Ash Croft Primary Academy

Our Approach to…*Mathematics*

Our aim is to ensure that children at our academies experience the best educational provision beginning with excellence in the Early Years Foundation Stage. We believe that school should be a place where every child achieves and makes progress in their learning across the whole curriculum over time. We know that parents are the single most influential factor in children's outcomes and that we need to prioritise even further the need to support parents to support their children's education. Every child has the entitlement to an inclusive curriculum, and we strive to ensure that disadvantage and additional needs do not act as barriers to learning and achievement. We aim for all our children to succeed both academically and socially, ready for the next phase of their learning and beyond as responsible and respectful citizens.

The Harmony Trust core values underpin everything we do.

Our Approach to Mathematics at Ash Croft Primary Academy

The mathematics curriculum at Ash Croft uses the National Curriculum (2014) as its core.

"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"*

To this end, as a staff we continue to review our maths curriculum:

- The principles underpinning this document draw on a range of research – some recently published (*i.e. EEF Early Maths Guidance and KS2 to KS3 Guidance and NCETM Materials*) and other robust mathematical and pedagogical research which continues to be well regarded (*i.e. Nunes and Anghileri*)
- We have developed a set of Fluent in Five Facts which have been mapped out from pre-school to Year 6. They are designed to provide children with firm foundations on which to build stronger and more resilient mathematical understanding. They have also been created to ensure children can successfully recall their multiplication facts to 12x12 by the end of Year 4.
- SpeakWell (and similar) language structures can be used to model and scaffold children's mathematical talk. Teachers model the thinking and learning process to support the development of metacognitive strategies (*'thinking out loud'*)
- Teachers keep up to date with pedagogical research to deliver a mathematics curriculum with opportunities to develop sound number sense and explore planned reasoning and problem solving tasks
- Teachers are aware of common mathematical misconceptions and plan lessons to both avoid these misconceptions forming and to use them to deepen children's understanding

Long and Medium Term Planning

The maths leaders, together with the teachers regularly review the long term plan for Maths to ensure appropriate coverage and progression is being planned for across school.

Medium term plans are in place from Nursery to Y6 and any minor adjustments are made by teachers to meet the needs of their class at that time. MTPs state the main objective from the National Curriculum and the specific focus from that objective. A range of mathematical topics are planned for each half term.

Ash Croft Academy has a calculation policy to ensure consistency and progression in written calculation methods.

Short Term Planning

Short term planning is carried on a week to week basis taking into account assessment for learning opportunities from previous lessons.
Learning objectives should be clear and in 'child-speak'. Success criteria in Mathematics will usually be of the form of a description of a process. They should describe what process the children will work through back at their table in order to complete their task. Specific mathematical language should be included on the short term plan – selected from those outlined on the relevant MTP.

Remember It activities should be planned for each day. This will usually be presented as a quadrant grid and should be used to recap previous learning.

Children in KS1 and EYFS should have further incidental opportunities for daily counting to develop mental agility. Recommendation 2 in the EEF publication 'Improving Mathematics In The Early Years And Key Stage 1' advocates that practitioners should, *'Make the most of moments throughout the day to highlight and use mathematics, for example, in daily routines, play activities, and other curriculum areas'*. (See page 8 for the summary poster)

Scaffolding should be available for each lesson to support the learning of all children and the role of any supporting adults should be defined for each part of the lesson. Extension activities should not be 'more of the same' but should contribute to deeper understanding through the requirement of pupils reasoning about their maths learning and/or solving a related problem.
There should be a clear progression to the week's lessons and objectives should be planned so that skills build on skills incrementally. This ensures that pupils do not become cognitively 'overloaded' and learning is sequential.
Reasoning and problem solving tasks should be planned for throughout the week which provide children with the opportunities to apply their knowledge, skills and understanding they learn throughout the week. These tasks should allow children to reason and explain their thinking using correctly modelled mathematical language.

Research by Nunes (2009) identified the ability to reason mathematically as the most important factor in a pupil's success in mathematics. It is therefore crucial that opportunities to develop mathematical reasoning skills are integrated fully into the curriculum. Such skills support deep and sustainable learning and enable pupils to make connections in mathematics.

TTRockstars is used from Y3 upwards for children to rehearse their age related multiplication facts at home and in school.

Sumdog is used across the school for the children to practise their number skills in a fun and engaging way. The assessment facility of this program is also used as part of our formative assessment strategy.

Both of these programs are used to provide homework tasks for the children to complete.

Developing Fluent Mathematicians

One of the three aims of the National Curriculum states that pupils (of all ages, not just primary children) will: *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.*

How can we support children in becoming fluent? Russell, Susan Jo. (May, 2000). *Developing Computational Fluency with Whole Numbers in the Elementary Grades.*

As with much of mathematics, the key to fluency is in making connections, and making them at the right time in a child's learning.

Manipulatives

*"*We learn by moving from the concrete to the abstract and structured apparatus such as Dienes can be helpful for learning about place value or number bonds."

(See also EEF Improving Mathematics In The Early Years And Key Stage 1 - recommendation 3 and EEF Improving Mathematics in Key Stages Two and Three – recommendation 2)

Talking about their work

"The quality of the talk is important. It is not simply children sharing how they did a particular calculation, but describing why and how it worked, and how their method is the same or different to those of others. In other words, giving children opportunities to use those higher-level skills of comparing, explaining and justifying."

(See also EEF Improving Mathematics In The Early Years And Key Stage 1 - recommendations 2 and 4 and EEF Improving Mathematics in Key Stages Two and Three – recommendations 2 and 5)

Consolidation in meaningful contexts

"By offering children practice in context we help them to make links between the types of situations that a particular strategy might suit. Russell calls this mathematical memory, which is different from just memorising. She says that important mathematical procedures cannot be "forgotten over the summer" because they are based in a web of connected ideas about fundamental mathematical relationships."

(See also EEF Improving Mathematics In The Early Years And Key Stage 1 - recommendations 1 and 4 and EEF Improving Mathematics in Key Stages Two and Three – recommendations 4 and 6)

Lesson Structure/Teaching Strategies

In the main, lessons should be planned around the following structure:

- 'Remember It' – A recap of previous learning usually in the form of a quadrant grid. This will cover key skills and identify gaps in learning.
- 'Do It' – This section of the lesson includes explicit teaching of a skill or process and allows the children to practise this in their books. This mainly focuses on the fluency aspects of the learning.
- 'Twist It' – This looks at common misconceptions that the children may encounter during the learning process. This is modelled to the children to ensure their understanding.
- 'Solve It' – This element of the lesson focusses on a problem solving or reasoning question linked to the day's learning. Children are required to apply their maths knowledge to be able to solve these.
- 'Challenge It' – This is an extension activity to deepen the children's understanding of a particular concept. These are more complex or open ended challenges that require the children to apply their mathematical understanding in different ways.
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Quality first teaching is key and in maths, teachers should model and scaffold the learning for their pupils. In her 2006 paper: *Scaffolding Practices That Enhance Mathematics Learning*, Julia Anghileri describes three levels of scaffolding in maths:

Level 1: Environmental Provision

- Classroom organisation, groupings, display
- Structured tasks – e.g. rehearsal of a newly acquired skill
- Emotive feedback – not always feedback specific to the maths but rather feedback to encourage the learners

Level 2: Explaining, Reviewing, Restructuring

- Explaining – elements of showing and telling, explaining how and why (mostly by the teacher)
- Reviewing –Looking, touching and verbalising, allowing children to explain and justify their thinking, quality teacher modelling and the use of prompting and probing questions
- Restructuring – creating meaningful contexts for abstract ideas, simplifying the problem to allow it to be accessible

Level 3: Developing Conceptual Thinking

- Children using taught procedures to solve isolated problems
- Making connections
- Quality mathematical talk – terminology, reasoning, explaining

Although Level 3 is the aim and where the most quality maths learning takes place, it cannot be reached without progressing effectively through levels 1 and 2.

Assessment and Targets

Summative Assessment:

Each teacher undertakes a baseline assessment in early September with their new class. End of year targets are agreed with the principal in a data meeting.
Formal testing is undertaken in Y2 and Y6 (SATs).
Each term an assessment week takes place. Years 1, 3, 4 and 5 complete the relevant PUMA test. Years 2 and 6 complete a previous SATs paper.
In Years 4, a termly multiplication check is administered to assess pupil's progress towards knowing all of their multiplication facts by the end of year 4. The results of these checks enable teachers to set individual, group or class targets.

Formative Assessment:

Teachers use their own subject knowledge and ongoing AfL strategies to identify gaps and move children on through effective feedback. As an academy, we believe that verbal feedback during the lesson is most effective. Books are marked according to the academy's Marking and Feedback policy and children get the opportunity during 'Fix-it Time' to address any errors they might have made.

Environment and Resources

The maths display should follow the guidelines set out by the overall learning environment policy.

On and around maths displays, there should be evidence of:

- The display being a working wall. Ongoing learning for that week's series of lessons should be displayed appropriately.
- Worked examples.
- Subject and age specific vocabulary – unit specific vocabulary should be changed with the unit.
- Clearly labeled and stored resources.
- Number lines appropriate to age related expectations.
- Other suitable teaching resources such as a 100 square.
- Place value grid appropriate to age related expectations.
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EYFS - Planning, Teaching and Assessment

In Nursery, there will be a focused maths sessions planned for each week.
In Reception, there will be a daily maths lesson. Opportunities to reinforce mathematics concepts are built into daily routines – such as snack time and registration.

Maths plans incorporate whole group sessions, small teacher led groups and activities within continuous provision.

Reception children use a maths book from September, and also have a learning journey to show independent maths learning in a range of areas.

Tracking sheets are updated termly and gaps are identified and further learning planned for. The Rainbow challenge incorporates a maths challenge which is updated weekly.

Teaching in EYFS is always interactive, with all children engaged with appropriate resources. All adults teach maths through the different learning areas, including outdoors.

Summative Assessment

On entry to school, all children are assessed against the relevant EYFS assessment criteria.
Tracking sheets are updated termly and the children's progress in maths is tracked.

Formative Assessment

Teachers use their subject knowledge and ongoing AFL to identify gaps and move children on. Maths books are used in Reception and are marked according to the academy's marking and feedback policy.

EYFS - Resources and Environment

In EYFS,

- Maths resources should be clearly labeled and accessible
- Photographs should show children working in the maths area to celebrate learning and as a model for children to follow
- Resources should be age and stage appropriate
- Number facts/Learn Its should be displayed and referred to
- Classrooms should have number tracks and lines
- Opportunities for mathematical experiences should be planned into, and be available in, all continuous provision

- Appropriate shape and measure resources
- An outdoor maths area is defined and used on a daily basis.

Year 6

The aim in Year 6 is for the children to be as well-equipped as they can be to sit the National SATs test for Mathematics in May. We do not teach to the test but we want to ensure that they perform to the best of their abilities.

A comprehensive curriculum is in place which covers the necessary syllabus for Y6 and also addresses any skills and knowledge gaps the children might have – supported by accurate Teacher Assessments.

The maths focus is changed on a week to week basis, with a progressive series of differentiated lessons planned for. Opportunities to solve problems, reason and explain are planned for and past SATs questions are used to get children used to the question types and apply their skills.

Extra mathematics sessions are timetabled in the afternoon where revisits of past learning are planned for. There is also a further focus on Arithmetical strategies in one of the sessions – using CGP Arithmetic Books and timed challenges to build up speed and maths mastery.

From January, all year 6 children attend an after-school Booster session for maths. Children work in small groups and the sessions are targeted to their needs and abilities.

Homework is set regularly from published revision guides and children can access TT Rockstars and Sumdog from home to do further independent study.
The weeks (depending on the cohort) immediately preceding the National Test week are ran as revision weeks and the most recent past SATs papers are completed, reviewed and any gaps in knowledge addressed. Exam technique is also acquired during this time.

This policy has been reviewed and amended in light of the EEF documents: Improving Mathematics in Early Years and Key Stage 1 and Improving Mathematics in Key Stages 2 and 3.

Education Endowment Foundation

IMPROVING MATHEMATICS IN THE EARLY YEARS AND KEY STAGE 1

Summary of recommendations

1 Develop practitioners' understanding of how children learn mathematics

- Professional development should be used to raise the quality of practitioner' knowledge of mathematics, of children's mathematical development and of effective mathematical pedagogy.
- Developmental progressions show us how children typically learn mathematical concepts and can inform teaching.
- Practitioners should be aware that developing a secure grasp of early mathematical ideas takes time, and specific skills may emerge in different orders.
- The development of self-regulation and metacognitive skills are linked to successful learning in early mathematics.

2 Dedicate time for children to learn mathematics and integrate mathematics throughout the day

- Dedicate time to focus on mathematics each day.
- Explore mathematics through different contexts, including storybooks, puzzles, songs, rhymes, puppet play, and games.
- Make the most of moments throughout the day to highlight and use mathematics, for example, in daily routines, play activities, and other curriculum areas.
- Seize chances to reinforce mathematical vocabulary.
- Create opportunities for extended discussion of mathematical ideas with children.

3 Use manipulatives and representations to develop understanding

- Manipulatives and representations can be powerful tools for supporting young children to engage with mathematical ideas.
- Ensure that children understand the links between the manipulatives and the mathematical ideas they represent.
- Ensure that there is a clear rationale for using a particular manipulative or representation to teach a specific mathematical concept.
- Encourage children to represent problems in their own way, for example with drawings and marks.
- Use manipulatives and representations to encourage discussion about mathematics.
- Encourage children to use their fingers—an important manipulative for children.

4 Ensure that teaching builds on what children already know

- It is important to assess what children do, and do not, know in order to extend learning for all children.
- A variety of methods should be used to assess children's mathematical understanding, and practitioners should check what children know in a variety of contexts
- Carefully listen to children's responses and consider the right questions to ask to reveal understanding.
- Information collected should be used to inform next steps for teaching. Developmental progressions can be useful in informing decisions around what a child should learn next.

5 Use high quality targeted support to help all children learn mathematics

- High quality targeted support can provide effective extra support for children.
- Small-group support is more likely to be effective when:
- children with the greatest needs are supported by the most experienced staff;
- training, support and resources are provided for staff using targeted activities;
- sessions are brief and regular; and
- explicit connections are made between targeted support and everyday activities or teaching.
- Using an approach or programme that is evidence-based and has been independently evaluated is a good starting point.

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eef.li/early-maths

1 Use assessment to build on pupils' existing knowledge and understanding

- Assessment should be used not only to track pupils' learning but also to provide teachers with information about what pupils do and do not know
- This should inform the planning of future lessons and the focus of targeted support
- Effective feedback will be an important element of teachers' response to assessment
- Feedback should be specific and clear, encourage and support further effort, and be given sparingly.
- Teachers not only have to address misconceptions but also understand why pupils may persist with errors
- Knowledge of common misconceptions can be invaluable in planning lessons to address errors before they arise

2 Use manipulatives and representations

- Manipulatives (physical objects used to teach maths) and representations (such as number lines and graphs) can help pupils engage with mathematical ideas
- However, manipulatives and representations are just tools: how they are used is essential
- They need to be used purposefully and appropriately to have an impact
- There must be a clear rationale for using a particular manipulative or representation to teach a specific mathematical concept
- Manipulatives should be temporary; they should act as a 'scaffold' that can be removed once independence is achieved

3 Teach pupils strategies for solving problems

- If pupils lack a well-rehearsed and readily available method to solve a problem they need to draw on problem-solving strategies to make sense of the unfamiliar situation
- Select problem-solving tasks for which pupils do not have ready-made solutions
- Teach them to use and compare different approaches
- Show them how to interrogate and use their existing knowledge to solve problems
- Use worked examples to enable them to analyse the use of different strategies
- Require pupils to monitor, reflect on, and communicate their problem solving

4 Enable pupils to develop a rich network of mathematical knowledge

- Emphasise the many connections between mathematical facts, procedures, and concepts
- Ensure that pupils develop fluent recall of facts
- Teach pupils to understand procedures
- Teach pupils to consciously choose between mathematical strategies
- Build on pupils' informal understanding of sharing and proportionality to introduce procedures
- Teach pupils that fractions and decimals extend the number system beyond whole numbers
- Teach pupils to recognise and use mathematical structure

5 Develop pupils' independence and motivation

- Encourage pupils to take responsibility for, and play an active role in, their own learning
- This requires pupils to develop metacognition – the ability to independently plan, monitor and evaluate their thinking and learning
- Initially, teachers may have to model metacognition by describing their own thinking
- Provide regular opportunities for pupils to develop metacognition by encouraging them to explain their thinking to themselves and others
- Avoid doing too much too early
- Positive attitudes are important, but there is scant evidence on the most effective ways to foster them
- School leaders should ensure that all staff, including non-teaching staff, encourage enjoyment in maths for all children

6 Use tasks and resources to challenge and support pupils' mathematics

- Tasks and resources are just tools – they will not be effective if they are used inappropriately by the teacher
- Use assessment of pupils' strengths and weaknesses to inform your choice of task
- Use tasks to address pupil misconceptions
- Provide examples and non-examples of concepts
- Use stories and problems to help pupils understand mathematics
- Use tasks to build conceptual knowledge in tandem with procedural knowledge
- Technology is not a silver bullet – it has to be used judiciously and less costly resources may be just as effective

7 Use structured interventions to provide additional support

- Selection should be guided by pupil assessment
- Interventions should start early, be evidence-based and be carefully planned
- Interventions should include explicit and systematic instruction
- Even the best-designed intervention will not work if implementation is poor
- Support pupils to understand how interventions are connected to whole-class instruction
- Interventions should motivate pupils – not bore them or cause them to be anxious
- If interventions cause pupils to miss activities they enjoy, or content they need to learn, teachers should ask if the interventions are really necessary
- Avoid 'intervention fatigue'. Interventions do not always need to be time-consuming or intensive to be effective

8 Support pupils to make a successful transition between primary and secondary school

- There is a large dip in mathematical attainment and attitudes towards maths as children move from primary to secondary school
- Primary and secondary schools should develop shared understandings of curriculum, teaching and learning
- When pupils arrive in Year 7, quickly attain a good understanding of their strengths and weaknesses
- Structured intervention support may be required for Year 7 pupils who are struggling to make progress
- Carefully consider how pupils are allocated to maths classes
- Setting is likely to lead to a widening of the attainment gap between disadvantaged pupils and their peers, because the former are more likely to be assigned to lower groups