



ST. CHAD'S

CHURCH OF ENGLAND
PRIMARY SCHOOL

Mathematics Policy

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St Chad's Maths Policy 2019

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St Chad's - Changing the Paradigm

Mission:

St. Chad's - a successful, inspirational learning community taking the courage to: innovate, ignite curiosity, learn creatively, love unconditionally and serve others.

St. Chad's learning community achieves excellence by:

- proactively embracing a unique vision for the future;
- placing high expectations on all community members; and
- nurturing independent, respectful, autonomous community members who enjoy positive self-esteem and confidence.

Vision

To develop independent, inclusive, informed individuals making imaginative, intelligent innovations in society.

- Develop responsible, tolerant community members who have the self-belief, without prejudice, that they can make a valuable impact within the world.
- Teach skills for life through problem solving via collaborative learning opportunities, thus developing resourceful, resilient and responsible individuals.
- Developing an understanding of meta-cognition in all community members so that they can successfully exploit all learning opportunities.
- Developing sophisticated communication skills both socially and technologically.
- Capitalize on and facilitate all vision for the future. Develop skills relating to global awareness and future roles in competitive markets.
- Develop sensitivity to health and well-being and all ecological issues.

Introduction – Mathematics; an integral part of learning.

At St Chad's we believe that mathematics is the means by which we make sense of the world, by having the confidence to develop skills, apply logic and to explore and investigate new phenomena. Through a rich and stimulating curriculum, with a firm emphasis on collaborative problem solving, we aim for our children to be mathematically equipped to face a rapidly advancing technological world. We believe that mathematics provides learners with powerful ways to analyse, evaluate, surmise and understand the world around us.

Mathematics is integral to all areas of the curriculum, promoting opportunities for children to apply their skills in a range of real life contexts and situations. We promote self-belief and enjoyment in everything that we do, and ensure that through a challenging and stimulating curriculum, children see themselves as mathematicians, with a positive attitude for the future.

At St Chad's we structure teaching and learning around the core aims of the National Curriculum for Mathematics:

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- *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.”*

National Curriculum 2014 DfE

St Chad's additional aims and objectives:

- Promote enquiry and the confidence to not only answer questions, but to ask them to broaden and challenge children's thinking. Bloom's taxonomy is used as a model to promote the use of challenging and rich questions within the classroom;
- Harness children's intrinsic curiosity about the world through engaging and investigative approaches;
- Promote enthusiasm and enjoyment of mathematics;
- Apply logic and problem solving strategies to all areas of the curriculum, making links and recognising patterns and relationships;

- Empower children through effective feedback and communication;
- Ensure the consistent and accurate use of mathematical vocabulary when questioning, explaining and reasoning and
- Ensure that children are secondary school ready, and have the skills to be life-long learners of mathematics.

Specific aims relating to the content of the National Curriculum.

Our pupils should:

- Have a sense of the size of a number and understand where it fits within the number system;
- Know by heart number facts, including bonds, and in particular multiplication and related division facts (see progression of skills document);
- Calculate accurately and efficiently, drawing upon a range of calculation strategies (see calculation policy);
- When solving number problems, explain, justify and reason using correct mathematical terms;
- Judge whether answers are reasonable through estimation and draw upon strategies which check the accuracy of a calculation;
- Suggest suitable units for measuring and make sensible estimates of measurement;
- Explain and make predictions from the information presented in graphs, diagrams, charts and tables and
- Develop special awareness and an understanding of the properties of 2d and 3d shapes

Rationale

This policy is a formal statement of intent for mathematics within our school. It has been developed collaboratively with teaching staff, to ensure that all staff, children, parents and governors have a clear understanding of our aims and objectives. It reflects the essential part that mathematics plays within our school, and celebrates our achievement and the commitment we have towards empowering children. The policy also facilitates how we, as a school, meet the legal requirements of the revised National Curriculum for mathematics, whilst encompassing the fundamental Characteristics of Learning which enable children to be critical thinkers through engagement and independent active learning.

Provision

Mathematics is incorporated into a wide range of cross-curricular subjects, providing children with opportunities to apply their skills to real life contexts, and giving mathematics a purpose. The teaching of the subject supports the social development of children through collaborative learning. They are encouraged to communicate, challenge, reason and problem solve in a supportive and encouraging setting. Children have the opportunity to work individually, in pairs and small groups to discuss their ideas and results. The use of the TASC model facilitates these opportunities (see appendix 1)

The study of famous mathematicians and historical methods contributes to the cultural development of children, and through cultural art, children are able to develop their understanding of shape and pattern.

Children also have opportunities to develop their maths skills in other subjects, such as measuring in science and design technology, for the consideration of properties of shape and geometric patterns in technology and art, and for the collection, organization and presentation of information and data in history and geography.

Children are encouraged to question and discover how logical reasoning can be used to consider the consequences of particular decisions and the value of mathematical truth. From Early years through to year 6 children access P4C where they develop the skills to negotiate alternative viewpoints, and consider how factual information and data can influence opinions and inform decisions.

Number and Calculation

At St Chad's we recognise the importance of a consistent and structured approach to ensure appropriate progression. Our calculation policy has been devised to meet the requirements of the National Curriculum 2014 for the teaching and learning of mathematics. It outlines mental and written methods and procedures, both formal and informal, which ensures a balance of procedural fluency and conceptual understanding.

An intrinsic element of teaching and learning in maths is the ability to not only select appropriate and efficient methods to calculate, but to apply our skills to estimate/approximate and to check calculations. Only equipped with these skills will children be able to evidence, reason and explain their understanding of maths.

(See St Chad's Written Calculation policy for a broader appraisal of mental and written calculation at our school)

Progression and Attainment

Early learning in number and calculation in Reception follows the 'Development Matters' EYFS document, and the teaching of maths at St Chad's is designed to build on progressively from the content and methods established in the Early Years Foundation Stage. Where children exceed expectations in Reception, reference is made to our calculation policy; addressing National Curriculum objectives.

The expectation, set out in the National Curriculum 2014, is that the majority of pupils will move through the programmes of study at broadly the same pace. However, decisions about when to progress are always based on teacher assessment, and the security of pupils' understanding, considering their readiness to move onto 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, through additional practice and application, before moving on. These appraisals directly inform and tailor teachers' medium and short term plans.

We use the long term curriculum plan for mathematics, written in conjunction with the White Rose Maths Hub. The overviews:

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- *have number at their heart;*
- *ensure teachers stay in the required key stage and support the ideal of depth before breadth and*
- *provide plenty of time to build reasoning and problem solving elements into the curriculum.”*

Trinity Academy Halifax 2015

At St Chad's, it is our aim that by the end of year 5 all children will understand, and use efficiently, conventional standard written methods to carry out and record calculations that they are unable to do mentally. Children are however encouraged to use an expanded layout, until they are competent to work towards the most compact form, underpinned by secure understanding and reasoning. Should this transition be too early, where children are taught to use more succinct and abstract methods, progression is hindered and misconceptions established.

In terms of attainment, at St Chad's the majority of children are expected to exceed the national cohort related expectations (secure and working towards the next band). A very large majority of children will meet expectations (working within) whilst few children will be working towards those expectations (beginning in the year band).

We endeavour at all times to provide learning tasks that both challenge and motivate. We promote a positive attitude, where children are encouraged to embrace challenges. This growth mindset encourages children, particularly in maths, to appraise their work more readily, question the efficiency of their methods or approaches, and employ alternative strategies. With this, children subsequently exceed national attainment expectations.

Formative assessments are made during class based activities to enable teaching staff to build up a picture of each child's progress throughout each term. Reference is made to key performance indicator statements, outlined on Arbor, and cross referenced with the National Curriculum assessment exemplification (as published). It is essential that movement through the steps and bands is only made with sufficient assessment evidence against the statements to indicate that the child is ready to progress. The key focus remains on embedding and securing children's understanding of key skills and concepts before moving on to the next phase of learning. Our strong emphasis on problem solving and reasoning proves essential here.

Evidence and Recording

Evidence is gathered in a variety of ways:

- Teacher records of pupil progress;
- Teacher's subject knowledge and professional judgements;
- Evidence from class discussions and enquiry – whole class and peer collaboration;
- Analysis of responses to maths tasks – verbal and written;
- Use of maths in other curriculum areas, including evidence of using and applying;
- Notes/videos/ annotated photos of active learning (including outdoor learning) ;
- Children's written work and evidence of application;
- Pupil talk and self-appraisals;
- Annotated planning;
- Exemplification materials to cross reference judgements and
- Statutory test assessment which takes place annually.

Evidence of children's work for number and calculation is found in books with squared paper, reinforcing place value and supporting the children in the use of more formal methods. Evidence of work in other areas of the maths curriculum is found in plain books, where a range of evidence and recording is appropriate and allows for greater autonomy and creativity.

Mathematical Language and Vocabulary

The National Curriculum reflects the importance of the use of a rich mathematical repertoire of language in order to support the children's cognitive, social and linguistic development. In order for children to reason and present mathematical judgement or proof, children must have the opportunity to hear and speak quality mathematical language. At St Chad's, we believe that teaching staff play an essential role in providing a model for children, giving clarity to their thinking when explaining it to others. Through effective questioning and role modelling, teaching staff encourage children to make links and to secure their understanding, whilst probing and resolving any misconceptions. Children are able to communicate and develop mathematical language through:

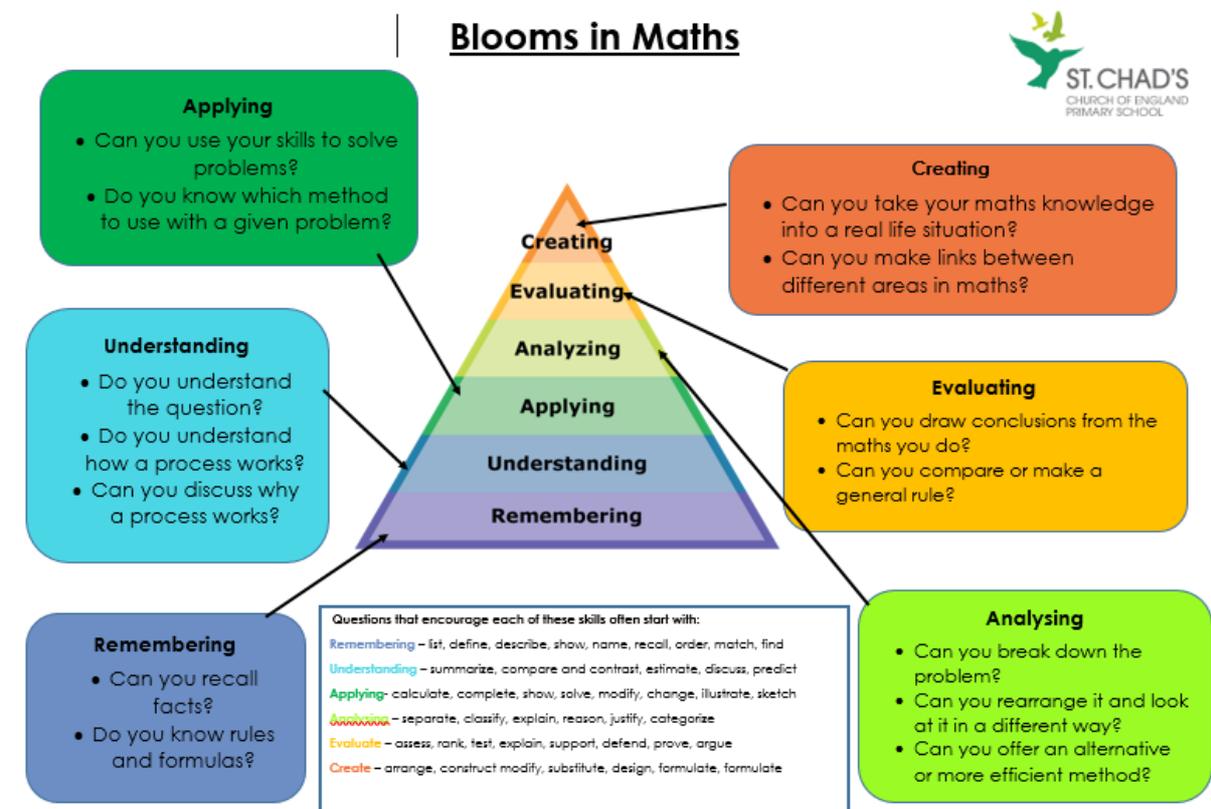
- Sharing key vocabulary relating to mathematical concepts and promoting its use throughout daily learning;
- Modelling clear sentence structures using mathematical language, with a firm emphasis on reasoning;
- Collaboration and
- Reflection through effective questioning and pupil explanation.

We have high expectations, and encourage children from a very early age to use correct mathematical terms. Vocabulary relating to number and calculation is outlined in our calculation policy. Reference is also made to our mathematical vocabulary policy, written in response to the new curriculum. In light of the revised curriculum, we have also employed the use of 'ones' in place of 'units' when relating to number and place value.

Mathematical vocabulary and terminology is displayed in classrooms, alongside reasoning statements which help scaffold children's responses to questioning and discussion about their learning. If we are to promote investigative approaches in maths, it is important that children are confident to ask questions and seek justification for concepts and ideas. Teaching staff at St Chad's value all pupils' oral contributions and create an ethos in which children feel they can contribute.

Bloom's Taxonomy

Bloom's Taxonomy, a hierarchical ordering of cognitive skills, provides a model on which both teachers and students can enrich their teaching and learning. This model is well established through all areas of the curriculum, and is used to provide broad, rich and challenging experiences with mathematics. Appendix 2 provides question cues based on Bloom's model.



Learning environment - displays/working walls.

We strive to create interactive learning environments which challenge mathematical understanding and stimulate questioning. Displays celebrate children's collaborative success, through visual imagery. Our displays also promote mathematical thinking and discussion through effective questioning and open tasks. Alongside mathematical vocabulary and phrases, our visual calculation policy is displayed which acts as a reference for children, but also demonstrates progression of skills within each classroom.

A wide range of physical resources are accessible for children, encouraging independent choices about those they might like to use to aid understanding. Resources available are strategically placed to support children through a progressive model of concrete, pictorial and abstract methods (CPA). E.g. A KS1 child approaching an addition problem may for example, select counting bears or cubes. Another may select a hundred square or a tens frame, whilst some children may have progressed to abstract methods and may select a blank number line.

Pedagogy: A Concrete – Pictorial – Abstract (CPA) approach

In light of the new curriculum aims, and showing credence to our school vision, the maths curriculum at St Chad's is centered around problem solving and investigative approaches, allowing our children to develop life-long mathematical skills. Our approach to teaching the curriculum engages students in inquiry and sees them actively furthering their own knowledge and subsequent possibilities. Questioning plays a crucial role in this, helping children identify thinking processes, making connections between ideas and building new understanding. We believe that for children to show autonomy and tenacity, we must provide them with a scaffold on which they can build new skills and knowledge.

At St Chad's we embrace a teaching method which recognises the three representations necessary for pupils to develop understanding of a concept, and that the reinforcement of this concept is achieved by a continuous revisit of the stages. This model is therefore established throughout the school, where children in upper KS2 are still encouraged to make sense of a problem by visualizing and conceptualising it through pictures and symbols, and where necessary; concrete representations. We believe that children should have a firm understanding of mathematical concepts before applying more abstract methods. This approach also supports the premise that there are multiple ways in which a problem can be solved, and the selection of the most efficient method should be considered, whilst also recognising the National Curriculum's guidelines and preferred written algorithms. Our maths TASC wheel outlines the process for problem solving which works alongside the CPA approach (see appendix 1)

Concrete: The Doing

A child is first introduced to an idea or a skill by acting it out with real objects. This is a 'hands on' component using real objects and is the foundation for conceptual understanding.

Pictorial: The Seeing

A child has sufficiently understood the hands-on experiences performed and can now relate them to representations, such as a diagram or picture of the problem.

Abstract: The Symbolic

A child is now capable of representing problems by using mathematical notation and is confident to develop the use of formal written methods; supported by fluency of numbers facts and mental calculation.

Marking and Feedback

Children are encouraged to use strategies to check their answers, including the use of inverse operations. This strategy is sometimes used for the children to self and peer assess, although timely, formative assessments are always made by teaching staff. Marking is completed in line with St Chad's marking and feedback policy. Errors are not marked 'incorrect' but referenced for the children to 're-think' or re-calculate. Time is offered, where appropriate, for children to correct or address any errors, or answer questions raised by teaching staff.

Comments made in books promote a 'growth mindset' and encourage children to work towards the next step or consider an alternative strategy. Teachers also acknowledge the Characteristics of Effective Learning in providing constructive feedback which recognizes children's engagement and motivation.

Feedback is offered to parents in annual reports where comments are made relating to pupil progress and attainment, effort and attitude.

SEND

Our impetus for teaching mathematics and pedagogical approaches enable all children to make progress in maths. Quality first teaching ensures that effective support and appropriate provision is in place and that the

needs of individual children are considered. Communication with the SENCO, parents and teaching staff ensures that an action plan is in place to determine the best provision to support children with specific and additional needs. In some cases, children are 'pre-taught' or introduced to new concepts prior to the lesson to enable them to prepare and contextualise new concepts with greater readiness. See SEND policy for more comprehensive details of interventions and procedures.

Parental Involvement

At St Chad's we recognise the importance of making links between home and school and encourage parental involvement through parents evenings, forum meetings and workshops. Parents are invited into school to review changes to the curriculum and policies are made accessible via our website which offer guidance and support.

Homework provides opportunities for children to:

- Practice and consolidate their skills and knowledge;
- Develop and extend strategies and techniques;
- Share mathematical work with their family and
- Prepare for future learning.

Homework tasks often involve the participation of parents through games, challenges and puzzles.

Computing

With the omnipresence of technology and computing, we believe that we have a responsibility to prepare children for a multi-technological world. Computing is encountered within the maths curriculum to support teaching and motivate children's learning. This includes the use of iPads, calculators, digital thermometers, clocks and scales, programmable floor robots and audio-visual aids. Computing will however only be used where appropriate, and when considered most efficient in aiding the children's understanding and providing engaging and stimulating activities.

Role of maths leader

- Promote a culture that enables staff and children to excel in mathematics; maintaining positive attitudes and enthusiasm for the subject;
- Lead by example, ensuring highly effective teaching;
- Focus on consistently improving the outcomes of all children, ensuring progression and attainment in line with the school's expectations;
- Lead the development, implementation, monitoring and evaluation of the school's policy;

- Identify and address the needs of all children through collaboration with staff and analysis of assessment data;
- Manage the audit of resources to ensure that staff and children can access a stimulating and relevant curriculum;
- Monitor and evaluate the quality and standard of mathematics around school through lesson observations, ward rounds, looking at children's work and discussions with children;
- Collaborate with staff to celebrate and share outstanding practice;
- Support colleagues in the teaching of mathematics, providing a strategic lead and direction for the subject in school;
- Attend local network meetings and training to stay informed about government initiatives and current agendas;
- Work collaboratively with the SENCO to ensure appropriate provision for children with SEND;
- Plan, organize and deliver parent forum meetings and provide appropriate information to support parents;
- Communicate with the Head Teacher, informing the annual report and future action plans;
- Provide data and information in relation to mathematics for the appraisal of our governing body and
- Share expertise and guidance through the School Direct programme.

Using the TASC model to solve a mathematical problem

Aims: Helping children to build a solid conceptual understanding of mathematical problems through mathematical fluency, skill development, positive attitudes and metacognition. Children are encouraged to work systematically and with perseverance, with a strong impetus towards reasoning and communication.

Learners are encouraged to reflect upon the process which they have undertaken, and the mathematical knowledge and skills which have been developed and applied. They may identify here their next steps and areas for development.

Children gather what they already know, making reference to prior knowledge and developing mathematical fluency. The teacher may facilitate opportunities for children to practice rapid recall of known number facts and skills.

Children share their findings or solutions with others, using a rich repertoire of mathematical vocabulary to explain, reason and justify. This may challenge children's thinking further or may help to consolidate their understanding of mathematical concepts.

Children read, interpret and contextualise the problem through visualisation. They illuminate unnecessary information and record important ideas and concepts. They consider whether the problem can be simplified. Children may begin to form concrete or pictorial representations. They will identify whether the problem has multiple steps and which operation is required.

Children consider how their thinking has developed; have they made any links to prior knowledge or recognised any new patterns? By referring back to their estimations, learners consider whether their answer is logical and where appropriate, children apply their knowledge of inverses to check calculations. Learners appraise whether the most efficient method was taken and how they might approach a similar problem in the future.

Having identified which operation is required; children begin to consider which method might be appropriate, including both written and mental strategies. They consider whether more than one strategy is required and think about what resources might support them.

Children work systematically and logically to solve the problem. Learners are encouraged to present their calculations and processes through concrete, pictorial or abstract forms. Children may solve a problem or prove/disprove a statement through pictures, diagrams, lists, tables or numerical calculations.

Children decide which method will be most efficient, and if necessary which resources are most suitable. Learners consider whether estimation is required. They work collaboratively to reason and justify. They may also make inferences and conjectures based on evidence and information provided.



Mathematical question cues based on Bloom's Taxonomy

