Clifton Primary School
Mathematics Policy 2016

MH
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Review
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Equal Opportunities
Teachers should set high expectations for every pupil. They should plan stretching work for pupils whose attainment is significantly above the expected standard. They have an even greater obligation to plan lessons for pupils who have low levels of prior attainment or come from disadvantaged backgrounds. Teachers should use appropriate assessment to set targets which are deliberately ambitious. Children will not be excluded from learning and every opportunity will be taken to ensure British values are espoused within lessons.

Purpose of study
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
Teachers should use every relevant subject to develop pupils’ mathematical fluency. Confidence in numeracy and other mathematical skills is a precondition of success across the national curriculum. Teachers should develop pupils’ numeracy and mathematical reasoning in all subjects so that they understand and appreciate the importance of mathematics. Pupils should be taught to apply arithmetic fluently to problems, understand and use measures, make estimates and sense check their work. Pupils should apply their geometric and algebraic understanding, and relate their understanding of probability to the notions of risk and uncertainty. They should also understand the cycle of collecting, presenting and analysing data. They should be taught to apply their mathematics to both routine and non-routine problems, including breaking down more complex problems into a series of simpler steps.

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 develop conceptual understanding and the ability to recall and apply knowledge rapidly and accurately.
- 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 nonroutine problems with increasing sophistication, including breaking down problems into a series of simpler steps and persevering in seeking solutions.

Mathematics is an interconnected subject in which pupils need to be able to move fluently between representations of mathematical ideas. The programmes of study are, by necessity, organised into apparently distinct domains, but pupils should make rich connections across mathematical ideas to develop fluency, mathematical reasoning and competence in solving increasingly sophisticated problems. They should also apply their mathematical knowledge to science and other subjects.

The expectation is that the majority of pupils will move through the programmes of study at broadly the same pace. However, decisions about when to progress should always be based on the security of pupils’ understanding and their readiness to progress to the next stage. 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.
Information and communication technology (ICT)
Calculators should not be used as a substitute for good written and mental arithmetic – they should only be used for checking results and to support written methodology.
Teachers should use their judgement about when ICT tools should be used.

Spoken language
The national curriculum for mathematics reflects the importance of spoken language in pupils’ development across the whole curriculum – cognitively, socially and linguistically. 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.

National Expectations
Below are a brief outline of the statutory requirements
(For full guidance)

Foundation
In the Nursery and Reception much of the mathematics teaching takes place through structured play and practical activities and is often integrated with other areas of learning. Children are working towards the Early Learning Goals set out in the area of learning for Mathematical Development in the Foundation Curriculum document. Children are presented with a firm basis in sorting, experience in practical use of measures, shape and space, pictorial representation and number. Language development is a key concern. Children will be taught and encouraged to use appropriate mathematical language, as well as to ask and respond to questions such as “What would happen if?” Practical work and discussion may lead to some children beginning to record their mathematics. Planning pays due regard to the Early Learning Goals and record keeping is an ongoing process based on the Foundation Stage Profile. Focus Mathematics provides a core of ideas through which to deliver the curriculum. By Reception children follow the objectives set out in the Numeracy Strategy and appropriate activities are chosen by staff to deliver the curriculum.

Key Stage 1 and Key Stage 2
The National Curriculum 2014 outlines what should be taught in each year group throughout KS1 and KS2. In this way the National Curriculum Programmes of Study are delivered in a balanced way. It is expected that most children within a particular year group will follow the objectives for that year group. Some children will be working from the previous year’s objectives while those who have ‘mastered’ their age related expectations will be working at a greater depth. Work is thus differentiated appropriately according to the ability of the child.

Years 1 and 2 (Key Stage 1)
The principal focus of mathematics teaching in key stage 1 is to ensure that pupils develop confidence and mental fluency with whole numbers, counting and place value. This should involve working with numerals, words and the four operations, including with practical resources [for example, concrete objects and measuring tools]. At this stage, pupils should develop their ability to recognise, describe, draw, compare and sort different shapes and use the related vocabulary. Teaching should also involve using a range of measures to describe and compare different quantities such as length, mass, capacity/volume, time and money. By the end of year 2, pupils should know the number bonds to 20 (using known facts to solve problems up to 100.
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Year 2 should know their 2, 5 and 10 multiplication tables and be precise in using and understanding place value. An emphasis on practice at this early stage will aid fluency. Pupils should read and spell mathematical vocabulary, at a level consistent with their increasing word reading and spelling knowledge at key stage 1.

Years 3 and 4 (Lower Key Stage 2)
The principal focus of mathematics teaching in lower key stage 2 is to ensure that pupils become increasingly fluent with whole numbers and the four operations, including number facts and the concept of place value. This should ensure that pupils develop efficient written and mental methods and perform calculations accurately with increasingly large whole numbers. At this stage, pupils should develop their ability to solve a range of problems, including with simple fractions and decimal place value. Teaching should also ensure that pupils draw with increasing accuracy and develop mathematical reasoning so they can analyse shapes and their properties, and confidently describe the relationships between them. It should ensure that they can use measuring instruments with accuracy and make connections between measure and number. 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. Pupils should read and spell mathematical vocabulary correctly and confidently, using their growing word reading knowledge and their knowledge of spelling.

Year 5 and 6 (Upper Key Stage 2)
The principal focus of mathematics teaching in upper key stage 2 is to ensure that pupils extend their understanding of the number system and place value to include larger integers. This should develop the connections that pupils make between multiplication and division with fractions, decimals, percentages and ratio. At this stage, pupils should develop their ability to solve a wider range of problems, including increasingly complex properties of numbers and arithmetic, and problems demanding efficient written and mental methods of calculation. With this foundation in arithmetic, pupils are introduced to the language of algebra as a means for solving a variety of problems. Teaching in geometry and measures should consolidate and extend knowledge developed in number. Teaching should also ensure that pupils classify shapes with increasingly complex geometric properties and that they learn the vocabulary they need to describe them. 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. Pupils should read, spell and pronounce mathematical vocabulary correctly.
Mathematics at Clifton
At Clifton mathematics is about the study of Number, [including number notation (e.g. Place value), number operations (i.e. addition, subtraction, multiplication and division), money, estimation, number patterns and algebra], Measures (i.e. Length, weight, volume and capacity, area and time), Geometry and Statistics. The learning and quick recall of number facts including multiplication tables and the development of mental strategies for calculation is seen as paramount. The children will be given opportunities to use and apply mathematics within the subject itself and in other areas of the curriculum.

The school’s mathematics provision is based upon the Programmes of Study laid down in the National Curriculum 2014, along with the school’s own Curriculum Guidelines.

Age stage expectations:
The calculation policy is organised according to age stage expectations as set out in the National Curriculum 2014, however it is vital that pupils are taught according to the pathway that they are currently working at and children are showing to have ‘mastered’ a pathway before moving on to the next one. Working with more complex and richer problems rather than new methods will support this ‘mastering’ of maths. However, children who are working at levels above their age can be challenged to the next pathway as necessary.
Teaching Resources
The school does not rely solely on any one particular published scheme, but provides a wealth of material from which staff can choose appropriate activities.

All classrooms have the necessary resources to deliver the curriculum. Additional resources are held centrally. Teachers should also ensure central resources are not kept in classrooms when maths topics are completed. They must be returned to the central stock after a unit of work is finished. They are not classroom resources.

The Mathematics Co-ordinator should be informed when equipment needs replacing or supplementing. Children should be taught how to take care of equipment and resources. Progressively children should be encouraged to select materials suitable for the task on which they are engaged.

Children in all year groups need to have access to a range of mathematical resources during the math’s lesson. Children should be encouraged to use number lines, 100 squares, counters, base10 resources, beads and Numicon to support their calculations and carry out methods in a visual context. When problem solving children should be allowed to choose any resources they feel are needed to solve the problem and make jottings as they feel necessary.

Curriculum Time
At Clifton mathematics should be taught at least daily. This is in line with national recommendations. There will also be opportunities for cross-curricular links providing work in others areas of the curriculum that support and reinforce mathematical development.

Planning
Overview Document
The planning starts with an overview document – a Lancashire City Council resource. This identifies six half termly blocks of six weeks with focus areas of mathematics for each week. The units are designed to be cohesive and allow for application of learning and skills across the mathematics curriculum. The assess and review weeks can be used to gain information for teacher assessments or can be used to pick up elements that need further support. It is not designed to be used as an entire week of testing with no teaching. This is a suggested layout and teachers should adapt to meet the needs of their class as required.

Half Termly Planning Documents
The half termly planning documents have been compiled to the following principles:

- Each half term is predominantly learning about number.
- Almost all weeks are focused on one area of mathematics, giving children time to focus on a single area for a longer amount of time.
- The 'rationale' justifies why the objectives have been put together and how to enhance the teaching and learning during that week, e.g. number work is often given a context of data, measures, money or problem solving.
- The objectives are the end of year expectations and it is the decision of teachers whether to visit the whole objective more than once throughout the year or to organise progression within each objective.
- Every objective is covered at least twice within the year.
- The learning within each week are NOT in a prescribed order and teachers should use their discretion when organising progression within the unit.

The ‘Starter’ suggestions begin with consolidation of the previous year’s work and develop over time to consolidate learning within the given year group. It is important that children have the opportunity to
regularly revisit learning from all aspects of the mathematics curriculum, and the ‘Starter’ is an effective time in which this can occur.

**Differentiation**
The objectives are based on age related expectations. For purposes of differentiation, the National Curriculum 2014 suggests: ‘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.’

On completion of a topic it is important to review and assess what children have learned and this may lead to the setting of Targets for individuals or groups of children. **Weekly Planning** is carried out on **Standard Planning Sheets** and outlines **Learning Objectives** (for Mental and Oral starters as well as for the Main Part of the Lesson), **Proposed Activities** (for Mental and Oral starters as well as appropriately differentiated for the Main Part of the Lesson), **Key Vocabulary** to be developed, **Teacher Focus**, to be used and an outline of the **Plenary** activity. The Maths Co-coordinator monitors weekly planning fortnightly. The reverse of the Planning Sheet also provides ongoing assessments on which teachers record informally children not reaching the stated objectives, children exceeding objectives and notes for future planning.

**Classroom Organisation**
Mathematics lessons should be enjoyable for both pupils and teachers. Maths should be fun.

A range of classroom organization should be planned. There should be times for whole class teaching, times when groups of children work with the teacher, times when groups of children work together or in pairs and also times when children work alone. The most effective teaching will make use of a variety of organizational strategies in a purposeful manner. Pupils should meet regular daily sessions of whole class interactive teaching, especially in the rehearsal of mental strategies and the quick recall of mathematical facts during mental oral starters, the teaching input at the beginning of the main part of the lesson and during the plenary sessions.

Teachers should ensure that the recording of mathematical thinking should reflect the children’s understanding. Undue pressure should not be put on children to record work before their understanding has been adequately and securely developed. Informal jottings to aid mental calculation should be encouraged. Written algorithms or formal methods of calculation should not be introduced to the pupils until at least the final term of Year 3. Teachers should regularly refer to full use of the documents Teaching Mental Calculations and Teaching Written Calculations.

Teachers will develop effective use of open and closed questioning techniques as central to their teaching strategies. This will enable appropriate pace to be fostered during lessons. The use of both open and closed questions will build variety into lessons and encourage children to be more creative in their mathematical thinking. Useful examples are given in the book.
Mathematical Vocabulary.
Pupils should be expected to explain their thinking and their calculation strategies from Foundation onwards. Their increased involvement in lessons will be advanced through pupil demonstrations in practical or imaging activities and whiteboard work.

The greater emphasis on oral work will result in appropriate mathematical terminology being introduced year by year. Full guidance is given for teachers in the Mathematical Vocabulary books.

Children should be encouraged to develop their own strategies and methods of calculating mentally. Eventually they need to acquire a range of strategies from which to choose the most appropriate method depending on the situation.

In relation to the Calculations Strand it is the responsibility of the teacher to provide opportunities for children to use mental methods, informal jottings, and formal written methods as appropriate. Formal written methods will not be introduced until Year 3.

In the later year groups children should be encouraged to look at the calculation and decide the most appropriate and efficient method:
- Can I do it in my head?
- Do I need to make jottings?
- Should I use a formal method?

Progress in calculation methods is dependent on pupils learning number bonds (e.g. Addition and subtraction bonds to 10, 20 or 100) and multiplication tables and their division equivalents. Children should learn facts by heart and parents should be involved in helping to practice these facts with their children at home. In KS2 children are expected to learn their tables as set out for the various year groups in the Strategy. Tables will be set as homework and tested weekly.

The ability to use Mathematics in Context is an important aspect of being numerate. Throughout the mathematical year pupils should be provided with problems to solve including problems related to money and measures. In the Strand Solving Problems the application of mathematics in other subjects should be encouraged. Handling Data is best taught in the context of self-generated data or through data collected through other curriculum areas such as Science, Geography or History.

Measures also provide opportunities not only to carry out practical activities but also to make real measurements for example in Science AT1 activities. Such opportunities help to alleviate the pressure of lack of time to deliver all the necessary strands of the curriculum.

Shape and Space provides further opportunities for hands on learning and problem solving. Teachers should seek activities, which develop children’s’ creativity and this area of the curriculum lends itself to enhancing children’s’ understanding of other cultures and racial equality.

Expectations
It is important for teachers to have high expectations for the children. These expectations need to be shared with the pupils and parents.
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Target leaflets will be sent out to parents each term to outline the targets their children will be working on for the forthcoming term. These leaflets also contain ideas that parents can use to help develop their children’s mathematics at home.

Learning Objectives will be written on the board and shared with children at the start of the lesson. These should include Learning Objectives for both the Mental Oral Starter and the Main Activity. The Learning Objectives should be referred back to in the plenary session.

Key vocabulary to be developed should be written on the board or on display in the classroom. Key vocabulary should be referred to throughout the lesson and in the Plenary.

Time scales for completion of work should be made clear to the children. Activities should be time limited where appropriate and the children should be informed of what is expected of them and how long they have to finish their work. The pace of work is important and this needs to be made clear to the children.

Teachers should have high expectations for the presentation of work. This is particularly important at KS2. Shoddy work should not be accepted. All work should be dated. Children should use a ruler to draw straight lines. The previous day’s work should be ruled off.

Every class will have a dedicated mental maths time. The time will focus on multiplication tables and/or number bonds. Staff are all aware that the target is for every child to know their multiplication facts to 12 x 12 by the end of Year 4 (unless the child has SEND).

To support the children in this:

- Mental maths will form part of the weekly timetable
- Tables/number bond record sheets will be maintained by staff
- Celebrations and rewards will be given by staff to children who acquire a new set of skills (and can apply)
- Parents will be informed – possibly via social media.

Assessment, Recording and Reporting

Assessment should be:

- Informative
- Useful
- Manageable

Summative Assessment

Statutory end of KS1 and KS2 tests are administered in Y2 and Y6. Rising Stars Age related tests are completed termly. After data analysis curricular targets may be set for groups of children or cohorts of children.

The results of the above tests are analysed to inform future planning and may highlight training needs.

A report to parents will be written at the end of each academic year.

Why do we need to assess mathematics?

Assessment is the means by which:

- Teachers and pupils can identify problems they are experiencing in teaching and learning mathematics.
- Teachers and pupils can identify achievements.
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- Teachers can identify pupils’ current understanding, knowledge and skills.
- Teachers can inform future planning.
- Teachers can ensure continuity and progression.
- Teachers can evaluate previous teaching.
- Clifton can inform the process of self-evaluation and target setting.
- Clifton meets the statutory requirements regarding the assessment, recording and reporting of mathematics.

What should we assess?

- A pupil’s understanding of numbers and the number system.
- A pupil’s knowledge of number, measurement and shape and space facts.
- A pupil’s calculation skills.
- The ability of a child to apply their knowledge, understanding and calculating skills to solve real life problems.
- The ability of a child to read, interpret and represent mathematical data.
- Children’s attitudes to learning mathematics
- Children’s application to their work.

How should we assess mathematics?

### Observation
of how well pupils perform when engaged in mathematical activities. It is appropriate to focus on a small number of pupils in order to assess their performance in mental/oral starters or the main activity. Their attainment in relation to objectives should be noted along with their response to oral questions and their attitudes and willingness to be actively involved in lessons and demonstrations. Informal assessments should be noted on the reverse of weekly planning sheets and can thus be used to inform future planning or the setting of targets.

### Marking
– every piece of child’s work should be marked. Some work should be quality marked (see policy). Quality marking includes fix—its, challenges and mathematical modeling.

### Modelling
Teacher may choose to model a misconception/expectation at the start of the lesson to a group or the whole class. During this modeling (guided maths) the children may copy the work demonstrated and use it as a WAGOLL (what a good one looks like) to aid independence during the lesson. Modelling should demonstrate to the children how errors have been made and/or show the child a more effective way of working.

(All marking and responses to the Marking should be of a high standard in terms of presentation and digit formation).

### Discussion
work is a key principle of the Numeracy Strategy. Oral work is vital to the progress made by the children. Individual, group or whole class discussions provide teachers with an insight into children’s thinking and afford opportunities to assess children’s knowledge of number facts, understanding of the number system, (e.g. place value), calculation skills and language acquisition and usage. Such assessments are necessarily informal but may give rise to the uncovering of misunderstandings and misconceptions etc. and may lead to the setting of individual targets for children.

### Children’s work
provides teachers with regular opportunities to recognize achievement, praise good work, raise self-esteem and move children to the next point through constructive comments and mini-targets. Children’s work may also demonstrate misconceptions which can be dealt with on an individual, group or whole class basis. Children’s work is a useful source of information for other teachers and for parents as well as guiding future curriculum planning.
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Weekly Tests and Homework provides teachers further opportunities to assess children’s understanding and knowledge of number facts including multiplication tables. Parents are able to support their children in their mathematics at home.

All children at KS2 will have regular homework and mental arithmetic/tables tests.

Setting Targets
Targets are set to help teachers identify significant areas of children’s attainment in order to monitor progress. Targets give children and parents clear aims and provide them with clear objectives for improving progress. Target Setting enables teachers to:

• Identify assessment criteria.
• Set appropriately high expectations.
• Help children to monitor their own achievements.
• Involve parents with their child’s learning and enlist their support.
• Provide a manageable and informative record keeping system.
• Contribute to the school’s overall numeracy targets.

Each term curricular targets are set as well as targets for classes. A copy of these is sent to parents along with suggested activities to carry out at home which help children to make progress towards reaching of the targets.

Curricular targets should be on display in the classroom and the children should be directly involved in highlighting Key Objectives achieved.

A class record of achievement against Key Objectives will be kept by teachers for underperforming groups and updated at least every half term. Updated sheets should be passed onto the Mathematics Co-coordinator whose responsibility it is to ensure that centrally held records are updated. Records are kept on a database and updated in the light of teachers’ assessments. Updated record sheets are printed and returned to class teachers. Individual tracking of pupil’s progress against Key Objectives is thus maintained throughout their time at Clifton. Record sheets are passed onto the child’s next teacher at the end of each academic year. If a child transfers to another school an overview of progress is readily available. The database also enables the setting of targets for individual children or the setting of Curricular Targets for cohorts, phases or Key Stages.

Informal Assessments of pupils progress towards Learning Objectives along with noteworthy comments related to children’s attitudes and responses will be recorded on the back of Weekly Planning Sheets. This informal assessment informs planning and is a useful source of information for setting individual targets and for end of year reporting to parents.