

## Maths calculation Policy 2020-2021

The 2014 National Curriculum provides a structured and systematic approach to the teaching of calculation. The aim is for mental calculations and written procedures to be performed **efficiently, fluently**, and accurately with **understanding**. Procedures and understanding are to be developed in tandem. End of Key Stage expectations are explicit in the programme of study. At JKPS, we have a consistent approach to the teaching of written calculation methods in order to ensure continuity and progression across the school. We uphold and nurture the following underlying principles for the teaching and learning of mathematics in our school, aiming 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 and procedural 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, e.g. “Convince me that...” or “I know that...so...”
- **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. The Bar Model device is used throughout the school to support problem solving.
- Are taught through the **Concrete → Representational → Abstract** sequence:
  - **Concrete representation**— a pupil is first introduced to an idea or skill by acting it out with real objects. This is a ‘hands on’ component using real objects and is a foundation for conceptual understanding.
  - **Pictorial representation** – a pupil 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 representation**—a pupil is now capable of representing problems by using mathematical notation, for example  $12 \times 2 = 24$ . It is important that conceptual understanding , supported by the use of representation, is secure for all procedures.
  - **Reinforcement** is achieved by going back and forth between these representations
- Should be given the opportunity for **every relevant subject** to develop their mathematical fluency and mathematical skills during maths lessons and across the curriculum
- Challenge through greater depth - rather than accelerated content, (moving onto next year’s concepts) teachers set tasks to deepen knowledge and improve reasoning skills within the objectives of their year group



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## Curriculum design and planning

- Staff use **White Rose Maths** Schemes of Learning (starting with the yearly overview) as a starting point in order to develop a coherent and comprehensive conceptual pathway through the mathematics. The focus is on the whole class progressing together. Collaborative planning with year group colleagues is encouraged to ensure consistency.
- Learning is broken down into **small, connected steps**, building from what pupils already know. The lesson journey should be detailed and evident on flipcharts, as only a skeletal plan is required
- Difficult points and potential misconceptions are identified in advance and strategies to address them planned.
- Key questions are planned, to challenge thinking and develop learning for all pupils.
- **Contexts and representations** are carefully chosen to develop reasoning skills and to help pupils link concrete ideas to abstract mathematical concepts.
- The use of high quality materials and tasks to support learning and provide access to the mathematics, is integrated into lessons. These may include White Rose Maths Schemes of Learning and Assessment Materials, Maths No Problem textbook activities, NCETM Mastery Assessment materials, NRICH, visual images and concrete resources. Opportunities for extra fluency practice (instant recall of key facts, such as number bonds, times tables, division facts, addition and subtraction facts) should be provided outside mathematics lessons (morning starters or post lunch)
- **Differentiation** – challenge must be planned for in each lesson, any child who is performing below ARE will need a separate lesson planned for. Differentiated activities across the school will take account of the children's differing needs and abilities (working toward national standard, at national standard and mastery standard) ensuring all children have access to the mathematics curriculum at the appropriate standard. Children with special educational needs in mathematics are supported to enable them to achieve the learning objective. (see the Special Educational Needs Policy and the Equal Opportunities Policy for details)

## Lesson Structure

- All lessons to begin with a mental starter
- Lessons are sharply focused; digression is generally avoided- key new learning points are identified explicitly.
- There is regular interchange between concrete/contextual ideas, pictorial representations and their abstract/symbolic representation.
- Mathematical generalisations are emphasised as they emerge from underlying mathematics, which is thoroughly explored within contexts that make sense to pupils.



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- Making comparisons is an important feature of developing deep knowledge. The questions “What’s the same, what’s different?” are often used to draw attention to essential features of concepts.
- Repetition of key ideas (for example, in the form of whole class recitation, repeating to talk partners etc) is used frequently. This helps to verbalise and embed mathematical ideas and provides pupils with a shared language to think about and communicate mathematics.
- Teacher-led discussion is interspersed with short tasks involving pupil to pupil discussion and completion of short activities.
- Formative assessment is carried out throughout the lesson; the teacher regularly checks pupils’ knowledge and understanding and adjusts the lesson accordingly-looking for missed opportunities
- Gaps in pupils’ knowledge and understanding are identified early by in-class questioning. They are addressed rapidly through individual or small group intervention, either on the same day or the next day, which may be separate from the main mathematics lesson, to ensure all pupils are ready for the next lesson.
- Teachers discuss their mathematics teaching regularly with colleagues, sharing teaching ideas and classroom experiences in detail and working together to improve their practice.

### Assessment

- At the end of each block – children will take the **end of block units** which teachers will record on Target tracker
- In addition to the **formative assessment** undertaken in lessons, teachers will use termly summative assessments (during Assessment Week) supplied by the White Rose Maths Hub to reinforce their judgements and provide further opportunities to identify gaps in pupil learning and tailor future lessons

### Early Years Foundation Stage (EYFS)

Children in EYFS explore mathematical concepts through active exploration and their everyday play-based learning. Children are taught key concepts and develop number sense using a hands-on practical approach. EYFS practitioners provide opportunities for children to manipulate a variety of objects which supports their understanding of quantity and number. Pupils explore the ‘story’ of numbers to twenty and the development of models and images for numbers as a solid foundation for further progress. The CPA approach is used when teaching children key mathematical skills. Practitioners allow children time for exploration and the use of concrete objects helps to support children's mathematical understanding. Mathematics in the early years provides children with a solid foundation that will enable them to develop skills as they progress through their schooling and ensures children are ready for the National Curriculum.

### Home/School Link



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At JKPS we encourage parents to be involved in the mathematics curriculum by:

- Providing parents with guides outlining what mastery teaching involves in EYFS and KS1 & KS2 and how they can support at home.
- Running teaching for mastery curriculum evenings and workshops throughout the year.
- Inviting parents in twice a year for parents evening to discuss their child's progress.
- Reporting on mathematical progress in their child's report.
- Using our mathematics page on the school website to provide information about how we teach the four calculations as pupils move through the school. Pupils are provided with mathematics home-learning on a weekly basis.

### **Agreed Principles For Mathematics.**

- Agreed worksheets will be used: using school's correct LQ and success criteria: in KS2 worksheets will take up half the page and children will show their working out on the other side
- Children will learn to work in cm squared paper during Year 1 to facilitate a smooth transition into recording their work in books in KS2. One digit/symbol per square is the agreed rule. All children will use pencils.
- Wherever possible, the checking or marking of work (cheat sheet) will be done wither with/by teacher or through per or self assessment.
- Children's responses to their teacher's marking should be encouraged when it is appropriate.
- There will be a working maths wall in every classroom with key resources to support learning in evidence: along side the calculations policy for that year group will be on display

### **Resources.**

Each class is equipped with a range of mathematical resources and apparatus relevant to the year group of that class; where required this must be accessible for all learners.

All children have access to a range of numeracy aids such as place value cards, dice, time table squares and 100 squares and place value counters.



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## Appendix: Calculation Progression Grid

	EYFS/Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Addition	<p>Combining two parts to make a whole: part whole model</p> <p>Starting at the bigger number and counting on- using cubes.</p> <p>Regrouping to make 10 using ten frame.</p>	<p>Adding three single digits.</p> <p>Use of base 10 to combine two numbers.</p>	<p>Column method- regrouping.</p> <p>Using place value counters (up to 3 digits).</p>	<p>Column method- regrouping.</p> <p>(up to 4 digits)</p>	<p>Column method- regrouping.</p> <p>Use of place value counters for adding decimals.</p>	<p>Column method- regrouping.</p> <p>Abstract methods.</p> <p>Place value counters to be used for adding decimal numbers.</p>
Subtraction	<p>Taking away ones</p> <p>Counting back</p> <p>Find the difference</p> <p>Part whole model</p> <p>Make 10 using the ten frame</p>	<p>Counting back</p> <p>Find the difference</p> <p>Part whole model</p> <p>Make 10</p> <p>Use of base 10</p>	<p>Column method with regrouping.</p> <p>(up to 3 digits using place value counters)</p>	<p>Column method with regrouping.</p> <p>(up to 4 digits)</p>	<p>Column method with regrouping.</p> <p>Abstract for whole numbers.</p> <p>Start with place value counters for decimals- with the same amount of decimal places.</p>	<p>Column method with regrouping.</p> <p>Abstract methods.</p> <p>Place value counters for decimals- with different amounts of decimal places.</p>
Multiplication	<p>Recognising and making equal groups.</p> <p>Doubling</p> <p>Counting in multiples</p> <p>Use cubes, Numicon and other objects in the classroom</p>	<p>Arrays- showing commutative multiplication</p>	<p>Arrays</p> <p>2d x 1d using base 10</p>	<p>Column multiplication- introduced with place value counters.</p> <p>(2 and 3 digit multiplied by 1 digit)</p>	<p>Column multiplication</p> <p>Abstract only but might need a repeat of year 4 first (up to 4 digit numbers multiplied by 1 or 2 digits)</p>	<p>Column multiplication</p> <p>Abstract methods (multi-digit up to 4 digits by a 2 digit number)</p>
Division	<p>Sharing objects into groups</p> <p>Division as grouping e.g. I have 12 sweets and put them in groups of 3, how many groups?</p> <p>Use cubes and draw round 3 cubes at a time.</p>	<p>Division as grouping</p> <p>Division within arrays- linking to multiplication</p> <p>Repeated subtraction</p>	<p>Division with a remainder- using lollipop sticks, times tables facts and repeated subtraction.</p> <p>2d divided by 1d using base 10 or place value counters</p>	<p>Division with a remainder</p> <p>Short division (up to 3 digits by 1 digit- concrete and pictorial)</p>	<p>Short division</p> <p>(up to 4 digits by a 1 digit number including remainders)</p>	<p>Short division</p> <p>Long division with place value counters (up to 4 digits by a 2 digit number)</p> <p>Children should exchange into the tenths and hundredths column too</p>



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