



# Dovecot Primary School



<b>Date of review</b>	
<b>Reviewed by</b>	
<b>Signed</b>	
<b>Next review date</b>	

# Mathematics Policy

# DOVECOT PRIMARY SCHOOL

## VISION STATEMENT

*Learning together, growing together*

## **Curriculum Intent Statement**

At Dovecot Primary School the curriculum is designed to recognise children's prior learning, provide first-hand learning experiences, allow the children to develop interpersonal skills, build resilience and become creative, critical thinkers.

Every child is recognised as a unique individual. We celebrate and welcome differences within our school community. The ability to learn is underpinned by the teaching of basic skills, knowledge, concepts and values. We provide enhancement opportunities to engage learning and believe that childhood should be a happy, investigative and enquiring time where there are no limits to curiosity and there is a thirst for new experiences and knowledge.

Children leave our school with a sense of belonging to a tightly knit community where they have the confidence and skills to make decisions, self-evaluate, make connections and become lifelong learners.

### **Our core values:**

- Excellence in all areas of school life.
- A broad and challenging curriculum.
- Engaged and motivated children.
- High standards of behaviour and expectations.
- A love of lifelong learning.
- Strong and positive relationships within the community.

**"Education's starting point should not be about us. It should be about them, their needs, their aspirations and goals."**

*(Dr Maggie Atkinson, Children's Commissioner for England September 2013)*

## Introduction

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.

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 non-routine problems with increasing sophistication, including breaking down problems into a series of simpler steps and persevering in seeking solutions.

***'Children 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.'*** (National Curriculum)

Aims and Purposes of Maths at Dovecot Primary School

At Dovecot we aim to develop motivated, creative and resilient mathematicians who can confidently apply what they learn. We do this by:

- developing and nurturing a 'growth mindset', based on the belief that everyone can do mathematics
- teaching new skills and encouraging the children to practise – intelligent practice
- avoiding children just memorising a single procedure - they need to know why they are doing what they are doing and know when it is appropriate to use different methods
- developing procedural fluency and conceptual understanding in tandem because each supports the development of the other.
- using concrete, pictorial and abstract activities in turn to support understanding
- building on previous concepts through carefully structured and progressive learning units
- teaching children to reason and, therefore, explain/deepen their understanding

- revisiting and consolidating areas of study, spending significant time developing deep knowledge of the key ideas that are needed to underpin future learning
- making connections at the optimum time
- emphasising the structure and connections within the mathematics, so that pupils develop deep learning that can be sustained
- providing the ‘tools’ needed to be a ‘problem solver’ both in maths and in other areas of the curriculum
- pitching lessons to challenge all to reach the highest standard
- promoting the relevance of maths in real life scenarios
- providing opportunities for the use of information technology (i.e. scratch maths)
- regularly and diagnostically assessing children’s outcomes and measuring progress
- supporting our learners at home

As a result of this learning, our children will:

- learn number facts and times tables to automaticity to avoid cognitive overload in the working memory
- solve problems efficiently and think logically
- be resilient in their learning
- be reflective and able to discuss and evaluate their work with confidence
- reach the highest standard possible and to think for themselves within the subject
- be creative and imaginative, to appreciate the power and beauty of mathematics
- be confident to talk about their work
- be confident to work mentally
- be the best that they can be independently, choosing resources to help their understanding as they need them
- be prepared for applying their skills effectively in everyday life situations, in their future learning and in the work place.

Our approach to the teaching of mathematics focuses upon high quality teaching of mathematics, in order to introduce, and then secure and embed key concepts. At Dovecot Primary School, we teach for mastery.

### **The Mastery Approach**

Teaching for mastery is an approach, not a teaching style. Mastering mathematics is a gradual, cumulative process that creates mathematical tools for life. Mastery is what we want pupils to acquire (or go on acquiring), rather than teachers to demonstrate to give them the best chances.

***‘Mastering maths means acquiring a deep, long-term, secure and adaptable understanding of the subject. At any one point in a pupil’s journey through school, achieving mastery is taken to mean acquiring a solid enough understanding of the maths that’s been taught to enable him/her move on to more advanced material.’*** NCETM 2016

Through a rich diet of challenge, investigation and problem solving on a daily basis, all children will learn to understand and clarify information; consider what they know that will help them to solve problems; realise what they need to know next; create systems and strategies; organise information in a way that helps find patterns and solutions; investigate open ended challenges and to communicate and present their findings effectively.

The depth of understanding of an individual, be it emerging, developing or secure in a given objective, will be challenged in a wide variety of formats in order to 'test the edges of understanding'. Children will expect and welcome challenges which push them to deepen their learning at all levels. Problems are not solely for those who excel in maths.

### **Content/Organisation**

Dovecot Primary School uses the Liverpool Maths Plans, along with the White Rose Maths Hub resources, which systematically builds maths knowledge, skills and understanding.

Teaching will cover each the following areas of mathematics from the National Curriculum:

- ✓ Number
- ✓ Calculations
- ✓ Fractions, decimals and percentages
- ✓ Measurement
- ✓ Geometry
- ✓ Statistics

The focus of our learning is based on:

- ✓ the use of concrete, pictorial and abstract methods
- ✓ fluency, reasoning and problem solving questions
- ✓ a variety of questions that help children to progress to understanding with greater depth

Where links can be made across units we will endeavour to do so, in order to create a mathematics curriculum which is not compartmentalised.

Maths is taught daily for a period of between 45 minutes and an hour. It is also applied through other aspects of the curriculum to ensure that our children have the opportunity to practise their skills and knowledge repeatedly, and through different aspects of their learning.

In Reception, The Foundation Stage curriculum is organised into prime and specific areas of learning with an aim of children meeting the early learning goals. The area of Maths is split into Number and Shape, Space and Measures of which problem solving, reasoning and numeracy are all a part.

### **Planning**

Planning begins from a thorough understanding of children's needs gleaned through effective and rigorous assessment and tracking, combined with high expectations and ambition for all children to achieve.

All staff are required to use weekly short term maths planning identifying which parts of the Primary National Curriculum in England, Mathematics, are being covered. These planning sheets are an agreed part of our whole school curriculum policy.

Within short term planning, clear success criteria for each learning objective taught should be created – demonstrating the progression needed to reach and exceed the objective. This will enable the class teacher to follow a clear and systematic teaching sequence, where input and activities are differentiated by considering which parts of the success criteria individual children are ready for.

In specific circumstances, where children are working significantly above or below the majority of the class, and where extending this by expanding the success criteria seems inappropriate, objectives from higher or lower age-groups will be planned and taught.

Class teachers should regularly plan for opportunities for children to apply their maths skills to different problems within maths lessons and across the curriculum. This will also allow children to revisit, practise and consolidate different areas of maths and apply them within different contexts.

When planning across the curriculum for all children, questions should be used within lessons, in the form of a ‘challenge’ or problems which require the pupil to demonstrate their ability to apply the skill and in doing so deepen their understanding. The planning for these opportunities will be supported through reference to quality resources, such as progression papers with reasoning, which are published on the website for the **National Centre for Excellence in Teaching Mathematics, the White Rose Maths Hub** and also the activities on the **NRich** website.

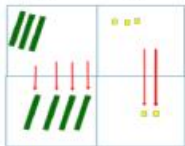

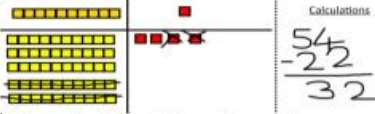
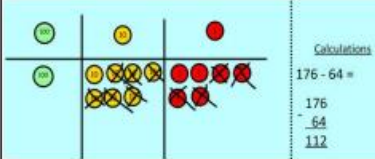
### **Learning and Teaching**

- Pre-learning tasks define starting points for individual children so that teachers can tailor learning to support their needs. Tasks are provided specifically pitched to suit the needs of the child at that specific point in time. All groups are flexible and will change according to a continuous skills audit.
- Usually the class will be working on the same unit, allowing the teacher to work with the whole class, with groups of pupils and, at times, with individual pupils. Mostly pupils will be grouped according to their current level of ability in relation to an objective. Groups will be fluid and so will often vary on a daily basis.
- Throughout the lesson the teacher and other adults in the class will use questioning to clarify and challenge learners, and continually assess the effectiveness of the learning taking place. During the lesson, many pupils will talk about their work and be given opportunities to explain their thinking.
- We use a wide mix of games, puzzles and investigations as well as some published schemes of work and online resources in order to enhance learning opportunities. We also incorporate regular opportunities to develop problem solving skills. In each unit of work every pupil should experience mathematics through a mixture of approaches. It is never appropriate for a teacher to rely on one source of activities.
- In the Foundation Stage, children are given the opportunity to develop their understanding of number, measurement, pattern and shape and space through a combination of short,

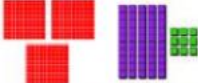
formal teaching as well as a range of planned structured play situations, where there is plenty of scope for exploration.

- In Year 5/6, a view will be taken annually and a decision will be taken dependent on cohort as to whether children are set according to ability. Fluidity of groupings will always be maintained.
- Children will become very competent 'counters' so that their fluency with the number system provides a foundation for mathematical understanding. Counting forwards and backwards in many different sized steps as well as from different starting and ending points is essential.
- Maths learning builds from a concrete understanding of concepts where children are manipulating objects. When children are able to see concepts this way, they then need to understand the same concepts represented pictorially. Children are then ready for abstract representation before being able to apply their knowledge to different situations.
- Children should be encouraged at all times to communicate their understanding of maths so that it clarifies their thoughts. Reasoning activities will use terminology such as: convince me..., explain..., is it true/false... why? Which is the odd one out? Prove it etc.
- Children's mental maths is of great importance, with number bonds, times tables facts and various strategies for calculation taught and practiced at school with support sought from parents through homework activities.
- A progression towards efficient written calculations should be developed and applied consistently in each year-group. The school Calculation Policy should be followed.
- Though the nature of lessons will be very different depending on the needs of the class, children should be: active; practising skills they haven't yet mastered (perhaps recapping on class targets); learning something new OR learning to apply their knowledge to different contexts. They should be: 'doing' very quickly; working at a good pace and being productive; sharing their thoughts and methods and being successful.

At Dovecot, we use models (concrete resources) and images (pictorial) to support our teaching sequence dependent on the needs of an individual child or group. (Please see table below.)

Objective and Strategies	Concrete	Pictorial	Abstract
Column method without regrouping	 <p>Use Base 10 to make the bigger number then take the smaller number away.</p>  <p>Show how you partition numbers to subtract. Again make the larger number first.</p>	 <p>Draw the Base 10 or place value counters alongside the written calculation to help to show working.</p> 	$47 - 24 = 23$ $\begin{array}{r} 40 + 7 \\ - 20 + 4 \\ \hline 20 + 3 \end{array}$ <p>This will lead to a clear written column subtraction.</p>

Children will generally begin learning an objective with fluency (and fluency variations). This includes use of concrete and pictorial methods to support ALL learners. Understanding is then deepened through reasoning and problem solving. Children will move onto these at different times.

		FLUENCY	REASONING	PROBLEM SOLVING																																
<b>Place Value</b>	Read and write numbers up to 1000 in numerals and in words.	<ul style="list-style-type: none"> <li>Fill in the blanks</li> </ul> <table border="1" style="width: 100%;"> <thead> <tr> <th>Numbers in words</th> <th>Numerals</th> </tr> </thead> <tbody> <tr> <td>Four hundred and two</td> <td></td> </tr> <tr> <td></td> <td>560</td> </tr> <tr> <td>Three hundred and sixty six</td> <td></td> </tr> <tr> <td></td> <td>132</td> </tr> </tbody> </table>	Numbers in words	Numerals	Four hundred and two			560	Three hundred and sixty six			132	<ul style="list-style-type: none"> <li>What number is represented in the place value grid?</li> </ul> <table border="1" style="margin: 0 auto;"> <thead> <tr> <th>100s</th> <th>10s</th> <th>1s</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">●●●●</td> <td style="text-align: center;">●●●●</td> <td style="text-align: center;">●●●●</td> </tr> </tbody> </table> <p>Using the same number of counters, how many different numbers can you make? Convince me you have found them all.</p>	100s	10s	1s	●●●●	●●●●	●●●●	<ul style="list-style-type: none"> <li>Match the number in words to the number in numerals. Fill in the missing numbers.</li> </ul> <table border="1" style="display: inline-table; margin-right: 20px;"> <tbody> <tr><td>Four hundred and sixty two</td></tr> <tr><td>Four hundred and twenty six</td></tr> <tr><td>Six hundred and forty two</td></tr> <tr><td>Two hundred and sixty four</td></tr> </tbody> </table> <table border="1" style="display: inline-table;"> <tbody> <tr><td>4</td><td></td><td></td></tr> <tr><td></td><td>4</td><td></td></tr> <tr><td></td><td></td><td>4</td></tr> <tr><td></td><td></td><td>6</td></tr> </tbody> </table>	Four hundred and sixty two	Four hundred and twenty six	Six hundred and forty two	Two hundred and sixty four	4				4				4			6
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	<ul style="list-style-type: none"> <li>What number is represented by the Base 10? Write it in numerals and words.</li> </ul> 	<ul style="list-style-type: none"> <li>Tim was asked to write the number four hundred and forty. He wrote 400 40. Do you agree with Tim? Explain why.</li> <li>Hannah has written the number five hundred and thirteen as 530. Explain the mistake that Hannah has made.</li> </ul>	<ul style="list-style-type: none"> <li>There are 3 cards with a digit on each. Find every 3 digit number that could be made from the cards. Write out the largest, smallest and middle number in words.</li> </ul> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; background-color: #007bff; color: white; padding: 5px; border-radius: 5px;">3</div> <div style="border: 1px solid black; background-color: #6f42c1; color: white; padding: 5px; border-radius: 5px;">6</div> <div style="border: 1px solid black; background-color: #ffc107; color: white; padding: 5px; border-radius: 5px;">8</div> </div>																																	

**ALL children** will have exposure to reasoning and problem solving tasks to develop mathematical language and understanding and may need to spend longer on one part than another in order to ensure that knowledge is secure.

### Written Methods of Calculation

The Primary National Curriculum in England, Mathematics, sets out progression in written methods of calculation that highlights how children would move from informal methods of recording to a formal written method for each of the four operations.

The aim is that by the end of Key Stage 2, the great majority of children should be able to use an efficient written method for each operation with confidence and understanding. This guidance promotes the use of what are commonly known as ‘formal’ written methods – methods that are efficient and work for any calculations, including those that involve whole numbers or decimals. They are compact and consequently help children to keep track of their recorded steps. Being able to use these written methods gives children an efficient set of tools they can use when they are unable to carry out the calculation in their heads or do not have access to a calculator. We want children to know that they have such a reliable, written method to which they can turn when the need arises.

In setting out these methods, the intention is that we adopt a greater consistency in our approach to calculation so that all teachers understand which methods in which we work towards. Children are entitled to learn how to use the most efficient methods for them personally. The challenge for

teachers is determining when their children should move on to a refinement in the method and become confident and more efficient at written calculation.

**Support for parents** is provided through a Parent Information Booklet and our Maths Calculation Policy. The end of year expectations for each year group and our philosophy towards Maths are available on the school website under the curriculum tab.

### **Assessment, recording and reporting**

#### Formative Assessment

Assessment for learning should occur throughout the entire maths lesson, enabling teachers/ support staff to adapt their teaching/input to meet the children's needs. This feedback should be incisive and regular. Teachers will make note of attainment against objectives.

On a daily basis, children should self-assess against the learning objective and success criteria, giving them a sense of success. Children should know when they are meeting their targets and be self-assessing against those too.

Pupils' work should be marked in line with the Marking & Feedback Policy.

Evidence of feedback to children either written or verbal should be evident, and children should be expected to respond to this and given time to do so, enabling them to learn from their misconceptions or incorrect methods.

Future lesson design should depend on class success evaluated through marking and observations made during the lesson. If understanding is still not secure at the end of a taught unit, this will be addressed by the class teacher either in class or in a specific intervention group.

#### Summative Assessment

During the year, each child's progress should be recorded by the class teacher with regard to their progress towards meeting the end-of-year expectations for their year group.

This will take the form of:

- Post learning tasks for a specific unit of work
- Half termly assessments using Rising Stars/ NFER and White Rose Hub Assessments
- Progression Tests

The senior leadership team will meet with class teachers on a termly basis in order review the progress from each class and the individuals within it, to ensure that expected progress is being made. This is called the Pupil Progress meeting. As a group the leadership team will support the class teacher in setting appropriate targets and discuss actions for the following term based on evidence from the pupils' work, the outcome of assessments and the rate of progress.

We assess what pupils have done against what we hoped they would learn. This enables us to plan what they should do next. Teachers will use the language 'emerging', 'developing', 'meeting the standard' and 'meeting the standard in greater depth'.

We prepare pupils for the KS1 and 2 SATs so that they can achieve as well as possible. We also use the SAT optional assessment materials and other assessment material in order to inform our Year 6 teaching and the needs of each pupil. Evaluations of attainment and progress take a variety of forms and may be formal or informal dependent upon the age of the pupils, the unit of work and time of year.

Tracking systems and the use of targets for groups or individuals will be used to ensure areas where the majority of the class have not grasped a concept can be revisited and mastered, and interventions implemented where needed.

Data is loaded on to the school's 'O-Track' system on a half-termly basis using evidence from the formal assessments.

Pupil attainment and progress will be reported to parents in Maths at the end of Spring and Summer term and orally during parent-consultation evenings which take twice a year.

### **Learning across the Curriculum**

Mathematics contributes to learning across the curriculum in order to provide real life opportunities which demonstrate the purpose and need for mathematical skills. We aim to enhance thinking skills, financial capability, enterprise and work-related learning. We do this by ensuring that these areas are addressed in our planning and teaching in a variety of ways.

Mathematics contributes in major way to the key skills of communication, application of number, ICT, working with others, improving own learning and performance and problem solving.

Mathematics contributes greatly to the development of ICT skills and competencies. We will teach children to use spread sheets, to handle data by creating graphs, tables and charts, use logo in measures, shape and space and other software to develop pupils' understanding of mathematics. The children will be taught how to use appropriate apps and other internet resources in order to enhance their mathematical learning.

### **Inclusion, SEN and Differentiation**

In order to provide all pupils with relevant and appropriate work at each stage:

- We plan suitable learning challenges.
- Respond to pupils' diverse needs through pre-learning tasks.
- Endeavour to overcome potential barriers to learning through quality teaching and intervention as required.

All the mathematics we work on shows positive images of the various groups in society. We seek to celebrate the mathematical heritage of all the cultures in the school and to recognise that the mathematics we do comes from all over the world.

### **Resources**

Classroom maths displays are expected to engage children in the current learning. In addition, mathematical vocabulary should be displayed so that children use this in the communication of their understanding.

There should be maths work on display in classrooms and in other areas of the school in order to encourage a positive attitude and enthusiasm towards mathematics for all groups of children.

Photocopiable resources are stored, maintained and used by all year groups. 'Hands on' resources are stored in classrooms.

On the staff share drive (school server), each year group has an identified set of resources for use. Staff disseminate information from Maths related training during planned staff meeting time.

### **Home Learning**

Feedback from parents is evaluated and acted upon where possible and where appropriate and practical home learning is accessible on the school website. There is an expectation that all children will spend time practising times tables on a regular basis.

### **The Role of the Maths Lead**

- In addition to the roles outlined in the overarching curriculum policy the Maths leader liaises with School Improvement Liverpool and governors on matters relating to Maths.
- A team approach to leadership has been established so that the school can get the best from each phase of school and each have accountability for learning. We hope this will have a strong impact; bringing support to new leaders and developing existing leader skills.

### **Monitoring**

The maths subject lead and senior leadership team will monitor the approaches detailed in this policy, in line with the school monitoring and evaluation policy. The focus for monitoring each year will be in line with the school's improvement priorities. Monitoring will employ a variety of strategies including work scrutiny, lesson observations, pupil interviews and the termly Pupil Progress meetings.

### **Governance**

The named link governor for maths is responsible for meeting with the Maths subject lead in order to examine the effectiveness of this policy and any actions/impacts of the school improvement plan as detailed in the Maths Action Plan.