7	8+8	8+9	8+10
9	9+0	9+1	9+2	9+3	9+4	9+5	9+6	9+7	9+8	9+9	9+10
10	10+0	10+1	10+2	10+3	10+4	10+5	10+6	10+7	10+8	10+9	10+10

- Plan when all facts are going to be learnt
- Teach systematically
- Have a clearly defined set of facts being learnt
- Use these in problems being solved in class
- Practice
- Include previously learnt facts in this

5. Mathematical Thinking:

- If taught ideas are to be understood deeply, they must not merely be passively received but must be worked on by the student: thought about, reasoned with and discussed with others.
- Pattern spotting allows pupils to make connections between mathematical relationships, notice the structure and to reason logically. Through this they also develop their ability to explain and convince others of their ideas.
- The quality and variety of language that pupils hear and speak are key factors in developing their mathematical vocabulary and presenting a mathematical justification, argument or proof. They must be assisted in making their thinking clear to themselves as well as others and teachers should ensure that pupils build secure foundations by using discussion to probe and remedy their misconceptions.

For example:

$$\begin{aligned} \square + 17 &= 15 + 24 \\ 99 - \square &= 90 - 59 \\ 48 \times 2.5 &= \square \times 10 \\ 3 \div 4 &= 15 \div \square \end{aligned}$$

These four missing number problems can be solved instrumentally, however by teaching children to think in a connected manner, children can begin to notice the relationship across the equals sign.

“17 is 2 more than 15, therefore the missing number must be 2 less than 24.”

“99 is 9 more than 90, therefore the missing number must be 9 more than 59.”

“2.5 is 4 times smaller than 10, therefore the missing number must be 4 times smaller than 48.”

“15 is 5 times bigger than 3, therefore the missing number must be 5 times bigger than 4.”

3. Planning and Organisation

The approach to the teaching of mathematics within the school is based on:-

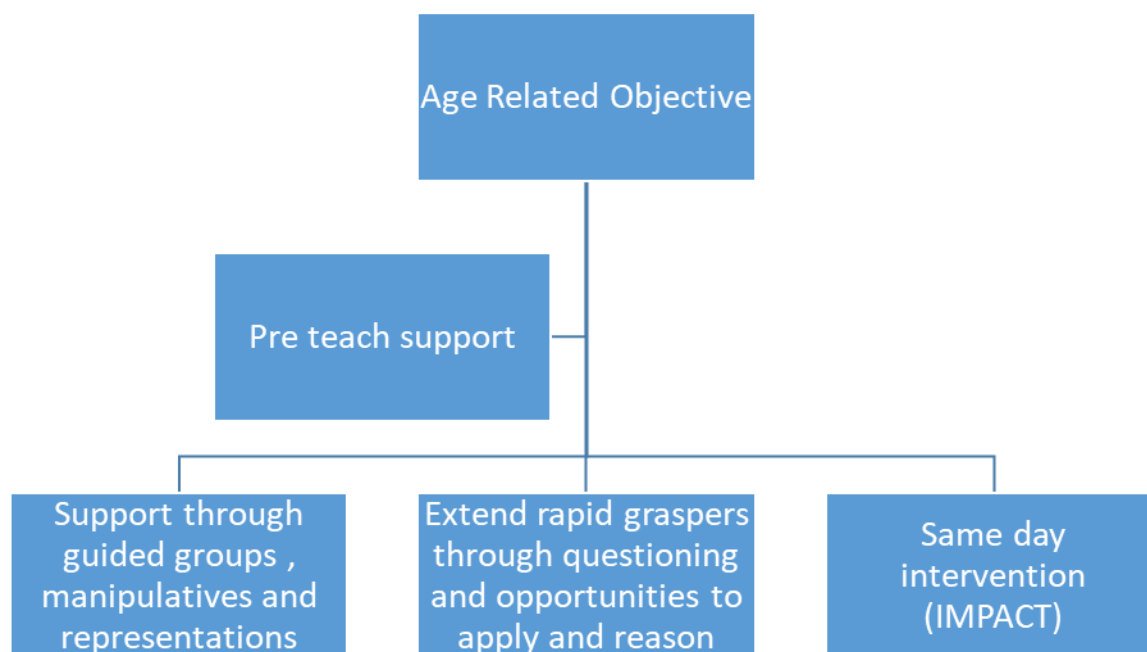
- A mathematics lesson every day
- An ‘in focus’ hook to introduce the learning, guided practice and then time for children to practise independently and with support.
- A pre-teach and/ or an intervention session for pupils who struggled to meet the objectives of the mathematics lesson - this will usually be held on the same day as the lesson once the teacher has identified who would benefit.

In the revised national curriculum 2014 it is suggested that:

Pupils who grasp concepts rapidly should be challenged through being offered rich and sophisticated problems before any acceleration through new content. Those who are not sufficiently fluent with earlier material should consolidate their understanding, including through additional practice, before moving on.’

Every attempt is made to keep the whole class learning together. Differentiation is achieved, not through offering different content, but through paying attention to the levels of support and challenge needed to allow every student to fully grasp the concepts and ideas being studied. This ensures that all students gain sufficiently deep and secure understanding of the mathematics to form the foundation of future learning before moving to the next part of the curriculum sequence. This prevents students from being left behind.

We use teaching assistants to provide appropriate support to individuals or to groups of pupils. Teaching assistants within Priory Junior School are viewed as an important 'asset' to the school and, as such, are appropriately involved in the planning and delivery of the mathematics curriculum.



Planning is based upon the new National Curriculum (2014) using the White Rose Framework and Maths- No Problem! textbooks. Class teachers are responsible for the relevant provision of their own classes and individually develop weekly SMART plans which give details of learning objectives and show the route of learning with appropriate activities. Although planned in advance, these are adjusted on a daily basis to better suit the arising needs of a class and individual pupils and shape the planning of future teaching.

By the end of year 4, pupils should have memorised their multiplication tables up to and including the 12 multiplication table and show precision and fluency in their work. We therefore run short 'Multiplication Superhero' slots throughout the week for children to practise their times tables and corresponding division facts for which accurate and speedy results are rewarded. We also use Times Table Rock Stars to support our children with their development of these facts.

By the end of year 6, pupils should be fluent in written methods for all four operations, including long multiplication and division, and in working with fractions, decimals and percentages. Due to this arithmetic skills which are taught within each term are recapped daily to ensure the methods are kept sharp.

4. Assessment, Recording and Reporting

The assessment and recording of Mathematics is part of the overall assessment of the child and should be seen alongside all of the other areas of development. Assessment in mathematics reflects the general principles and procedures laid down in the school's assessment policy. Key elements of our mathematics assessments are:

- Use of White Rose assessment tests termly
- SAT results
- Daily assessment of pupils within lesson in preparation for intervention groups, teacher providing a positive comment that is specifically linked to the Learning and Objective, and a target, where necessary in order to move children on in their Mathematics. (See marking policy for PAR marking).

Formal written reports are provided each year and this information is shared with parents. Additionally, two other meetings are held each year, with parents, to discuss progress informally and to share targets.

5. Resources

As with all curriculum policies, equal access to the curriculum is a priority. Planning and presentation of resources and tasks will ensure that all activities are inclusive. Special arrangements will be made where appropriate. All classrooms are fitted with interactive whiteboards and have timetabled access to the laptops and iPads. A range of software is available to support work with advancing technology both at school and for home learning. Teachers also have access to a range of practical concrete resources, which can be used to aid and support learning, following the teaching for mastery procedure.

6. Equal Opportunities and Special Educational Needs

Providing Equal Opportunities is the responsibility of the whole school community and must be reflected throughout the organisation of the school and at the heart of its ethos. The taught and hidden curriculum will provide opportunities for all pupils to thrive and at Priory we recognise that treating people equally does not always mean treating them the same. All curriculum subjects should be planned and marked with Equal Opportunities in mind. They should expose all of our pupils to a wide range of learning experiences and promote an awareness and curiosity about the world. Our curriculum aims to prepare all of our pupils for life in modern Britain and to be citizens of a diverse and changing world. Adaptations will be made through support, equipment and to resources to allow access for all pupils with SEND e.g. dyslexia, including provision for pupils who are exceptionally able.

Teachers should take action to respond to pupils' diverse needs by:

- creating effective learning environments;
- securing their motivation and concentration;
- providing equality of opportunity through teaching approaches e.g. multi- sensory;
- using appropriate assessment approaches;
- setting targets for learning

7. Monitoring and review

Monitoring of the standards of children's work and of the quality of teaching in mathematics is the responsibility of the mathematics subject leader and the SLT.

The work of the mathematics subject leader also involves supporting colleagues in the teaching of mathematics, keeping informed about current developments in the subject and

providing a strategic lead and direction for the subject in school. The mathematics subject leader gives the head teacher an annual summary in which s/he evaluates strengths and weaknesses in the subject and indicates areas for further improvement. The head teacher allocates management time to the mathematics subject leader so s/he can review samples of children's work and undertake lesson observations of mathematics teaching across school. Governors are informed through the head teacher's report and specifically at the Development and Planning committee meetings.

8. Role of Governors

Governors determine, support, monitor and review the school policies. They support the use of appropriate teaching strategies by allocating resources effectively. They ensure that the building and equipment are safe. They monitor pupil attainment across the school and ensure that staff development and performance management promote good quality teaching.