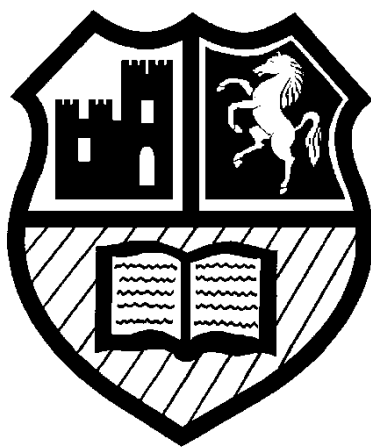


Otford Primary School



School Maths Policy

Date July 2025

For review (Annually) July 2026

OTFORD PRIMARY SCHOOL

MATHEMATICS POLICY

Explore, Discover, Fly High with Kindness Courage & Curiosity

"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."

AIMS OF THE MATHEMATICS CURRICULUM

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.

At Otford Primary School, the purpose of Mathematics education is for all pupils to:

- achieve the aims and expectations of the National Curriculum: Key stages 1 and 2
- be intrinsically motivated and resilient in their learning of concepts and solving of problems
- to be increasingly aware of the relevance of mathematics in the wider world

Discover, Explore, Fly High...

For all pupils to engage in mathematics as a journey of **discovery** as they learn new strategies and recognise links between them in engaging contexts.

For all pupils to **explore** ways of solving problems and learning concepts efficiently; understanding that exploring is often best done collaboratively as they ask questions, engage in mathematical discussion and learn from teachers, peers and their own mistakes and experiences.

For all pupils to **fly high** by ensuring that they are motivated, challenged, supported and expected to achieve their potential in all areas of mathematics.

...with Kindness, Courage and Curiosity

Throughout the mathematics curriculum, a supportive and respectful nature is developed as pupils learn collaboratively, feeling safe as they take risks and fly high. Their courage is developed through the opportunities to learn in different contexts, challenge their own and each other's views and take risks in their learning. Lessons are skilfully designed to develop pupil curiosity by offering different stimulating contexts, puzzles and problems.

PLANNING OF THE MATHEMATICS CURRICULUM

Planning across the school follows White Rose Education. This forms a medium-term plan which helps to ensure coverage and progression of all areas of the National Curriculum in Mathematics.

Short term planning is completed weekly, in steps. This may take the form of formal plans, annotated White Rose plans or slide shows. All units will have concrete, pictorial and abstract elements.

Learning objectives:

- are informed by the National Curriculum
- pervade the entire lesson
- are shared with the children
- are foundational to the lesson's success criteria

Learning Journeys

Individual lessons are in essence steps on a journey of mathematical learning. Teachers plan progressive steps which allows pupils to reach the expected standard or exceed it. At the beginning of a learning journey, the teacher assesses children's required provision in order to achieve by the end of the learning journey.

The time spent on a learning journey may vary from a few days to a few weeks, dependent on the children's needs and the required breadth of coverage.

Success criteria

Success criteria, which are planned by the teacher and shared and refined with pupils, are tools that help learners challenge themselves appropriately and know how to achieve the learning objective. They can take the form of layered expectations or a series of steps to success that enable children to achieve the learning objective an attainable level. Children are not restricted by success criteria but aspire to succeed in them all.

Adaptive teaching

The aim of every lesson is to ensure that all children achieve expectations of the National Curriculum and make progress from their starting point. A review of prior learning, and of current understanding, is gained through a variety of means, such as via Flashback 4 questions, quizzes, and questioning.

The questioning and scaffolding individual pupils receive in class as they work through units of learning will differ, with higher attainers being challenged through more demanding or creative problems which deepen their knowledge of the same content. Pupils' difficulties and misconceptions are identified through immediate formative assessment and addressed with adaptations to questions or by providing additional worked examples or teacher input. Providing concrete, pictorial and abstract representations for children to access and enhance their understanding of mathematical principles is key for understanding. Teachers always provide additional support, through deployment of adults or use of manipulatives, to ensure that all children progress and enrichment opportunities are offered for mastery of the curriculum. Adaptive teaching strategies ensure that all children make progress.

Our goal is for children to be confident, reflective, independent learners who are prepared to seek support or resources where needed and look to challenge themselves.

TEACHING AND LEARNING OF THE MATHEMATICS CURRICULUM

All mathematics lessons at Otford should provide the children with the following:

- a context/reason for learning - purpose
- clear explanations and instruction about mathematical concepts – Concrete, Pictorial, Abstract
- opportunities to think and reason mathematically for themselves
- appropriate resources that equip the children to succeed

Children are given a secure foundation in mental calculation and recall of number facts before standard written methods are introduced. The highest priority is given to ensuring that children are confident in recalling multiplication tables, number bonds and mental calculation.

Delivery, Pace and Learning styles

Mathematics lessons at Otford Primary School are delivered in a collaborative and motivating manner that promote and cultivate positive learning behaviour. Effective classroom routines maximise learning time and lessons are sufficiently pacy to maintain the concentration of all pupils at all times. Lessons cater for all learning styles through carefully planned activities. Lessons have an effective structure that injects a sense of progression, thereby engendering motivation, determination and perseverance. Children are typically listening for no more than five minutes before taking an active part in a lesson, for example through use of learning partners, answering open and closed questions, sharing answers using whiteboards or using practical equipment.

Growth Mind-set

Key to the teaching of mathematics, is a focus on celebrating and investigating methods and attitudes of children rather than being satisfied with the answers. Children are praised more for developing their skills than for finding the correct outcome. Research suggests this produces learners with a greater appreciation of the value of learning and a greater tenacity and resilience in learning. The idea of grappling with a problem – rather than “getting through an activity” – pervades the lessons.

Questioning

Teachers plan and ask predominantly open questions to generate discussion, engage learners and challenge children’s thinking. Carefully chosen closed questions are used strategically to explore, for example, levels of understanding, misconceptions and for assessment. Hinge questions are used to evaluate understanding and to ascertain which children are ready to apply learning independently and which need further input. Teachers are aware of vulnerable children and direct targeted questions towards them; they ensure children have sufficient time to cogitate before expecting an answer. (See **Appendix 1**)

TEACHING AND LEARNING OF THE MATHEMATICS CURRICULUM (Cont’d)

Communication

Research confirms the learning benefits of communication amongst learners in mathematics lessons. A supportive, encouraging atmosphere is the context for small group and paired work, allowing pupils opportunities to do the following:

- discuss their ideas and strategies
- explain their methods and reasoning,
- using correct mathematical terms and develop vocabulary
- probe and challenge answers
- ask for alternative strategies or explanations

Within mathematics lessons, through careful planning and preparation, children learn in a range of contexts and in different ways: group work, paired work, individual work and whole class teaching.

Mastery and Expectations

Teachers have the highest expectation of each pupil in the class. Every learner is given the opportunity to challenge themselves and all resources and adults are deployed effectively to ensure that everyone achieves the relevant programme of study for that year group.

To develop a mastery curriculum, pupils at Otford Primary School are given varied and frequent practice of concepts for the majority of pupils to move through the programmes of study at broadly the same pace. Teachers move learning forward based on their assessment of pupils’ understanding and readiness. Pupils who grasp concepts rapidly are challenged through reasoning and applying in different contexts, before any acceleration through new content. Those pupils who are not sufficiently fluent with earlier material consolidate their understanding, including through additional practice, before moving on. (See **Appendix 2**).

Formative Assessment

Teachers assess pupils' understanding at the start of each lesson and during the session which directly informs the next part of the teaching sequence. At the end of each session, children should be clear about their learning and how successful they have been. The teacher may record children's understanding by highlighting objectives when children have achieved them or using a broken or dotted line when they have not.

Self and Peer Assessment

Studies on formative assessment point clearly to the value of learners assessing themselves and 'live marking'. Through this process learners become aware of what they need to know, what they do know, and what needs to be done to narrow the gap. They also help inform the teacher as to their understanding of a concept. Each lesson pupils use traffic lights (or similar) to reflect upon their learning. Other forms of self- and peer-assessment may also be used; for example, children may identify *what has been done well*, explain *why it has been done well* and then identify *what could be improved* and explain *how it could be improved*. They will also be able to apply their learning in different contexts which will demonstrate a deep understanding.

Summative Assessment

Summative assessment of each pupil's achievement takes place at the end of each unit of learning. Children complete the White Rose unit assessments and these are used to ensure gaps in understanding are diminishing. More formal assessments are carried out in term 2, 4 and 6 using the Rising Stars NTS assessment tests in Arithmetic and Reasoning. The question marks are then individually inputted by class teachers directly into an online program (Boost Insight) in order to analyse gaps. The online program automatically creates individual pupil reports including standardised scores. This thereby supports teachers in identifying trends for individual gaps as well as groups. This helps to inform teacher assessment judgements made on the school tracker system: Sonar Tracking. Judgements are also largely informed and evidenced by children's recorded work as well as other more informal assessments. As a school, we know that some children find more formal assessments stressful and adaptations are made to always support children's well-being above all else.

Year 4 Multiplication Tables Check

Year 4 pupils will take the online Multiplication Tables Check (MTC). The purpose of the MTC is to determine whether pupils can recall their times tables fluently, which is essential for future success in Mathematics. The multiplication tables check is an online test where the pupils are asked 25 questions on times tables 2 to 12. For every question, they will have 6 seconds to answer and in between there is a 3 second rest. Questions about the 6,7,8,9 and 12 times tables come up more often. The questions are generated randomly and no two pupil tests are exactly the same set of questions. The results of the MTC will enable teachers to identify pupils who have not yet mastered their times tables, so that additional support can be provided. Pupils in Years 4 will prepare for the test by using tablet devices or PC's to access tests which simulate the MTC, typically using the web application Maths Shed. Typically, Year 4 children will practise their multiplication tables in class, through oral starters as well as practising at least twice a week using the tablet devices or PC's. There will be a 3-week check window to administer the MTC. Teachers will administer the check to small groups using tablet devices across the 3 week check window.

Prior to the mandatory check window, Year 4 pupils will have the opportunity to access the 'try it out area' to familiarise themselves with the system. Teachers will also apply any necessary accessibility features for pupils with Additional Educational Needs. Pupils will then have a chance to complete the MTC ahead of the check window to ensure these additional features work for them.

TEACHING AND LEARNING OF THE MATHEMATICS CURRICULUM (Cont'd)

Marking

Work is marked in line with the school's marking policy and it serves three main purposes: to motivate, to address misconceptions or provoke deeper thinking on an objective, to inform teachers' assessments. Specific time should be allowed for children to read, reflect and respond to marking. Number "reversals" are corrected as they occur in books with opportunities for children to correct.

Homework/Online Maths

Mathematics practice is set each week across key stages 1 and 2. It is recommended that children log in to Times Tables Rock Stars/Numbots regularly for all children in Y1 – Y6. From Y2 - Y5, children are allocated Maths tasks on MyMaths and in Y6 they will be asked to complete weekly arithmetic in their CGP books.

Presentation

In Reception and Year 1, maths learning should be practical and engaging. Learning will be recorded from teacher observations until children are ready to show their maths learning on paper. In year 2 and 3, children complete their maths learning in White Rose booklets. This enables them to focus on their mathematical skills and understanding, rather than their presentation and layout, and reduces cognitive overload by providing learning in more manageable chunks and with a variety of colourful representations. From Y4, Maths learning is usually recorded in A4 blue mathematics books.

Pupils work in pencil and the school presentation policy is followed. Children are encouraged to take pride in their learning and to record their findings in a way that best demonstrates their maths knowledge, skills and understanding.

STRUCTURE OF MATHEMATICS LESSONS

Mathematics at Otford Primary School is typically taught discretely for one hour each day in order to ensure sufficient provision. It is also incorporated across the curriculum regularly in order to develop understanding in other purposeful contexts. The teaching of mathematics is in line with the whole school teaching and learning policy. It is also wholly compatible with the school vision, national curriculum in Years 1 to 6 and the Early Years curriculum in the EYFS.

STARTER

In order to stimulate mathematical thinking and discussion, lessons typically begin with a mental, oral activity. Flashback 4 White Rose questions are used to recap, recall and re-visit prior learning.

One minute of class counting, often at a level above that of children's own ability (e.g. using larger steps, fractions or decimals), is led by the teacher. 'Super Movers' videos will be used at least 3 times a week to rehearse number facts. <https://www.bbc.co.uk/teach/supermovers>

FOCUSED TEACHING

Context for learning

The context for learning is meaningful for pupils. All learning should start with 'Why are we learning this?'. Techniques are often used to motivate and capture the imagination: real life or topic-related contexts and questions; video clips; pictures/photographs; outdoor learning; unexpected events; drama. Teachers use ICT resources to enhance their Maths teaching and the children are given access to ICT to reinforce and consolidate their Mathematical learning, for example using Maths games (such as Top Marks/TTRS/Numbots) to practise quick fire recall of number facts.

A mathematical problem that challenges children's knowledge and draws out misconceptions may be posed which is later solved through the lesson's learning and followed by reflective discussion. Research has shown that such conflicts lead to more permanent learning than conventional, incremental teaching methods which seek to avoid learners making "mistakes".

Modelling

Typically, new learning will be introduced by **clear and methodical** modelling. It should be evident that children have understood foundational concepts before moving on to a new one. Teachers break concepts into simple steps before children are given an opportunity to practise for themselves. Connections within mathematics are made explicit.

Worked examples

Worked examples in maths are problems with their complete, step-by-step solutions provided to illustrate a concept or procedure, helping learners understand how to solve a problem by reducing the cognitive load and making the expert's problem-solving visible to the novice. They can be used to transition students from watching to practicing, encourage reasoning, or as part of different strategies, such as scaffolding or contrasting examples

Concrete-Pictorial-Abstract

Where new learning is introduced, teaching begins by using concrete, practical resources which both teachers and children use in order to gain a clear foundational understanding. A range of resources may be used which are clearly visible to all and often manipulated by children.

When clearly established through concrete illustrations, teaching is directed to represent the principal pictorially. Simple pictures or diagrams – such as in the Bar or Part/Whole model– are modelled clearly in order to bridge the gap between the concrete and abstract representation.

As soon as children are ready, teaching progresses to an abstract level, in which the concepts are introduced using numbers and symbols. Children are then given opportunities to practise the processes they have been shown.

STRUCTURE OF MATHEMATICS LESSONS (cont'd)

INDEPENDENT/GROUP/PAIRED TASK

Teachers provide learning opportunities (matched to the learning objective) for children to practise and explore mathematics; these activities include engaging opportunities which provoke a desire to learn. The White Rose questions are progressive and use concrete, pictorial and abstract ways of learning. Symbols indicate to the children whether they should use manipulatives, a bar model, partners or deeper thinking.

They also often:

- Are rich, collaborative tasks that challenge all learners;
- Are accessible and extendable
- Allow learners to make decisions
- Involve testing, proving, explaining, reflecting, interpreting;
- Promote discussion
- Encourage creativity and invention
- Encourage "what if" questions
- A range of resources are used to provide learning opportunities, including textbooks, worksheets, cards and computer software. Learning is typically recorded in children's own exercise books.

Pupils have the opportunity to engage in the following areas of mathematics:

- Written methods (taught in accordance with the Otford Primary School Calculations policy)
- Practical activities and mathematical games.
- Investigational work
- Problem solving
- Consolidation of basic skills and number facts
- Using technology as a mathematical tool.

PLENARY

Plenaries take place at the end of lessons and during pupils' independent work in order to:

- Revise key facts, ideas and vocabulary, and stress what needs to be remembered;
- go through an exercise, question pupils and rectify any remaining misunderstandings;
- make links to other work and what the class will go on to do next;
- highlight not only what pupils learn but how they have learned;
- provide an opportunity to assess pupils' current understanding;
- celebrate the progress pupils have made;
- share carefully chosen pieces of work which demonstrate high achievement, to stimulate success ;
- There is a shared and understood link between previous learning and the lesson; preparation is made to link learning to next lesson.

MATHEMATICS LEARNING ENVIRONMENT

An area of each classroom is dedicated to celebrating, promoting and supporting the learning of mathematics. Each classroom must have the following displayed:

- Mathematical vocabulary highlighted on a wall or other displays
- A working wall using on-going pupil work, alongside worked examples, support learning in each classroom (including the use of models / images to help pupils access the learning)

A variety of equipment and materials organized and clearly labeled for easy student access. Teachers should ensure their classes are supplied with the following resources (if appropriate) and liaise with the Maths Coordinator if they need to update any resources:

| | | | | | | | |
|--|--|--------------------------|----------------------------|--|---------------------|--|-----------------------------------|
| Multilink | 2d and 3d shapes-regular and irregular | Rulers | Protractors | Number lines of a range of increments | Isometric paper | Square paper | Graph paper |
| Compasses | Polydron | Geoboards | Counting beads | Trundle wheel | Dice | Base ten | Problem cards for each year group |
| Maths vocab | <i>Clinometers</i> | <i>4 big foam dice</i> | <i>Large playing cards</i> | <i>Dice (4, 6, 8, 10, 12 and 20 sided)</i> | <i>Maths games</i> | <i>Place value grids</i> | <i>number washing line</i> |
| Clock faces | Clock stamps | Maths dictionary | Beakers etc | Measure 'n' wipe wheel mass | Calculators | 2 colour counters | spinners |
| <i>Class set of counting teddy bears & dinosaurs</i> | <i>Base 10 apparatus</i> | <i>Digit Flips</i> | <i>Number Fans</i> | <i>Balance</i> | <i>Digit cards</i> | <i>Class set of Equivalent Fraction & Decimal Dominoes</i> | |
| <i>Pattern blocks</i> | <i>Pegboards</i> | <i>Construction Kits</i> | <i>Tessellating shapes</i> | <i>3D models</i> | <i>Mirrors</i> | <i>Tape measurers</i> | <i>Weighing scales</i> |
| <i>Trundle wheels</i> | <i>Stopwatches</i> | <i>Teaching clock</i> | Money | 2D and 3d shape posters | Multiplication grid | Hundred square | <i>Interactive bingo</i> |

ROLE OF SUBJECT LEADER

- To promote the vision, culture and ethos of the school within maths.
- Ensuring continuity and progression when pupils move year groups
- Helping staff with the planning and implementation of the maths curriculum
- To lead staff to achieve high quality teaching, effective use of resources and the highest standards of learning and achievement for all pupils.
- To liaise effectively with senior colleagues to ensure consistency of approach in teaching and learning in maths across the school.

APPENDICES

Appendix 1: OPEN QUESTIONS IN MATHEMATICS

"...In contrast, the research shows that effective questioning has the following characteristics. Questions are planned, well ramped in difficulty. Open questions predominate. A climate is created where learners feel safe. A 'no hands' approach is used, for example when all learners answer at once using mini-whiteboards, or when the teacher chooses who answers. Probing follow-up questions are prepared. There is a sufficient 'wait time' between asking and answering a question. Learners are encouraged to collaborate before answering. Learners are encouraged to ask their own questions."

After asking an open question, it is important to welcome and encourage answers, but not pass immediate judgement on them. "Thanks, that is a really interesting answer. Does anyone have something different?" will generate discussion, whereas "That is a really good answer." will inhibit discussion, because learners with alternative ideas tend to remain silent. Judgements should thus be reserved for the end of a discussion.

Typical 'show me' open questions

"Show me a really different example";

"Show me a complicated example";

"Show me an example that is different from everyone else on your table"

Show me: Two fractions that add to 1 . . . Now show me a different pair.

A number between 1.3 and 1.4 . . . Now between 1.3 and 2.7 .

A quadrilateral with two lines of symmetry.

A quadrilateral with a rotational symmetry but no lines of symmetry.

A hexagon with two reflex angles . . . A pentagon with four right angles.

A shape with an area of 12 square units . . . and a perimeter of 16 units.

A set of 5 numbers with a range of 6 . . . and a mean of 10 . . . and a median of 9.

Appendix 2: MASTERY

Excellent article explaining mastery:

https://www.ncetm.org.uk/public/files/19990433/Developing_mastery_in_mathematics_october_2014.pdf

Article that suggests ways of finding different ways of developing conceptual understanding for high achievers

https://www.ncetm.org.uk/public/files/224/improving_learning_in_mathematicsi.pdf

Classifying mathematical objects

Students devise their own classifications for mathematical objects, and/or apply classification devised by others. In doing this, they learn to discriminate carefully and recognise the properties of objects. They also develop mathematical language and definitions. The objects might be anything from shapes to quadratic equations.

(i) Odd one out

Perhaps the simplest form of classification activity is to examine a set of three objects and identify, in turn, why each one might be considered the 'odd one out'. For example, in the triplets below, how can you justify each of (a), (b), (c) as the odd one out? Each time, try to produce a new example to match the 'odd one out'.

Interpreting multiple representations

Students work together matching cards that show different representations of the same mathematical idea. They draw links between representations and develop new mental images for concepts.

If I share 5 pizzas among 4 people, how much pizza will each get?

$$5 \overline{)4}$$

$$0.8$$

$$4 \div 5$$

$$1.25$$

$$\frac{5}{4}$$

$$5 \div 4$$

$$4 \overline{)5}$$

$$\frac{4}{5}$$

If I share 4 pizzas among 5 people, how much pizza will each get?

Appendix 2: Mastery (Cont'd)

Evaluating mathematical statements

Students decide whether given statements are always, sometimes or never true. They are encouraged to develop mathematical arguments and justifications, and devise examples and counterexamples to defend their reasoning.

Always, sometimes or never true?

| | |
|---|---|
| $a \times b = b \times a$ It doesn't matter which way round you multiply, you get the same answer. | $a \div b = b \div a$ It doesn't matter which way round you divide, you get the same answer. |
| $12 + a > 12$ If you add a number to 12, you get a number greater than 12. | $12 \div a < 12$ If you divide 12 by a number, the answer will be less than 12. |
| $\sqrt{a} < a$ The square root of a number is less than the number. | $a^2 > a$ The square of a number is greater than the number. |

Creating problems

Students are asked to create problems for other students to solve. When the solver become stuck, the problem 'creators' take on the role of teacher and explainer. In these activities, the 'doing' and 'undoing' processes of mathematics are exemplified.

Analysing reasoning solutions

Students compare different methods for doing a problem, organize solutions and/or diagnose the causes of errors in solutions. They begin to recognize that there are alternative pathways through a problem, and develop their own chains of reasoning.

Paint prices



1 litre of paint costs £15.
 What does 0.6 litres cost?

Chris: It is just over a half, so it would be about £8.

Sam: I would divide 15 by 0.6
 You want a smaller answer.

Rani: I would say one fifth of a litre is £3, so 0.6 litres will be three times as much, so £9.

Tim: I would multiply 15 by 0.6

Teacher: Do your methods give the same answers?
 If I change the 0.6 to a different number, say, 2.6, would your methods change?
 Why or why not?
 Does the method depend on the numbers?

Appendix 2: Mastery (Cont'd)Evaluating mathematical statements:

Learners are asked to decide whether the statements are 'always', 'sometimes' or 'never' true, and give explanations for their decisions. Develops learners' capacity to explain, convince and prove.

Show me an example of . . .

What's wrong with this statement...

Similarities and differences

Explain why...

Classification – eg odd one out; Carroll or Venn diagrams or two way tables

Number

| | |
|---|---|
| If you divide a number by 2, the answer will be less than the number. | If you divide 10 by a number, your answer will be less than or equal to 10. |
| The square root of a number is less than or equal to the number. | The square of a number is greater than or equal to the number. |

Mastery Prompts

'What's the question?' If this is the answer, what could the question have been? This could be an equation or a word problem.

'What's wrong with this?' Can you explain what is wrong with the example below and correct the error?

'Draw it' Draw a picture to explain or demonstrate what you have worked out

'Reason it' Explain to your partner how you know. Remember to use the star words!

'Prove it!' Convince me that you are right. 'Empty box question'
What goes in the empty box(es)? Such as $+ 4 = 7$, $++ = 9$

'Find a pattern' Can you see a pattern (in the numbers)? Can you see a pattern in the answers? Continuing this pattern, what would happen if...?

'Before and after' What came before? What comes next? Explain how you know

'Tell a story' Make up a real-life story using your equation/numbers or shapes. Try to use the star words.

'Odd one out' Find an odd one out and explain why it doesn't fit.