Ankermoor Primary Academy

Mathematics handbook

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Intent

We intend to build a Mathematical curriculum that:

- deepens understanding, confidence, competence and retention of knowledge in maths
- creates a culture that produces strong, secure learning and real progress
- allows children to be a part of inspiring and engaging lessons that will give them a range of opportunities to develop an **OPEN-MINDEDNESS** in their approach to **mathematics**
- gives each pupil a chance to demonstrate high **ASPIRATIONS** of themselves as mathematicians and develop the power of **RESILIENCE** and determination when faced with mathematical challenges
- recognises that mathematics underpins much of our daily lives and therefore is of overriding importance for children to become successful in the next stages of their learning
- makes connections across mathematical ideas to develop fluency, mathematical reasoning and competence in solving increasingly sophisticated problems
- provides equal opportunities for children to apply their mathematical knowledge to other subjects (cross-curricular links)
- is in line with the expectations in the National Curriculum 2014.

Implementation

Mathematics is planned, following an approach in line with the EYFS Framework and KS1 and KS2 National Curriculum. Our planning is informed (but not dictated) by the White Rose Maths Hub scheme. The teaching and learning of mathematics at Manor Primary Academy School should include aspects of the following Mastery approach strategies in every lesson and/or over a series of

lessons:

Teachers can use or adapt activities for fluency, reasoning and mastery of tasks within each learning journey. The calculation policy is used within school to ensure a consistent approach to teaching the four operations over time. At the start of each new topic, key vocabulary is introduced and revisited regularly to develop language acquisition, embedding as the topic

progresses. We also complete a pre-assessment to show progress throughout a unit of learning. All lessons begin with a short assessment (White Rose Maths flashback) to support retrieval practice and develop long-term memory.

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 +, −, x, ÷ to indicate addition, subtraction, multiplication, or division.

What is Fluency?

Fluency comes from deep knowledge and practice. This is the first stage of 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 and 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. This is tricky for many teachers who are not used to focusing on verbal reasoning in their mathematics lessons. You might, for example, get young learners to voice their thought processes. Older students could take part in class debates, giving them the space to challenge their peers using logical reasoning and write written explanations.

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 it's right. 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/circled.

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.

Lesson Structure

Maths lessons happen daily at Ankermoor and are roughly an hour long in KS1 and KS2. EYFS follow a different timetable for maths but teach mathematics every week and have maths embedded into their continuous provision indoors and outdoors

Lessons begin with flashback 4 which allows pupils to work independently on questions from the previous day, week, month or year. These should be recorded into books in KS2. Teachers then discuss the new learning objective with pupils and discuss any key vocabulary required. Throughout the lesson pupils may use whiteboards or their maths books to record answers and are also encouraged to use manipulatives where appropriate to aid learning. *(See recording of learning for more detail).* There should be opportunities for 'I Do', 'We Do' and 'You do' throughout. Teachers should regularly be assessing learning by targeted questioning and whole class responses such as thumbs up/down if they agree. Talk partner opportunities should be frequent with partner A and B having chances to share their thinking. When answering questions pupils should be encouraged to use stem sentences to show depth in their answers – this is true because…

It is vital that teachers model not only varied fluency to pupils but also examples of reasoning and problem solving with chances for pupils to see written examples of how to tackle more in-depth questions.

Year 3 and above are using the White Rose tasks daily as their independent work. Year 1 and 2 are using a range of sources for their independent tasks such as primary stars alongside White Rose. Teachers may also seek further reasoning and problem solving from other websites. Children should record any additional tasks into their maths books and any extra sheets should be filed in their folder.

EYFS are following the reception White Rose scheme (trialling for 2025/26) as their daily maths input that guides their continuous provision.

Planning

Planning should be guided by the White Rose mixed age (except in EYFS and KS1 where they are following single age planning). The scheme of learning provides mixed age steps (linked to the national curriculum) for each mathematics block. The scheme of learning provides notes and guidance, key questions, stem sentences, misconceptions to look out for and the national curriculum links. It also provides examples of key learning with fluency, reasoning and problem-solving questions for each small step. Planning should be adapted to suit the needs of individual classes and other supporting resources can also be used within lessons such as primary stars and classroom secrets. While the scheme of learning should be followed as a guide, teachers should adapt and revisit key concepts when necessary. KS2 are also supplementing fluency with infinity quizzes for those who need them.

Calculation policy

Ankermoor have transitioned from their own calculations policy (written 2014) to now use the White Rose policy (updated 2024) please see link below.

download.asp

Times tables

Times tables knowledge and rapid recall are essential skills for all our children at Ankermoor. Year 4 children sit the Multiplication Tables Check (MTC) at the end of the academic year. This online assessment provides children with 25 rapid recall times table questions in which they have 6 seconds to type in their answers. This data then guides staff on which children are secure with their times tables (rapid recall of facts) and which children require further support in year 5 and 6. While this assessment is a key assessment tool for our year 4 pupils it is essential that times tables is a focus in every year group from year 2-6. In year 2 children should begin to learn their 2-,5- and 10 times tables. In year 3 children should learn their 3-, 4- and 8 times tables. In year 4 children should learn their 6-, 7-, 8-, 9-, 11- and 12 times tables.

Resources

As mentioned above, concrete resources are an essential part of developing mathematical understanding in all year groups. The concrete, pictorial, abstract (CPA) approach is a highly effective approach to teaching that develops a deep and sustainable understanding of maths in pupils. Children should be using a range of physical resources such as 5/10 frames, part whole models, double sided counters, place value counters, dienes, number fans, rekenreks and many other resources regularly in their lessons (both in KS1 and KS2). Pupils should then be supported in transitioning to using pictorial representation (guided by the calculation policy) to help them with fluency as well as problem solving and reasoning. Once pupils are secure with a concept, they may use taught abstract methods to show their workings and answers but should also still be using concrete and pictorial representations regularly. Stem sentence guides should also be provided to support pupils with their worded answers.

Recording of learning

Children in both KS1 and KS2 have a maths book and a folder to store worksheets. It should be modelled to children how to correctly use their books (one number per square, short date etc) as well as how to file their work correctly. Children should date White Rose worksheets that go into the folder. Whiteboards can be used for quick jottings and for showing answers/workings during an input, allowing teachers to assess understanding and adapt their teaching. However, maths books should be used for recording flashback 4, other work needed squares and any other regular tasks in KS2. EYFS pupils should start recording some basic number formations and other ELG linked tasks into a workbook in the summer term ready for transition into year 1.

Marking and feedback

Live marking is encouraged at Manor as it gives pupils instant feedback as well as allowing staff quick AFL opportunities. This should be done in green pen, and pupils should correct errors in purple pen. Peer/self-marking is also a useful tool for KS2 teachers to use during their lessons.

Verbal feedback is vital during maths lessons to support pupils with misconceptions and to guided them to use their mathematical reasoning to show depth with their answers. Teachers should us the VF mark to show that they have given verbal feedback and pupils should then record their adapted answer in purple pen. Children should be given additional time where necessary to correct errors highlighted by the teacher.

Assessment of maths

Formative assessment is a feature of each lesson. Observations and careful questioning in each lesson enable teachers to adjust lessons and brief other adults in the class if necessary. Staff use the White Rose end of unit mini quizzes as a form of assessment to support their teacher judgements. These are used to help guide staff through planning out the next stages of learning as well as highlighting any areas that need to be revisited. Summative assessments happen termly at Ankermoor and staff input results onto Smartgrade. Ankermoor use the White Rose single age assessments which are made up of arithmetic and a reasoning and problem-solving paper. Children complete these under test conditions and they are then marked by staff. The results are then analysed by the math lead and executive headteacher. Y6 pupils follow a different structure guided by Fierte.

Classroom environment

Every classroom is expected to have a Maths Working Wall which displays resources, images, vocabulary etc to support children's learning and understanding. These displays should be updated regularly to reflect the current learning objectives and, where suitable, include examples of children's learning. Resources and equipment (such as number squares, counting beads, place value counters, Numicon, etc) should be stored neatly and accessibly in each classroom and children should have access to these at all times. This may be in the form of maths baskets on each table or in a designated area of the classroom. Additional equipment is stored in the centralised maths cupboard in the breakout room.

Impact

Through following our maths curriculum our children will be equipped with the mathematical skills they will need for life. They will be proficient with the four operations and be able to apply their problem solving and reasoning skills to everyday situations e.g. using money, measuring and handling data. Children will feel confident in approaching mathematical problems and be able to use a range of strategies to solve these. Children will demonstrate their skills in a range of ways using the CPA approach and will show mastery in being able to explain their thought processes. Finally, children will have a love of maths and enjoy their maths lessons as it allows them to make connections and access other areas of the curriculum. This will be evident in the EYFS, KS1 and KS2 mathematics results and from the multiplication tables check within Year Four. It will also show within the wider curriculum as the children use their skills in other subjects such as science and design technology.

Pupils will make at least expected progress in Maths from their last point of statutory assessment or from their starting point in EYFS or KS1. Pupils will use their Mathematical knowledge and skills, in all curriculum areas, to enable them to have a deep understanding, confidence, competence and retention of knowledge in the subject. Children will demonstrate a quick recall of facts and procedures. This includes the recollection of their times tables and the opportunity to develop the ability to recognise relationships and make connections in maths lessons. Mathematical concepts are mastered when a child can show it in multiple ways, using the mathematical language to explain their ideas, and can independently apply the concept to new problems in unfamiliar situations.