



St Cross Catholic Primary School Mathematics Policy

February 2024

Mathematics Guidance

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At St Cross Catholic Primary School Academy, our mathematics curriculum follows the Programme of Study and Aims of the National Curriculum.

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.

2. 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 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.

Our vision for Mathematics

- ✓ To promote a positive attitude towards mathematics in all pupils
- ✓ To ensure all pupils are engaged in and are enjoying exploring Mathematics
- ✓ To enable all pupils to find links between mathematics and other areas of the curriculum, including Science
- ✓ To ensure all pupils progress in mathematics and are challenged appropriately through an in depth understanding
- ✓ To use a wide range of concrete, pictorial and abstract representations to develop all pupils' relational understanding of mathematics
- ✓ To ensure all pupils are confident using mathematical vocabulary when reasoning about mathematics
- ✓ To promote a growth mind set in all pupils, particularly when Problem Solving

3. Teaching and Learning - A 'Mastery' Approach

The teaching and learning of mathematics at St Cross should include aspects of the following Mastery approach strategies in every lesson and/or over a series of lessons:



'Concrete, pictorial, abstract (CPA) is a highly effective approach to teaching that develops a deep and sustainable understanding of maths.' (Maths - no problem!)

CONCRETE

Concrete is the “doing” stage, using concrete objects to model problems. Instead of the traditional method of mathematics teaching, where a teacher demonstrates how to solve a problem, the CPA approach brings concepts to life by allowing pupils to experience and handle physical objects themselves. Every new abstract concept is learned first with a “concrete” or physical experience.

For example, if a problem is about adding up four baskets of fruit, the pupils might first handle actual fruit before progressing to handling counters or cubes which are used to represent the fruit.

PICTORIAL

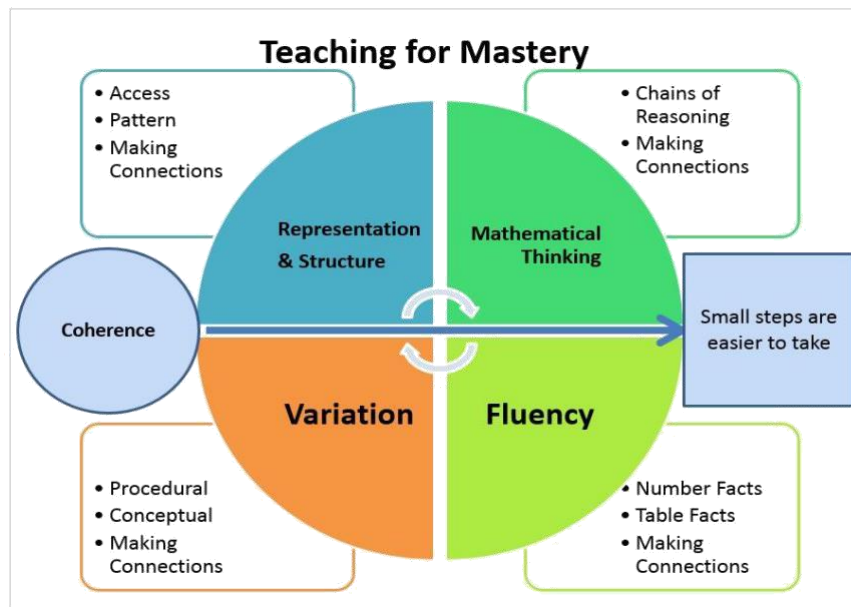
Pictorial is the “seeing” stage, using representations of the objects to model problems. This stage encourages pupils to make a mental connection between the physical object and abstract levels of understanding by drawing or looking at pictures, circles, diagrams or models which represent the objects in the problem.

Building or drawing a model makes it easier for pupils to grasp concepts they traditionally find more difficult, such as fractions, as it helps them visualise the problem and make it more accessible.

ABSTRACT

Abstract is the “symbolic” stage, where pupils are able to use abstract symbols to model problems (Hauser).

Only once a child has demonstrated that they have a solid understanding of the “concrete” and “pictorial” representations of the problem, can the teacher introduce the more “abstract” concept, such as mathematical symbols. Pupils are introduced to the concept at a symbolic level, using only numbers, notation, and mathematical symbols, for example $+$, $-$, $\times$, $/$ to indicate addition, subtraction, multiplication, or division.



4. What is Fluency?

Fluency comes from deep knowledge and practice. This is the first stage of a pupils' understanding.

Fluency includes: conceptual understanding, accuracy, rapid recall, retention and practice

Accuracy – Pupils carefully completing calculations with no or few careless errors.

Pace – Pupils are able to quickly recall the appropriate strategy to solve the calculation and progress through a number of questions at an age appropriate pace.

Retention – Pupils will be able to retain their knowledge and understanding on a separate occasion to when the concept was first introduced.

The key to fluency is deep knowledge, practice and making connections at the right time for a child.

What is Reasoning?

Verbal reasoning demonstrates that pupils understand the mathematics. Talk is an integral part of mastery as it encourages students to reason, justify and explain their thinking.

You might, for example, get young learners to voice their thought processes. Older Learners could take part in class debates, giving them the space to challenge their peers using logical reasoning.

Mathematical Talk

A mastery classroom should never be a quiet classroom. The way pupils speak and write about mathematics transforms their learning. Mastery approaches use a carefully sequenced, structured approach to introduce and reinforce mathematical vocabulary.

To encourage talk in mathematics, teachers may introduce concepts by including sentence structures (stem sentences). Pupils should be able to say not just what the answer is, but how they know the calculation is correct. This is key to building mathematical language and reasoning skills. This gives pupils the confidence to communicate their ideas clearly, before writing them down.

Example Stem Sentences:

The denominator is 5 because the whole has been divided into 5 equal parts.

The numerator is 3 because 3 equal parts have been shaded.

Teachers then maintain a high expectation upon pupils to repeat and use the correct mathematical vocabulary to explain their understanding verbally and in their reflection comments. By also displaying the vocabulary during the lesson, pupils will be able to use this independently.

When questioning and encouraging mathematical talk, teachers should provide regular, purposeful opportunities.

For example:

- Show me how to complete the calculation
- Teach your friend how to complete the calculation
- How do you know which operation to use?
- Why have you chosen this method?
- How else can you represent this number?
- What have you learnt today?
- True or False
- Odd one out
- Sometimes, always, Never

What is Problem Solving?

Mathematical problem solving is at the heart of the Mastery Approach. Pupils are encouraged to identify, understand and apply relevant mathematical principles and make connections between different ideas. This builds the skills needed to tackle new problems, rather than simply repeating routines without a secure understanding.

Mathematical concepts are explored in a **variety** of representations and problem-solving contexts to give pupils a richer and deeper learning experience. Pupils combine different concepts to solve complex problems, and apply knowledge to real-life situations. Through problem solving, pupils are required to select their mathematical knowledge and apply this to a new concept.

Problem solving is more than just word problems but the RUCSAC approach can be applied to this style of question:

- 1) Read / look at the problem
- 2) Understand the problem by underlining or discussing: What is the problem about?
- 3) Choose – Choose the operation required, the number facts or the approach.
- 4) Solve – Solve the problem by completing jottings on the page
- 5) Answer – complete the answer to the problem
- 6) Check – have I correctly answered the given problem or is there another step?

5. Teaching and Learning – Lesson Structure

Pupils in Reception to Year 6 are taught in mixed ability groups (classes) and follow an integrated mathematics curriculum.

Mathematics is taught for **at least one hour per day (or five hours per week)**. However, when required, teachers may choose to include additional mathematics lessons in their weekly timetable.

‘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)

Lesson Structure

All mathematics lessons at St Cross follow the following structure:

- ✓ Starter Activity – to promote fluency of arithmetic and the Non-negotiable concepts
- ✓ Introduce New Learning using the Mastery Approach
- ✓ Reflective Plenary (Purple Pen – KS2 or a Pictorial reflection e.g. drawings of a problem – KS1)

Starter Activity – to promote fluency of arithmetic

The purpose of this activity is to promote fluency of arithmetic and enable pupils to recap on the ‘Non-Negotiable’ aspects of mathematics.

The starter activity should be up to 10 minutes and could include:

Multiplication practice or Mini Math questions
Verbal Mental Maths games/competitions
Quick Fire questions on mini whiteboards
Times Table chanting

Reflective Plenary

At the end of each lesson, all pupils should have made progress by learning a new technique, gaining an improved understanding of a concept or being able to complete a new activity.

This new learning/progress should be evidenced by writing a purple pen comment (KS2 and Year 2) or by drawing a self-assessment image (Year 1).

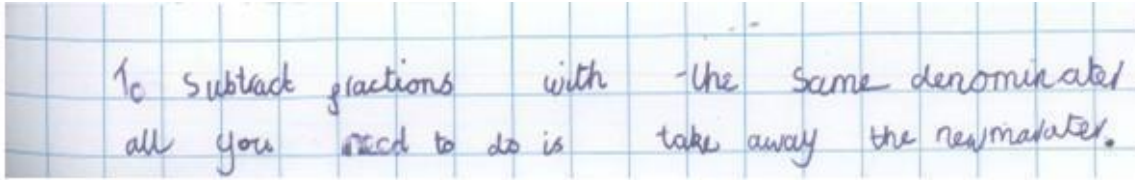
NB: It is important, particularly at the start of Year 1 and Year 2, to model writing a Purple Pen comment to ensure a consistent, detailed response which includes mathematical vocabulary.

Examples:

Today I have learned that percentages are always out of 100 and so I can create an equivalent fraction with 100 as the denominator.

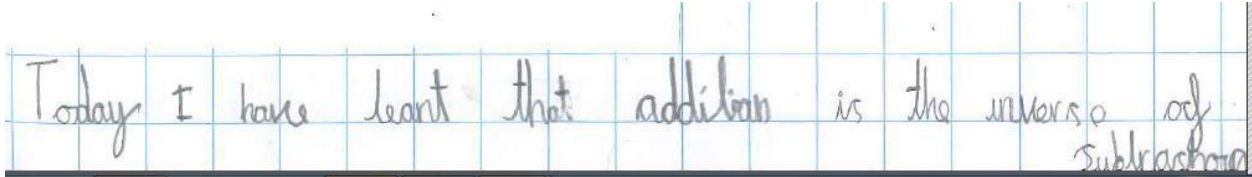
I now know that when I multiply by 10 all of the digits move up one place value column and when multiplying a whole number, I need to introduce a place holder.

KS2



To subtract fractions with the same denominator all you need to do is take away the numerator.

Year 2



Today I have learnt that addition is the inverse of subtraction

6. Planning

At St Cross, Teachers in Reception – 6 follow the White Rose Planning. This provides the yearly overview and Medium Term planning for each year group.

Short Term planning

Teachers should use White Rose Planning. This incorporates: precision teaching, modelling, misconceptions and key questions.

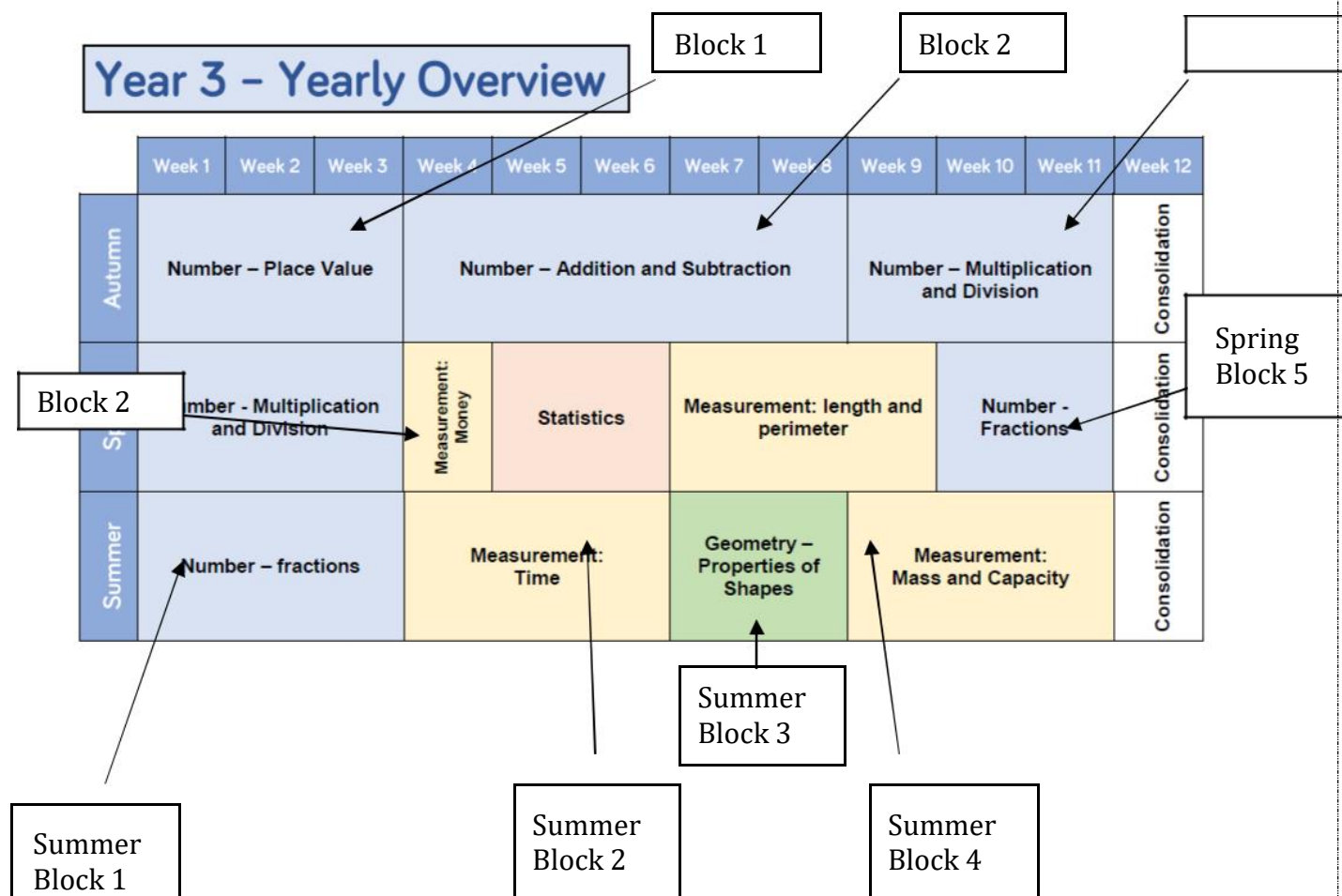
Number:

A large proportion of time is spent reinforcing number to build competency and fluency. Number is usually at the heart of any primary mastery scheme of learning, with more time devoted to this than other areas of mathematics. It is important that pupils secure these key foundations of mathematics before being introduced to more difficult concepts.

This increased focus on number will allow pupils to explore the concepts in more detail and secure a deeper understanding. Key number skills are fed through the rest of the scheme so that students become increasingly fluent.

Planning should aim for all pupils to master the age group expectations of the National Curriculum by including rich, deep activities. Rapid graspers should not be accelerated through concepts, instead they should complete Challenge questions from NCETM, and White Rose.

The yearly overview provides a Long Term Plan and is arranged into 'Blocks'



Each term, the Learning Objectives are listed and are time related to ensure coverage and pace

Year 3 – Spring Term

Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
<u>Number – multiplication and division</u> Recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables. Write and calculate mathematical statements for multiplication and division using the multiplication tables they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods. Solve problems, including missing number problems, involving multiplication and division, including positive integer scaling problems and correspondence problems in which n objects are connected to m objectives.			<u>Measurement – money</u> Add and subtract amounts of money to give change, using both £ and p in practical contexts.	<u>Statistics</u> Interpret and present data using bar charts, pictograms and tables. Solve one-step and two-step questions [for example, ‘How many more?’ and ‘How many fewer?’] using information presented in scaled bar charts and pictograms and tables.		<u>Measurement – length and perimeter</u> <u>Measure, compare, add and subtract: lengths (m/cm/mm); mass (kg/g); volume/capacity (l/ml).</u> Measure the perimeter of simple 2D shapes.			<u>Number – fractions</u> Count up and down in tenths; recognise that tenths arise from dividing an object into 10 equal parts and in dividing one-digit numbers or quantities by 10 Recognise and use fractions as numbers: unit fractions and non-unit fractions with small denominators. Recognise, find and write fractions of a discrete set of objects: unit fractions and non-unit fractions with small denominators. Solve problems that involve all of the above.		
Consolidation											

Within the planning documents, there are notes and guidance, Mathematical Talk (including Stem Sentences) and examples of how to show Varied Fluency, Reasoning and Problem Solving.

Comparing Statements

Notes and Guidance

Children use their knowledge of multiplication and division facts to compare statements using inequality symbols.

It is important that children are exposed to a variety of representations of multiplication and division, including arrays and repeated addition.

Mathematical Talk

What other number sentences does the array show?

If you know $4 \times$, how can you use this to work out your $8 \times$?

What's the same and what's different about 8×3 and 7×4 ?

Varied Fluency

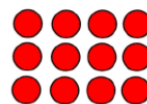
1 Use the array to complete the number sentences:

$$3 \times 4 = \square$$

$$4 \times 3 = \square$$

$$\square \div 3 = \square$$

$$\square \div 4 = \square$$



2 Use $<$ or $>$



$$8 \times 3$$

$$7 \times 4$$

$$36 \div 6$$

$$36 \div 4$$

3 Complete the number sentences:

$$5 \times 1 < \square \times \square \quad 4 \times 3 = \square + 3$$

Comparing Statements

Reasoning and Problem Solving

Shadya says,



8×8 is greater than 4×8 twice

Do you agree?

Can you prove your answer?

Possible answer: She is wrong because they are equal.



True or false

- $6 \times 7 < 6 + 6 + 6 + 6 + 6 + 6 + 6$
- $7 \times 6 = 7 \times 3 + 7 \times 3$
- $2 \times 3 + 3 > 5 \times 3$

- False
- True
- False

Can you find three different ways to complete each number sentence?

$$\square \times 3 + \square \times 3 < \square \div 3$$

$$\square \div 4 < \square \times 4 < \square \times 4$$

$$\square \times 8 > \square \div 8 > \square \times 8$$

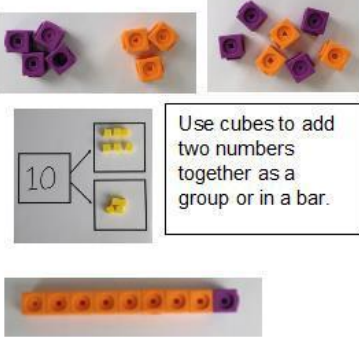
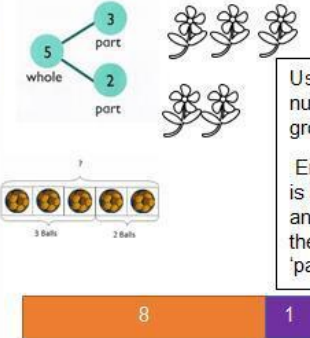
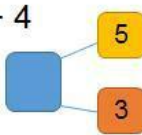
Possible answers:

- $1 \times 3 + 1 \times 3 < 21 \div 3$
- $1 \times 3 + 1 \times 3 < 24 \div 3$
- $1 \times 3 + 1 \times 3 < 27 \div 3$
- $1 \times 3 + 2 \times 3 < 30 \div 3$
- $24 \div 4 < 8 \times 4 < 12 \times 4$
- $16 \div 4 < 5 \times 4 < 7 \times 4$
- $8 \div 4 < 3 \times 4 < 4 \times 4$
- $4 \times 8 > 88 \div 8 > 1 \times 8$
- $2 \times 8 > 80 \div 8 > 1 \times 8$
- $6 \times 8 > 96 \div 8 > 1 \times 8$

A range of these questions should be completed by pupils as appropriate and evident in the pupils' mathematics books – 'Snipping Tool' is an excellent program on the school computers to help teachers to create this resource for all pupils.

7. Calculation Policy

The policy should be found on the Teacher Drive and Website and followed when teaching written methods. The policy demonstrates our Mastery Approach and shows progression through each operation for each stage of learning.

Addition				
Objective and Strategies	Concrete	Pictorial	Abstract	
Combining two parts to make a whole: part-part-whole model			$4 + 3 = 7$ $10 = 6 + 4$  Use the part-part whole diagram as shown above to move into the abstract.	

8. Times Tables

Multiplication facts are a mathematics 'Non-negotiable' and must be **taught** and then **practised**. TT Rockstars is available for the practice of times tables.

We use multiplication facts in the following progression:

- Year 1 – Be able to count in multiples of twos, fives and tens
- Year 2 - Be able to recall 2, 5 and 10 multiplication and division facts
- Year 3 - Be able to recall 3, 4 and 8 multiplication and division facts
- Year 4 - Be able to recall 6, 7 and 9 multiplication and division facts
- Year 5/6 - application of multiplication and division facts to problem solving

NB: All multiplication facts must be taught to 12×12

From 2022, Year 4 pupil now take an online Times Table test* which will be a timed assessment testing their speed of recall for multiplication and division facts.

TT Rockstars

TT Rockstars is an initiative for Year 2 – 6. It is a fun way to practise times tables. In school, awards are given for pupils who participate and make progress on TT Rockstars. Pupils are expected to log onto TT Rockstars **at home** for 15 minutes per week.

A full guide to TT Rockstars can be found on the website.

9. Resources

When resourcing and planning using the White Rose Planning, teachers to also choose resources which complement it and follow the Mastery Approach: Concrete, Pictorial and Abstract. Teachers have the flexibility to choose resources they feel are most effective to support the needs of all learners (differentiation) and ensure they achieve the aims of fluency, reasoning and problem solving.

Resources are kept online, in classrooms and in the mathematics cupboard.

- A range of 'Concrete' manipulates e.g. fraction walls, counting beads, place value counters etc.
- Master the Curriculum
- Target Maths Textbooks
- NCETM website
- Testbase website
- NRich

10. Recording of Learning

Pupils have a square-paged Maths Exercise Book each. **All Learning** (every lesson) to be evidenced. This could be photographs, worksheets or an explanation of today's learning in Purple Pen.

e.g. 'Today I went outside and measured the Perimeter of the playground by using a Trundle Wheel. I measured each length in metres and then added each value together.'

Morning Maths and multiplication charts must be at the back of the math book.

The presentation of mathematics books to be consistent, age appropriate and show that pupils take pride in the appearance of their work.

- The date to be written as figures e.g. 05.07.24
- The short Learning Objective to be at the top of the page on the left hand side (handwritten or typed)
- When sticking in question sheets/resources, these to be trimmed to ensure they fit onto the page
- Pencils and rubbers to be used – no pens (except Purple Pen comment)

11. Feedback and Marking

Immediate Intervention is essential. A pupil should leave each lesson feeling successful and any misconceptions or concerns to be addressed immediately. All teachers to follow the Marking Policy. On occasion and where appropriate, pupils should have the opportunity to self and peer mark their work but the teacher should always complete their own marking and assessment.

12. Assessment

Assessment should be regular and used to inform planning and to make the Teacher Assessment judgements at the end of each term on Target Tracker.

Formative Assessment – Completed regularly to inform planning

Questioning

Written Work

Multiplication assessment

Target Tracker – Objectives including non-negotiables

End of Block White Rose Assessments

Summative Assessment

NFER Assessment papers

Each Year: TT Rockstar Baseline Test* (Year 2 – 6)

Each Term: White Rose Assessments^ (Arithmetic and Reasoning and Problem Solving Paper)

Each Term: Practice SATs Papers (Years 2 and 6)

*Available on the TT Rockstars Website

The White Rose Assessment results to be recorded each term and saved in: Subject Maths – summative assessment.

There are no official grade boundaries for the White Rose Assessments. There are no official grade boundaries for the White Rose Assessments. However, in line with the KS1 and KS2 SATs, the following is a guideline:

- ✓ KS1 – Year 1 - a consistent score of approximately 60% (15/25) would indicate 'Expected' and 85% (21/25) would indicate 'Greater Depth'.
- ✓ Year 2 - - a consistent score of approximately 60% (21/35) would indicate 'Expected' and 85% (30/35) would indicate 'Greater Depth'.
- ✓ KS2 - a consistent score of approximately 55% (28/50) would indicate 'Expected' and 86% (43/50) would indicate 'Greater Depth'.

These tests should be used to inform teacher assessment.

At the end of each term, all teachers attend a Pupil Progress meeting to share data and to discuss pupils who are 'off target' on Target Tracker.

These pupils should be placed into an Intervention of pre teach and post teach/Booster group with a SMART target.

13. Mathematics Classroom Environment

Mathematics should be visible in all classrooms. This could be an interactive display on the wall and/or a Maths table.

Expectations:

- Relevant concrete apparatus should be readily available for all pupils to refer to.
- Key vocabulary, pictorial and abstract representations should be visible for reference.
- Relevant sections of our academy's Calculation Policy to be displayed (either directly from the policy document or another child friendly version e.g. pupils' poster)

14. Homework

Mathematics homework to be given on a Friday and is completed by the following Thursday.

Homework to be acknowledged by the teacher.

Weekly homework should consist of:

- One short piece of Maths homework to help consolidate the learning they have experienced that week set on AtomPrime
- Log onto TT Rockstars at home for 15 minutes per week.