OUR

Mathematics

CURRICULUM

SUPPORT • ACHIEVE • CELEBRATE

The teaching of Mathematics at Cherry Lane Primary School is underpinned by the principles of the Cherry Lane Way.

The Cherry Lane Way

Learn Actively

Ask and Answer Questions

Understand Key Vocabulary

Link Learning to Existing Knowledge

INTENT

At Cherry Lane Primary School, children have access to a high quality mathematics curriculum through a mastery approach, which tries to ensure that children can build a deep conceptual understanding of concepts, which will enable them to apply their learning in different situations. We aim to foster children's mathematical understanding and help all children to develop a confident, skilled and resilient approach to all aspects of mathematics. We aim to increase pupil confidence in maths so they are able to express themselves and their ideas using the language of mathematics with assurance. We offer an environment that embraces mistakes as opportunities for further learning. Through the teaching of key mathematical skills, we enable our children to become fluent, reason mathematically and finally problem solve. We want children to be able to see mathematics as being relevant to society and applicable to everyday life as well as being something that they will need as they move on through their school life and ultimately to the world of employment.

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.

(National Curriculum 2014)

IMPLEMENTATION

Mathematics is taught through the Mathematics Mastery programme, where each lesson follows a six-part structure to ensure pace and encourage active thinking. The lessons which are taught at Cherry Lane are taken from the Mathematics Mastery programme where an overview of each unit is provided for teachers to adapt the learning to suit the needs of children. Maths lessons are taught to include the following three key principles: depth of understanding, mathematical thinking and mathematical language where problem solving is at the heart of learning.

When adapting and tailoring lessons provided by the Mathematics Mastery Programme, teachers ensure the following are incorporated into their lessons:

- *Key vocabulary from each unit of study is shared and displayed*
- *Maths lessons are pacey with the use of a Ping Pong style of delivery*
- *A CPA (concrete, pictorial, abstract) approach is implemented*
- *The use of bar models as a strategy to approach mathematical problems (introduced from Year 2)*
- *Key questions taken from 'Ideas for Depth' by Mathematics Mastery' are used such as 'What's the same? What's different', 'Which is the odd one out and why?'*
- *Multiple opportunities are provided for written as well as verbal reasoning*
- *Modelling of skills and approaches*
- *Ensure that greater depth is provided for all learners*

At Cherry Lane, we believe that different approaches to teaching can be effective to consolidate key learning and ensure fluency. These are delivered at our school through Maths meetings via chants, rhymes, songs as well as concrete resources. Children at Cherry Lane are provided with the opportunity to learn and practice their multiplication and division facts via TTRockstars, songs, rhymes and the use of counting sticks.

PROGRESSION OVERVIEW

Progression and coverage in mathematics from Reception to Year 6.

	Autumn	Spring	Summer
Reception	• Early mathematical experience • Pattern & early number • Numbers within 6 • Addition & subtraction within 6 • Measures • Shape & sorting	• Numbers within 10 • Calendar and time • Addition and subtraction within 10 • Grouping and sharing • Number patterns within 15 • Doubling and halving • Shape and pattern	• Securing addition and subtraction facts • Number patterns within 20 • Number patterns beyond 20 • Money • Measures • Exploration od patterns within number
Year 1	• Numbers to 10 • Addition and subtraction within 10 • Shape and patterns • Numbers to 20 • Addition and subtraction within 20	• Time • Exploring calculation strategies within 20 • Numbers to 50 • Addition and subtraction within 20 • Fractions • Measures: Length and mass	• Numbers 50 &100 and beyond • Addition and subtraction • Money • Multiplication and division • Measures: Capacity & volume
Year 2	• Numbers within 100 • Addition and subtraction of 2 digit numbers • Addition and subtraction word problems • Measures: Length • Graphs • Multiplication and division	• Time • Fractions • Addition and subtraction of 2 digit numbers • Money • Face, shape and patterns: lines and turns	• Numbers within 1000 • Measures: capacity & volume • Measures: Mass • Exploring calculation strategies • Exploring multiplicative thinking
Year 3	• Number sense and exploring calculation strategies • Place Value • Graph • Addition and subtraction • Length & perimeter	• Multiplication & division • Calculating with multiplication division • Time • Fractions	• Angles & shape • Measures • Applying multiplicative thinking • Exploring calculation strategies and place value
Year 4	• Reasoning with large numbers • Addition & subtraction • Multiplication and division • Discrete and continuous data	• Calculating with multiplication and division • Fractions • Time • Decimals • Area & perimeter	• Solving measures and money problems • Shape & symmetry • Position & direction • Reasoning with pattern and sequences • 3D shape
Year 5	• Reasoning with large whole integers • Integer addition and subtraction • Line graphs and timetables • Multiplication and division • Perimeter and area	• Fractions and decimals • Angles • Fractions and percentages • Transformations	• Converting units of measure • Calculating with whole numbers and decimals • 2D and 3D shape • Volume • Problem solving
Year 6	• Integers and decimals • Multiplication and division • Calculation problems • Fractions • Missing lengths	• Coordinates and shape • Fractions • Decimals and measure • Percentage and statistics • Proportion	• Revision

Multiplication tables

	Autumn 1	Autumn2	Spring 1	Spring 2	Summer1	Summer 2
Year 1	Consolidate +/ -	Consolidate +/ -	2x	5x	10x	Consolidate 2x, 5x & 10x
Year 2	2x (link to 10x)	5x (link to 10x)	10x (link to 5x)	Consolidate 2x, 5x & 10x	Consolidate 2x, 5x & 10x	3x, 4x (link to 2x)
Year 3	2x (link to 10x)	5x, 10x	4x (link to 2x)	8x (link to 4x)	3x	6x (link to 3x)
Year 4	7x 11x	9x (link to 3x)	3x (revise) 6x (link together)	12x (link to 3x,6x,2x,4x)	Revise & consolidate	
Year 5	Consolidate, investigate and build connections					
Year 6	Consolidate, investigate and build connections					

Calculation Representations

Calculation representation in primary school mathematics refers to the variety of methods and tools we use to illustrate and solve mathematical calculations. These representations are vital for building pupils' conceptual understanding, bridging the gap between concrete experiences and abstract thinking. By employing multiple representations, teachers at Cherry Lane ensure that pupils develop a deep and flexible understanding of mathematical concepts.

Please see Appendix 1

CONSOLIDATION

Mathematics mastery is an approach that emphasizes deep, sustained understanding of mathematical concepts. It consolidates learning through focused teaching methods, practice, and assessment strategies that ensure pupils fully grasp concepts before moving on to new material. The goal is to build a strong foundation of mathematical knowledge that supports problem-solving and reasoning skills in a wide variety of contexts. To this end, it promotes:

✓ ***Depth Before Acceleration***

- *Pupils spend extended time exploring and mastering each concept to ensure they understand it deeply rather than superficially.*
- *For example, rather than moving quickly through multiplication, pupils explore its relationship to addition, arrays, repeated groups, and scaling.*

✓ ***Small Steps and Sequential Progression***

- *Concepts are broken into manageable steps, reducing cognitive overload and helping pupils build on prior knowledge.*
- *A step-by-step approach ensures new learning aligns with and reinforces previous understanding.*

✓ ***Concrete-Pictorial-Abstract (CPA) Approach***

- *Pupils begin with **concrete materials** (e.g., counters), progress to **pictorial representations** (e.g., bar models), and finally reach **abstract notation** (e.g., equations).*
- *Revisiting concepts through different representations consolidates understanding by showing connections between ideas.*

✓ ***Fluency and Procedural Practice***

- *Repetition of foundational skills (e.g., number bonds or times tables) helps pupils develop automaticity, freeing cognitive resources for problem-solving and reasoning.*
- *For example, practicing number facts ensures pupils can solve more complex calculations with confidence.*

✓ ***Varied Practice***

- *Pupils engage in varied practice with tasks that apply the same concept in different contexts, reinforcing adaptability.*
- *For instance, understanding fractions through shading shapes, finding equivalent fractions, and solving fraction word problems.*

At Cherry Lane we also deploy Retention Grids regularly as part of The Cherry Lane Way – Consolidating learning from; today, yesterday, last week and last term.

*We use diagnostic questions in interventions – Pre and Post Units: Yr1 & 2 (**16 units**) Yr3 (**13 Units**) Yr4 & 5 (**14 Units**) Yr6 (**10 Units**) to consolidate learning.*

Written Assessments – End of term assessments

- *Year 1: Arithmetic and reasoning combined termly assessments*
- *Year 2 -5:*
  New MM assessments are launched every half term.
- *These end of half termly assessments are designed to be completed at the end of each half-term and they assess the cumulative learning of pupils throughout the year and in particular the topics covered in the previous half term.*
- *Year 6: Termly arithmetic assessment provided by MM.*
- *school will be using National tests at the end of term (Mocks)/end of year assessments.*

	Autumn 1 Available 6.09.25	Autumn 2 Available 1.11.25	Spring 1 Available 6.01.25	Spring 2 Available 14.02.25	Summer 1 Available 11.04.25	Summer 2 Available 6.06.25
Year 1		Autumn assessment *(arithmetic and reasoning combined)*		Spring assessment *(arithmetic and reasoning combined)*		Summer assessment *(arithmetic and reasoning combined)*
Year 2 Year 3 Year 4 Year 5	Paper 1: Arithmetic	Paper 1: Arithmetic Paper 2: Reasoning	Paper 1: Arithmetic	Paper 1: Arithmetic Paper 2: Reasoning	Paper 1: Arithmetic	Paper 1: Arithmetic Paper 2: Reasoning
Year 6	Paper 1: Arithmetic	Paper 1: Arithmetic	Paper 1: Arithmetic	Paper 1: Arithmetic	N/A	N/A

KEY VOCABULARY

Each lesson starts with a recap or introduction to key vocabulary used in the lesson. Vocabulary plays a critical role in primary school mathematics, as it provides the foundation for pupils to understand, communicate, and apply mathematical concepts effectively. A strong mathematical vocabulary enables pupils to engage confidently with

problem-solving, reasoning, and the communication of ideas, which are essential components of the National Curriculum in England.

Strategies we use to Develop Mathematical Vocabulary

1. ***Explicit Teaching:*** *Introduce and define key terms at the beginning of lessons.*
2. ***Use in Context:*** *Encourage pupils to use new vocabulary in their explanations and written work.*
3. ***Repetition and Reinforcement:*** *Regularly revisit terms to embed understanding.*
4. ***Visual Aids:*** *Use word walls, flashcards, and diagrams to reinforce vocabulary.*
5. ***Discussion and Collaboration:*** *Foster a classroom culture where pupils discuss their reasoning using precise mathematical language.*

Please see Appendix 2

INCLUSION

Every child has an equal entitlement to all aspects of the Maths curriculum and to experience the full range of Maths activities. Therefore, in delivering Maths, care will be taken to ensure that all learning needs are met to ensure all children keep up with the learning and catch up needs are also met. Teachers are encouraged to seat children using mixed ability pairings this is so that advanced learners will model correct thinking, encourage discussion of concepts and deepen their own understanding as they explain to their less confident peers.

SEND:

Intervention groups: Take place for SEND and disadvantage pupils to bridge the gap so they are in line with age expectations.

Intervention groups will take place both within the Maths lesson and outside of it. These sessions may be delivered by the teacher or learning support assistant and may involve individual or small group work and

may include extending the most able mathematicians as well as supporting learners who require additional practise of skills.

EAL

All pupils are able to take part in maths lessons and different opportunities are provided for EAL learner with visuals and concrete resources. Opportunities are provided for pupils to enhance their learning with 'Lets Explore' tasks where they are able to talk using mathematical vocab with their peers.

More Able Pupils

Challenges are provided in each lesson targeting more able learners. These learners are able to extend their learning using 'Ideas for Depth' (MM).Able Maths Day takes place to enhance learning for more able pupils (Autumn or Spring term).
Please see Appendix 3

IMPACT

A mathematical concept or skill has been mastered when a child can show it in multiple ways such as using the mathematical language to explain their ideas as well as being able to independently apply the concept to new problems within unfamiliar situations.

The impact of our maths curriculum is measured in a variety of ways:

- *Attainment is measured using the EYFS profile, Year 2 optional SATS, Year 4 Multiplication Tables Check and end of Key Stage 2 Statutory assessments in mathematics. These results are measured against National standards of attainment.*
- *Pupils in Key Stages 1 and 2 complete regular written assessments which contribute to termly summative teacher assessments.*
- *Progress across the school is monitored by the subject leader and senior leadership team through: book looks, lesson observations, sharing best practise, pupil voice interviews, learning walks and data analysis.*

Teachers and learning support staff should use assessments during the 'Implementation' period as an opportunity to highlight which areas have been fully mastered and which areas still require further development to ensure all children can either meet or exceed age related expectations.

We also seek to ensure that children have a positive view of maths due to learning in an environment where maths is promoted as being an exciting and enjoyable subject in which they can investigate and ask questions; they know that it is reasonable to make mistakes because this can strengthen their learning. Our children have a good understanding of their strengths and what they need to do to improve. Our maths books evidence work of a high standard of which children clearly take pride; the components of the teaching sequences demonstrate good coverage of fluency, reasoning and problem solving and key elements of The Cherry Lane Way reinforce learning and encourage questioning and retention. Our feedback and interventions support children to strive to be the best mathematicians they can be, ensuring children are meeting their full potential.

Appendix 1 – Calculation Representations

Year 1 Key Representations

Find out more…

Watch the **Unit tutorial** before planning each unit.

Read the **planning guides** for suggestions of representations.

Make use of **PD videos** on unit pages and Progression in Calculations page.

Representations of number

Pupils are most familiar with concrete representations of number within 20 which show one to one correspondence, such as cubes, counters, bead strings to 20 and other countable objects. They also recognise numerals and numbers to 20. A ten frame has been used to represent numbers and think about what this shows.

There are seven counters.
Seven is two more than five.
Seven is three less than 10.

There are 11 cubes. 11 is one more than ten.

Ordering numbers

Pupils have explored a number of ways to order and compare numbers practically using representations including a **number track** and a **number line**, within 20. These representations are used to secure counting within 20 and stating one more / one less.

1	2	3	4	5	6	7	8	9	10

Part-whole language and representations

Pupils will have had lots of experience partitioning numbers in different ways through exploring concrete representations. They may identify these as parts and should see that numbers can be split in different ways.

A part-whole model is used to represent number bonds, addition and subtraction. Pupils are familiar with the concept of a whole and partitioning this into two or more parts. They explore how to write this relationship as an equation.

The whole is five. I can partition five into one part of three and one part of two.

There are three people in one train carriage and two people in another. One part is three and one part is two. The whole is five.

whole = part + part
5 = 3 + 2

Equations

The phrase 'is equal to' is used consistently to refer to the = symbol. What is on one side of the symbol is equal to what is on the other side. Present equations in different ways to support this:

2 + 3 = 5
5 = 3 + 2

Comparing numbers

Concrete representations are used to compare numbers, focusing on correct language use. The structure of the representation supports comparison: lining towers of cubes next to one another builds on one-to-one correspondence.

*Five is **less than** seven. Five ones is **fewer** than seven ones.*
*Seven is **greater than** five.*

Representing numbers 11-20

Pupils say, read and write teen numbers. Pupils understand the ten and ones relationship of teen numbers, supported by representations.

There are fourteen cubes. This is written as 14. 14 is one ten and four ones.

Counting principles – conservation of number

A key number principle for developing addition and subtraction strategies is to understand that the same number of objects will always have the same value.

There are still seven counters. The position has changed but no counters have been added or taken away.

Counting principles – subitising

Subitising is the ability to identify a group of objects without the need to count. Pupils have explored this and should be confident in subitising up to five objects. Making use of patterns e.g. die faces, triangle shapes can support this.

Doubling and halving

Pupils have had opportunities to represent doubling and halving within 20 practically using manipulatives and other countable objects. Some facts may be recalled and pupils may connect this with equal groups.

Double three is six. Three plus three is equal to six.
Half of six is three.

Development of division

Pupils explore counting in equal groups using manipulatives or pictorial representations.

There are three equal groups of 10, 10, 20, 30. There are 30 altogether.

Pupils have explored the concept of equal and unequal grouping and sharing in context using concrete manipulatives.

15 cows can be grouped into five fields in this way. The groups are unequal.

If 15 bags of grain are shared equally between five farmers, each farmer gets three bags.

Developing fraction language

The foundations for fractions have been laid through exploration of half full / half empty and associated descriptions. Pupils have also explored doubling and halving without linking specifically to fractions.

The bottle is half full.
The bottle is half empty.

Addition and subtraction strategies

Pupils are familiar with addition and subtraction (taking away) using concrete and pictorial representations. A range of contexts for this have been explored. Pupils should be familiar with strategies including count all, count on and count back using representations.

I have three red cubes and four purple cubes. I can put them together and count the whole. There are seven cubes.

I have four yellow cubes. I add two green cubes. I can count on from four: five, six. There are six cubes.

I have five cubes. I can take away two: four, three. Five take away two is three.

Year 2 Key Representations

Find out more…

Watch the **Unit tutorial** before planning each unit.

Read the **planning guides** for suggestions of representations.

Make use of **PD videos** on unit pages and Progression in Calculations page.

Representations of number

Pupils have primarily used counters, cubes and other discrete objects to represent number. Cubes have been used to support the process of **regrouping** – one ten is equal to ten ones. A ten frame supports this alongside number bonds for 10. Both are used to represent teen numbers.

One ten is regrouped for ten ones. Ten ones is regrouped for one ten.

17 is one ten and seven ones.

Pupils have also encountered Dienes equipment to represent larger integers to 100. Counting in tens to identify these numbers has also been developed.

Number lines

Number lines can be used to represent and compare numbers and can be used alongside a bead string. They demonstrate the continuous nature of the number system. Pupils have ordered numbers on a number line.

Part-whole language and representations

A part-whole model is used to represent the relationship between numbers and will have been used for addition and subtraction. The model is made of a **whole** and two or more **parts**.

The whole is ten. One part is six and one part is four. Six plus four is equal to ten.

whole = part + part
10 = 6 + 4

By moving the manipulatives the model represents subtraction. Care should be taken to ensure connections between the movement of the manipulatives: *I subtract one part of six. I am taking away one part of six.*

The whole is ten. I subtract one part of six. The missing part is four. Ten subtract six is equal to four.

whole – part = part
10 – 6 = 4

Equations

The phrase 'is equal to' is used consistently to refer to the = symbol. What is on one side of the symbol is equal to what is on the other side. Present equations in different ways to support this:

7 = 3 + 4
3 + □ = 7

Number bond knowledge

Pupils should be increasingly fluent in number bond recall for all numbers to 10 and use representations to consider commutativity.

Deriving facts

Pupils use known facts such as number bonds and understanding of place value and magnitude to derive further facts. Commutativity for addition is also used.

If I know 3 + 4 = 7 then I know 13 + 4 = 17
If I know 3 + 4 = 7 then I know 4 + 3 = 7

Comparing numbers

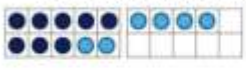
Pupils have experienced a range of language to compare numbers.

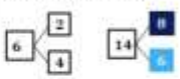
Five is less than seven. Five ones is fewer than seven ones.
Seven is greater than five.
Six is between five and seven. It is after five and before seven.

The 'make 10' strategy

Pupils apply number bonds to 10 to calculate how many more/less to the next multiple of ten. They partition the part into two parts to calculate mentally. Using concrete or pictorial representations can scaffold thinking.

8 + 6 = ? I know eight and two make 10 so I can partition six into two and four.



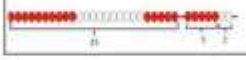


Ten more / ten less

Pupils have explored ten more and ten less than numbers within 50 using manipulatives. They also skip count on and back in tens from different starting points. Mental recall of this can be developed in Maths Meetings.

Finding the difference

Pupils recognise that in a subtraction calculation where the numbers are close together in value, a count on strategy can be used to find the difference.



32 – 25 = ? I can count on from 25 to find the difference. Five more is 30, two more is 32. The difference is seven.

Division by sharing / grouping

Pupils have been exposed to the concept of division within 20 through equal grouping and equal sharing. They have also explored unequal grouping and sharing. Pupils should explore the terms grouping and sharing and be familiar with both.

20 shared into five equal groups gives four in each group.

20 grouped into groups of five gives four groups.

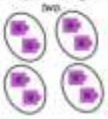
Representing fractions

Pupils identify half and quarter of a shape and a quantity within 20 using practical experiences including equal sharing for a quantity. They are also familiar with half turns, linking this to half past on a clock face.

One half is one of two equal parts.
One quarter is one of four equal parts.

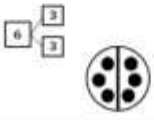
Half of six is three.

One quarter of eight is two.



Doubling and halving

Pupils have had opportunities to represent doubling and halving within 20 using concrete and pictorial representations. This is connected to their understanding of half. Some facts will be recalled.



Double three is six. Three plus three is equal to six.
Half of six is three. Six take away three is equal to three.

Year 3 Key Representations

Find out more...

Watch the **Unit tutorial** before planning each unit and read the **Unit Narrative**.

Read the **planning guides** for suggestions of representations.

Make use of **PD videos** on unit pages and Progression in Calculations page.

Explore the guidance for Year 3 representations.

Dienes equipment

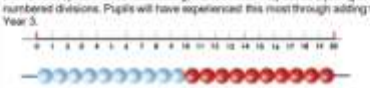
An important resource for demonstrating the relative size of place value columns. Supports the process of **regrouping** – one ten is equal to ten ones, one hundred is equal to ten tens and so on. Can also be used to represent addition and subtraction with 2- and 3-digit integers.

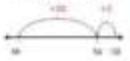
One ten is regrouped for ten ones. Ten ones is regrouped for one ten.

234 is two hundreds, three tens and four ones. I can represent subtracting 20 by removing two ten sticks.

Number lines

Number lines can be used to represent and compare numbers and can be used alongside a bead string. They demonstrate the continuous nature of the number system. When calculating, number lines may act as a jotting of the steps of a mental calculation and may begin 'empty' i.e. not have numbered divisions. Pupils will have experienced this most through adding tens then ones as shown. The use of number lines is extended during Year 3.





Equations

The phrase **'is equal to'** is used consistently to refer to the = symbol. Equations should be presented with symbols and missing numbers in different positions.

38 = 25 + 13
□ = 37 + 44
12 ÷ □ = 4

Number bond knowledge

Pupils should be increasingly fluent in number bond recall for all numbers to 20. Make use of transitions and Maths Meetings to develop this.

17 = 12 + 5
17 = 11 + 6
17 = 10 + 7

Deriving facts

Pupils use known facts such as number bonds and understanding of place value and magnitude to derive further facts.

If I know 12 + 5 = 17 *then* 22 + 5 = 27.
If I know 12 + 5 = 17 *then* 17 − 12 = 5
If I know 17 − 12 = 5 *then* 37 − 12 = 25

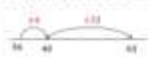
Bead strings

Bead strings help support the ordinality of number. They are repurposed e.g. beads have the value 101-200 for representation when rounding.

The 'make 10' strategy

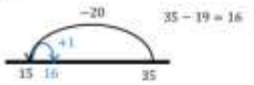
Pupils apply number bonds to 10 to calculate how many more/less to the next multiple of ten. They partition the part into two parts to calculate mentally. Using concrete or pictorial representations can scaffold thinking.

36 + 27 = ? I can partition 27 into 4 and 23. 36 plus 4 is equal to 40. 40 plus 23 is equal to 63.



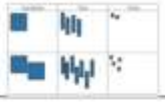
Round and adjust

Pupils apply understanding of ordinality of number, recognising when a part or whole is close to a multiple of 10 e.g. 29, 32. They round before calculating, then adjust their answer accordingly. Concrete or pictorial models are used to represent this.



Place value charts

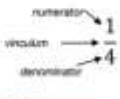
Place value charts have been used to represent two-digit numbers and can be used alongside concrete, pictorial and abstract representations of number to secure understanding of the positional aspect of the number system. Pupils have made use of place value charts when adding two 2-digit numbers and their use is extended in Year 3.



Representing fractions

A range of concrete and pictorial representations are used for fractions including fractions of a whole, as part of a set of objects and as part of a quantity such as a length or volume. Pupils should be familiar with a range of representations.

One of four equal parts



One quarter of 12 is three.

One quarter of a metre is 25 cm

Arrays

Concrete and pictorial arrays demonstrate the **commutativity** of multiplication and **inverse relationship** of multiplication and division. Pupils should be familiar with considering rows and columns. **Part-whole language** may be used alongside.

There are four parts/groups each with a value of three. The whole is 12. Four multiplied by three is equal to 12.

The whole is 12. There are three parts/groups each with a value of 4. 12 divided by three is equal to four. One third of 12 is equal to four.

Part-whole language and representations

A part-whole model is used to represent the relationship between numbers in all four operations. The model is made of a **whole** and two or more **parts**.

The whole is ten. One part is six and one part is four. Six plus four is equal to ten.

By moving the manipulatives the model represents subtraction.

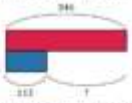
The whole is ten. I subtract one part of six. The missing part is four. Ten subtract six is equal to four.

Multiplication, division and fractions of quantities can be represented using multiple equal parts.

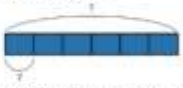
There are three equal parts with a value of four. The whole is 12. Three multiplied by four is equal to 12.
12 divided into three equal parts is equal to four.
One third of 12 is four.

Bar models

Pictorial bar models and concrete Cuisenaire as bar models are used throughout the year and represent **part-whole relationships** and **knowns and unknowns** within problems. See PD videos for further exemplification.



I know the whole is 346, and one of the parts is 112. I do not know the value of the missing part. I can subtract 112 from 346.



The value of each part is 7 and there are 6 equal parts. The whole is unknown.
7 × 6 = 42

Year 4 Key Representations

Find out more...

Watch the **Unit tutorial** before planning each unit and read the **Unit Narrative**.

Read the **planning guides** for suggestions of representations.

Make use of **PD videos** on unit pages and Progression in Calculations page.

Equations

The phrase **'is equal to'** is used consistently to refer to the = symbol. Equations should be presented with symbols and missing numbers in different positions.

38 = 25 + 13
□ = 37 + 44
12 ÷ □ = 4

Representations of number

Pupils are familiar with a range of concrete and pictorial representations of number with and without a place value chart. These are used to represent a number or calculation and should not be used as a counting tool. Pupils also make use of these when comparing numbers.

234 is two hundreds, three tens and four ones.

Number lines

Number lines can be used to represent and compare, demonstrating the continuous nature of the number system. When calculating, number lines may act as a jotting of the steps of a mental calculation and may begin 'empty' i.e. not have numbered divisions. They are also used as a representation for rounding.

Number fact knowledge

Pupils know number bonds to 100 and apply to other multiples of 10. Pupils are increasingly fluent in a range of number facts including partitioning in different ways to discuss number.

136 is multiple of 4 because I can see 120 and 16 which are both multiples of 4.

They are also familiar with multiplication tables for 2, 3, 4, 5, 6, 8 and 10 and related division facts.

6 × 8 = 48 48 ÷ 8 = 6

Make use of transitions and Maths Meetings to develop this.

Deriving facts and inverse relationships

Pupils use known facts such as number bonds and understanding of place value and magnitude to derive further facts.

If I know 12 + 5 = 17 *then* 222 + 5 = 227
If I know 3 × 4 = 12 *then I know* 6 × 4 = 24

Inverse relationships have also been explored.

If I know 12 + 5 = 17 *then* 17 − 12 = 5
If I know 3 × 4 = 12 *then I know* 12 ÷ 4 = 3

Multiplication and division by powers of 10

Pupils have experienced the concept of ten times greater and smaller through exchanging Dienes, linking this to the apparent move of digits in a place value chart.

30 is ten times greater than 3.

Part-whole language and representations

A part-whole model is used to represent the relationship between numbers in all four operations. The model is made of a **whole** and two or more **parts**.

We know the whole is 312 and the value of one part is 190. We can use subtraction to find the missing part.

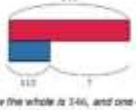
There are three parts.
90 + 150 + 72 = 312

Using multiple **equal** parts represents multiplicative relationships.

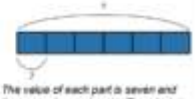
There are three equal parts with a value of 40. The whole is 120.
40 multiplied by 3 is equal to 120.
120 divided into three equal parts is equal to 40.

Bar models

Pictorial bar models and concrete Cuisenaire as bar models are used to represent **part-whole relationships** and **knowns and unknowns** within problems in all four operations. See PD videos for further exemplification.



I know the whole is 346, and one of the parts is 112. I do not know the value of the missing part. I can subtract 112 from 346.



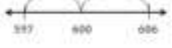
The value of each part is seven and there are six equal parts. The whole is unknown. Six groups of seven is equal to 42. The whole is 42.

Mental strategies

Pupils have experienced a range of mental strategies for all four operations, including:

- Applying number bonds to 10 and 100 to calculate how many more/less to the next multiple of ten, extending to 1000 and 10000, using the 'make 10' strategy.
- Identifying numbers close to a multiple of ten or 100 e.g. 28, 201 and using a round and adjust strategy, including for multiplication. *"If I know 20 x 4 is 80, then 19 x 4 is 76"*.
- Identifying near doubles for addition. *43 and 45 can be seen as 'double 43 plus two.'*
- Subtracting numbers close together in value, through counting on to find the difference.

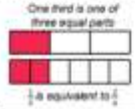
336 + 127 = ? I can partition 27 into 123 and 4. 336 plus 4 is equal to 340. 340 plus 123 is equal to 463.



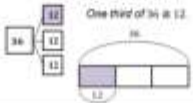
606 − 597 = ? I can count on from 597 to 606. The difference is 9.

Representing fractions

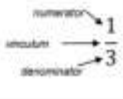
A range of concrete and pictorial representations have been used for fractions including fractions of a whole, as part of a set of objects and as part of a quantity such as a length or volume. Pupils can apply these representations to: comparing, finding simple equivalence and adding and subtracting with the same denominator, as well as fractions of sets or quantities.



One third is one of three equal parts



One third of 36 is 12.



Representing multiplicative relationships

Pupils have represented multiplicative relationships concretely and pictorially, primarily through arrays, Cuisenaire and bar models. A focus on equal parts, the number of equal parts and the value of each part supports understanding of commutativity and inverse relationships. The representations and language structures support written strategies.

There are four groups each with a value of 3.
There are three groups each with a value of 4.
I can see three; four times.
I can see four; three times.

12 divided into groups of 4 gives three groups.
12 shared into four groups gives 3 in each group.

Upper KS2 Key Representations

Find out more…

Watch the **Unit tutorial** before planning each unit and read the **Unit Narrative.**

Read the **planning guides** for suggestions of representations.

Make use of **PD videos** on unit pages and Progression in Calculations page.

Representations of number

Pupils are familiar with a range of concrete and pictorial representations of number with and without a place value chart. These are used to represent a number or calculation and should not be used as a counting tool. Pupils have also experienced representing decimal numbers using manipulatives including repurposing Dienes equipment, understanding the base 10 relationship.

This represents 2.34. It is 2 ones, 3 tenths and 4 hundredths.

234 is two hundreds, three tens and four ones.

		2	3	4

Number lines

Number lines can be used to represent and compare, demonstrating the continuous nature of the number system. When calculating, number lines may act as a jotting of the steps of a mental calculation and may begin 'empty' i.e. not have numbered divisions. They are also used as a representation for rounding.

Number fact knowledge

Pupils have an increasing range of number facts. Pupils should know all multiplication tables and related division facts.

Pupils make increasing use of number facts when considering larger integers.

I know 132 is a multiple of 4 because I can partition it into 120 and 12. These are both multiples of 4.

Equations

The phrase **'is equal to'** is used consistently to refer to the = symbol. Equations should be presented with symbols and missing numbers in different positions:

38 = 20 + 13
□ = 27 + 44
12 + □ = 4

Deriving facts

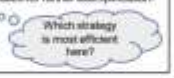
Using known number bonds pupils derive more complex facts including deriving decimal bonds and facts.

I know 1 + 3 = 4 so 0.1 + 0.3 = 0.4
I know 13 + 12 = 25 so 1300 + 1200 = 2500

Using strategies

Pupils are familiar with columnar addition and subtraction, short multiplication and short division written strategies and have developed conceptual understanding through concrete and pictorial representations. These strategies can be applied to larger integers and decimals. See PD videos for further exemplification.

Pupils should make use of a range of strategies, considering efficiency.



Mental strategies

Pupils have experienced a range of mental strategies for all four operations, including:

Applying number bonds to 10 and 100 to calculate how many more/less to the next multiple of ten, extending to 100 and 1000, using the 'make 10' strategy.

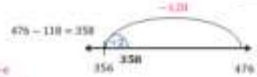
Identifying numbers close to a multiple of ten or 100 e.g. 28, 201 and using a round and adjust strategy, including for multiplication. *'If I know 20 x 4 is 80, then 19 x 4 is 76'*

Identifying near doubles for addition. *43 and 45 can be seen as 'double 43 plus two'*

Subtracting numbers close together in value, through counting on to find the difference.

Once secure, these can be applied to larger integers and decimal values.

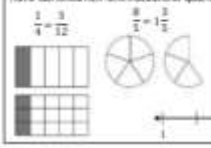
336 + 127 = ? I can partition 27 into 123 and 4.
336 plus 4 is equal to 340. 340 plus 123 is equal to 463.

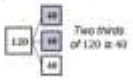


606 − 597 = ? I can count on from 597 to 606. The difference is 9.

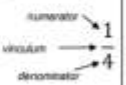
Representing fractions

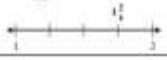
Pupils will have represented unit, non-unit and improper fractions in a variety of ways including area, part of a set and on a number line. Through representations they understand equivalence. They have identified non-unit fractions of quantities.





Two thirds of 120 is 40





Representing multiplicative relationships

Pupils have used an increasing range of models to represent multiplicative relationships and use these to describe inverse relationships and commutativity.

There are three rows with a value of four. There are four columns with a value of 3.
3 × 4 = 12 4 × 3 = 12
12 ÷ 4 = 3 12 ÷ 3 = 4

Three groups of four are equal to 12.
Four groups of three are equal to 12.

Part-whole language and representations

A part-whole model is used to represent the relationship between numbers in all four operations. The model is made of a **whole** and two or more **parts**.

The whole is ten. One part is six and one part is four. Six plus four is equal to ten.

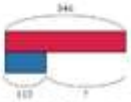
Using multiple equal parts represents multiplication, division and fractions of quantities.

There are three equal parts with a value of four. The whole is 12. Three multiplied by four is equal to 12.
12 divided into three equal parts is equal to four.
One third of 12 is four.

Close links are made between this and bar model representations.

Bar models

Pictorial bar models and concrete Cuisenaire as bar models are used to represent **part-whole relationships** and **knowns and unknowns** within problems in all four operations. See PD videos for further exemplification.



I know the whole is 346, and one of the parts is 112. I do not know the value of the missing part. I can subtract 112 from 346.

The value of each part is seven and there are six equal parts. The whole is unknown. Six groups of seven is equal to 42. The whole is 42.

Appendix 2 – Key Vocabulary.

Mathematics Mastery

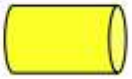
Mathematics Mastery vocabulary list

This document highlights the vocabulary introduced throughout the primary curriculum – from Reception to Year 6.

The vocabulary listed here is vocabulary that **pupils** are expected to use and understand on a daily basis within that year group, though the definitions are written for teacher reference and would not necessarily be shared with children as they stand. The vocabulary listed is cumulative and builds on the vocabulary previously introduced. Teachers should also consult with the Mathematics Mastery Primary Glossary.

This is a working document and will be updated as required.

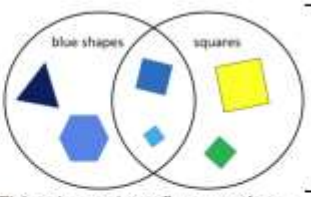
Reception	Definition	Example
Above	Used to describe a higher position than another object.	The Maths Meetings board is **above** the sink.
Add	Carry out the process of addition.	I can **add** two numbers together to find a total.
Addition	The operation to combine at least two numbers or quantities to form a further number or quantity, the sum or total. Addition is the inverse operation to subtraction.	Three plus seven is equal to ten. This is an **addition** equation.
Altogether	In total.	That will be £2 **altogether** please.
Balance	A measuring tool used to weigh objects. It has two dishes hanging on a bar. Both dishes will be level when the contents weigh the same. Also, as a verb, indicates equivalence and equality.	The objects in the **balance** are unequal in weight because the dish on the right side is lower down that the dish on the left side. The two objects **balance** which means they have the same mass.
Before	In front of or prior to.	The number '3' comes **before** '5' on the number line.
Below	Used to describe a lower position than another object.	The sink is **below** the Maths Meetings board.
Between	Indicates a position in relation to two other places or objects on either side.	The teacher is standing **between** two tables.
Capacity	The amount of liquid a container can hold.	This cup is full to **capacity** because it cannot hold any more water.
Circle	The name of a 2-D shape. A circle has a curved side.	
Clock	A tool used to measure time.	The **clock** shows us that the time is now 2 o'clock.
Compare	Look for similarities and/or differences between at least two objects or sets.	I can **compare** these two sets – this set has more.
Corner	A point where two or more lines meet. The correct mathematical term is vertex (vertices).	The table has four **corners** (vertices).
Cost	A monetary value assigned to a good or service.	This apple **costs** 10p. What coin could I use to pay for it?

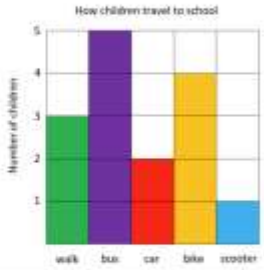
Count	Assigning one number name to each of a set of objects to determine how many there are.	I **counted** the children in the group – there are four so we will need four pencils.
Cube	A 3-D shape with six identical square faces.	
Cuboid	A 3-D shape with six rectangular faces.	
Curved surface	A non-plane surface of a 3-D shape. Both cones and cylinders have curved surfaces.	The cone has a **curved** surface.
Cylinder	A 3-D shape with two circular faces joined by a curved surface.	
2-D	Abbreviation for two-dimensional. A figure is two-dimensional if it lies on a plane.	A square is a **2-D** shape.
3-D	Abbreviation for three-dimensional. A solid is three-dimensional and occupies space.	A cylinder is a **3-D** shape.
Describe	To express mathematical features, qualities and details in words.	Can you **describe** the properties of a cube?
Difference	The numerical difference between two numbers or sets of objects. It is found by comparing the quantity of one set of objects with another.	The **difference** between ten and six is four.
Direction	The orientation of a line in space.	Which **direction** should we jump – forwards or backwards?
Distance	A measure between two points or things.	The **distance** between my house and the school is longer than that between the school and the train station.
Double	To multiply by two or add a value to itself.	Ten is **double** five.
Edge	A line segment joining two vertices of a plane figure (2-D shape) and the intersection of two plane faces (in a 3-D shape).	A triangle has three **edges** and a cube has 12 **edges**.
Empty	Containing nothing. Most commonly used in the context of measures.	There is no more water left in the jug – it is **empty**.
Equal	Indicates equivalence between two values and can be expressed with the symbol '='. The symbol is read as 'is equal to' which means the same as. Expressions on either side of the symbol have the same value.	My sets are **equal** because there are four bears in this set and there are four bears in this set.
Face	One of the plane surfaces of a solid shape.	A cube has six **faces**.

Fewer	A lesser amount – used when counting discrete objects, i.e. countable objects such as, pens, teddies, counters, etc.	There are **fewer** buttons on my coat than yours.
First	Comes before all others in time or position.	**First** I brush my teeth. Then I go to bed.
Flat	A level surface.	The table has a **flat** rectangular surface.
Full	Contains/holds as much or as many as possible; has no empty space.	The juice carton is not **full** because I drank some.
Group	To make equal size groups. This is one model for division.	I will **group** the crayons equally so that each person gets two.
Half	One of two equal parts of a shape, quantity or object.	I have shared the dolls into two equal groups – I have **half** and you have **half**.
Intersection of sets	Where the two subsets overlap in a Venn diagram. Objects or values which belong to both subsets are placed here.	The number 4 belongs in the **intersection** because it is even *and* less than 5.
Last	Comes after all others in time or order.	Rory is the **last** person in the line.
Length	A linear measurement.	The **length** of my snake is shorter than yours.
Less	A smaller amount or not as much.	I have 15p and you have 7p. you have **less** money than me.
Line	A set of adjacent points that has length but no width.	I have drawn a **line** matching the number four with the four ducks.
Long	An adjective used to describe length.	I have a **long** piece of string.
Mass	A measure relating to the amount of matter within a given object.	The **mass** of the school bag is greater than the **mass** of the book.
Measure	To find the size of something in a given unit.	How might we **measure** how much flour we need to bake a cake?
Minus	A name for the symbol '-', which denotes the operation of subtraction.	Three **minus** one is equal to two.
More	A greater amount.	I have six apples and you have two. I have **more**.
Next	Comes immediately after the present one in order.	The **next** shape in my pattern is a square.
Number bond	A pair of numbers with a given total.	Five and four make a **number bond** to nine.
Number line	A linear, continuous representation of number. Each number occupies a point on the line, and there is an equal interval between each number.	This **number line** starts at zero and ends at ten.
Number track	A linear, discrete representation of number. Each number is positioned in a square on the track.	I can count from one to ten, moving a counter along this **number track**.
Order	Describes the placement of items according to given criteria or in a pattern. As a verb, to place items according to given criteria or in a pattern.	I have **ordered** the bears from smallest to biggest.

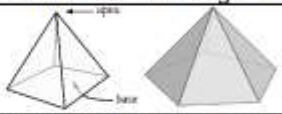
Pair	A set of two things used together.	Socks come in a **pair** – one for each foot.
Pattern	A systematic arrangement of numbers, shapes or other elements according to a rule.	The **pattern** is red, blue, red, blue, red blue.
Plus	The word representing the operation of addition. It is also the name for the symbol '+'.	Five apples **plus** two apples are equal to seven apples.
Rectangle	A quadrilateral with four right angles.	
Second	1. A unit of time. 2. An ordinal number.	Mohsin is **second** in the line today.
Sequence	A series of numbers or other elements which follow a rule.	The number 3 is next in the **sequence** because each number is one less than the one before.
Set	A defined group of objects, numbers or other elements.	I have placed all the purple counters in this **set** because they are all the same colour.
Share	To distribute fairly between a given number of recipients. This is one model for division.	I will **share** the crayons equally between the people at the table.
Short	An adjective used to describe length.	This string will not reach to the door. It is too **short**.
Side	A straight line that forms part of the boundary of a shape.	This shape has four straight **sides**.
Size	An element's overall dimensions or magnitude.	The **size** of my shoe is smaller than my teacher's.
Sort	To organise a set of elements into specified categories.	I will **sort** these objects based on their size.
Square	A quadrilateral with four equal length sides and four right angles.	
Straight	A line or movement uniform in direction, without bends or curves.	The walls of the school are **straight**.
Subtract	Carry out the process of subtraction.	Nine **subtract** three is equal to six.
Subtraction	The inverse operation to addition.	We are taking some away so it is a **subtraction** question.
Sum	The result of one or more additions.	The **sum** of five and three is eight.
Surface	An outer boundary of a 3-D object.	This cone has a curved **surface**.
Take away	Used in the reduction structure of subtraction. To remove a number of items from a set.	He ate three of the sweets so we need to **take away** three counters.
Tall	Measuring a specific distance from top to bottom.	Our class teacher is not as **tall** as our head teacher.
Time	Related to duration. Measured in seconds, minutes, hours, days, weeks, months, years etc.	After lunch it will be **time** for P.E.
Total	The sum found by adding.	There are a **total** of five people at this table.
Triangle	A polygon with three sides.	

Mathematics
Mastery

Venn diagram	Two or more circles which represent given sets and intersect according these.	
Vertex (pl. vertices)	The point at which two or more lines intersect.	This shape has five **vertices**.
Weight	The force exerted on an object by gravity. Weight therefore changes with a change in gravitational force. Used interchangeably with mass until KS2.	The **weight** of this book is heavier than the pencil.
Zero	The number before one. It is neither positive nor negative.	**Zero** comes before one on the number track.

Year 1	**Definition**	**Example**
Analogue clock	A clock with a face and hands.	
Anticlockwise	Movement in the opposite direction to the motion of the hands of a clock.	
Approximate	The number is not exact but it is close.	Our PSHE lesson lasts **approximately** half an hour.
Array	An arrangement of counters or numbers, in columns and rows, used to represent multiplication and division	 This **array** shows 3 × 4, 4 × 3, 12 ÷ 4 and 12 ÷ 3
Block graph	The pre-cursor to the bar graph, this representation of data has an x- and y-axis and one block represents one item. Each block is adjoined to the adjacent block.	
Chart	A table or graph.	I will mark one day for the sun on our weather **chart**.
Chronological	In time order.	I ordered the events in my day **chronologically**. I woke up, ate my breakfast, went to school then came home.
Clockwise	Movement in the direction of the hands of a clock.	

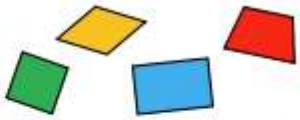
Cone	A 3-D shape with one circular plane face, which tapers to an apex.	
Continuous surface	An outer boundary of a 3-D object which is uninterrupted by any plane surfaces.	A sphere has a **continuous surface**.
Data	Quantitative information which has been counted or measured.	This block graph shows us **data** for the colour of the cars in the car park.
Decreasing	Becoming smaller in value. Used in relation to number sequences.	15, 14, 13, 12. This number pattern is **decreasing** by one each time.
Diagram	An illustration, drawing or representation.	I will draw a **diagram** to show how I programed my floor toy to move.
Digit	One of the ten Arabic numerals 0 to 9, from which we compose numbers.	The number 54 has the **digit** five in the tens column and the **digit** four in the ones. The **digit** five has a value of fifty.
Divide	To share or group into equal parts.	I can **divide** 12 by three using grouping or sharing.
Estimate	An appropriately accurate guess, depending on the context and numbers involved.	I **estimate** there are eight cubes in the cup because it looks about double four but fewer than ten.
Even number	A number with a 0, 2, 4, 6 or 8 in the ones and therefore exactly divisible by two.	32 is an **even number**.
Facts	Related to the four operations (+, -, ×, ÷). Pupils should be supported in achieving fluency, i.e. very fast recall, in these facts. These then become **known facts**.	Number bonds to and within 10 and 20 are **facts**, e.g. 3 + 7 = 10.
Fraction	1. A part of a whole number, quantity or shape. 2. Expressing a division relationship between two integers in the form $\frac{a}{b}$.	I have shared my sweets into four equal parts. Everyone will get a **fraction** of the whole quantity of sweets. One group is a quarter of the whole.
Half turn	A 180 degree rotation, i.e. $\frac{1}{2}$ of a 360 degree or 'full' turn.	
Hour	A unit of time.	There are 24 hours in one day.
Increasing	Becoming greater in value. Used in relation to number sequences.	2, 4, 6, 8. This number pattern is **increasing** by two each time.
Kilogram	A standard unit of mass, equal to 1000 grams.	The book has a mass of two **kilograms**.
Known fact	A number fact which has been committed to memory (or very fast recall) and can be applied fluently to various calculation strategies.	When I use the 'Make ten' strategy to add, I use **known facts** to partition the number I'm adding.
Left	Indicating the position or direction.	Make a quarter turn **left** and walk forward three steps.
Litre	A standard unit of volume, equal to 1000 millilitres.	The capacity of the jug is about half a **litre**.

Mental calculation	A calculation performed without using a formal written strategy. Simple jottings may aid a mental calculation.	14 plus 5 is equal to 19. I completed this using a **mental calculation** and deriving facts because I know that four plus five is equal to nine.
Metre	A standard unit of measure, equal to 100 centimetres.	I estimate that the table is about a **metre** tall.
Minute	A unit of time.	We will have lunch in five **minutes.**
Oblong	A quadrilateral with two pairs of parallel sides of equal length.	
Odd number	An integer which is not divisible by two without a remainder.	All numbers which end in 1, 3, 5, 7 and 9 are **odd numbers**.
Partition	To split a number into two or more parts.	The number 23 can be **canonically partitioned** (by place value) into 20 and 3, or **non-canonically partitioned** in many different ways, including 18 and 5, 17 and 6, etc.
Place value	A system for writing numbers, in which the value of a digit is defined by its position within the number.	In the number 452 written in base ten, the digit four has a value of 400, the five has a value of 50 and the two has a value of two.
Position	Location, expressed either descriptively using positional prepositions, or specified by coordinates.	The book is **on** the table. The clock is hanging **above** the board.
Pound (sterling)	The official currency of the United Kingdom.	**Pounds sterling** are written using the £ symbol. There are 100 pence in one **pound** sterling.
Property	Any attribute.	A **property** of a triangle is that it has three straight sides and three vertices, the sum of whose angles is 180 degrees.
Pyramid	A 3-D shape with a polygonal base and otherwise triangular faces, which form edges with the base, and which meet at an apex.	
Quantity	An amount, in some cases given a numerical value.	A **quantity** of apples is placed on the left-hand side of the balance. How many kilogram masses will we need to place on the right to balance the apples?
Quarter	One of four equal parts of a whole, quantity or object.	I have shared the eight conkers into four equal groups – I have two conkers, which is one **quarter** of the whole.
Quarter turn	A 90-degree rotation, i.e. $\frac{1}{4}$ of a 360 degree 'full' turn.	
Repeated addition	A structure of multiplication where equal parts are added to make a whole.	I can show 4 × 5 as **repeated addition**: 4 + 4 + 4 + 4 + 4.

Repeated subtraction	A structure of division, where equal parts are subtracted and the number of equal parts summed to calculate a quotient.	I can use **repeated subtraction** to calculate 20 divided by four: 20 – 4 – 4 – 4 – 4 – 4.
Represent	To express or show a mathematical concept using words, numerals and symbols, pictures, diagrams, or concrete manipulatives.	I have used three blue cubes to **represent** the three oranges in the question. I used a part-whole model to **represent** the addition question.
Right	Indicating the position or direction.	The picture is on the **right**-hand side of the board.
Rule	A consistent pattern which allows generalisation. Awareness of a rule allows a pupil to continue a sequence or generate a related sequence.	2, 5, 8, 11, 14… The **rule** is that each number is three greater than the previous number. Therefore, the next number in this sequence will be 17.
Scales	An object used to measure mass.	The **scales** showed that the banana had a greater mass than the apple.
Sign	Synonymous with symbol in its mathematical context, e.g. +, -, ×, ÷, =.	20 □5 = 4. What is the missing **sign**?
Standard unit	A uniform measure, agreed upon as standard.	**Standard units** of mass include grams and kilograms. **Standard units** of length include centimetres, metres and kilometres. **Standard units** of volume and capacity include millilitres and litres.
Sphere	A 3-D shape with a continuous surface, which is at all points equidistant from its centre. It has an infinite number of flat faces and straight edges.	A bowling ball is a **sphere**.
Symbol	Synonymous with sign in its mathematical context, e.g. +, -, ×, ÷, =.	20 □5 = 4. What is the missing **symbol**?
Table	A structure organised into columns and rows, in which data can be recorded.	The information for Thursday is not yet complete on the **table** because it is only Wednesday.
Turn	Rotation (see half and quarter turn).	A whole turn is 360 degrees. A half turn is 180 degrees. A quarter turn is 90 degrees.
Unit	1. An element considered as a single entity. Ten single cubes can be grouped together to make a unit of ten. 2. A unit of measure, which can be standard or non-standard.	I regrouped ten ones for one **unit** of ten. Unifix cubes can be used as **units** of measure, but these are not **standard units**.
Volume	A quantity or amount of any substance and the 3-D space it fills.	The bottle contains a **volume** of one litre but its capacity is two litres. The bottle is half full.

Mathematics
Mastery

Year 2	Definition	Example
Angle	The amount of turn, measured in degrees.	The **angle** is 60 degrees.
Calculate	To compute or work out mathematically.	Can you **calculate** the answer to 13 + 4?
Centimetre	A metric unit of length.	The book is 15 **centimetres** long.
Column	A vertical arrangement of numbers or objects.	23 has two tens – I will place them into the tens **column**.
Commutative	A property of addition and multiplication. It does not matter in which order the addends or factors are added or multiplied; the result will be the same.	4 + 6 = 10 6 + 4 = 10 This demonstrates that addition is **commutative**. Arrays demonstrate the **commutativity** of multiplication, i.e. 3 × 4 = 4 × 3
Consecutive	Following in order.	2, 3, 4, 5, 6 are **consecutive** numbers. 3, 6 and 9 are **consecutive** multiples of 3.
Denominator	The number written below the vinculum in a fraction. In a measure context, it indicates the number of equal parts into which the whole is divided. In a division context, it is the divisor.	In the fraction one quarter, four is the **denominator**.
Division	The process of partitioning a whole into equal parts.	12 **divided** by 3 is equal to 4.
Efficient	Well-organised. Choosing an efficient computation strategy requires consideration of the numbers involved and will normally utilise 'known facts'.	I will use my number bonds knowledge to calculate 22 + 7 **efficiently**. I know that 2 + 7 is equal to 9, so the answer is 29. That's more efficient that counting on seven.
Frequency	The number of times something occurs within a data set.	4 pupils have brown hair. The **frequency** of brown hair is 4.
Gram	A metric unit of mass.	The pencil weighs 20 **grams**.
Heptagon	A polygon with seven sides and seven angles.	
Hexagon	A polygon with six sides and six angles.	
Inverse operations	Opposite operations that 'undo' each other.	Addition and subtraction are **inverse** operations.
Millilitre	A metric unit of capacity/volume.	The can of fizzy drink has a capacity of 330 **millilitres**.
Multiple	The result of multiplying a number by an integer, for example, 12 is a multiple of 3 and 4 because 3 × 4 = 12.	36 is a **multiple** of three because three multiplied by 12 is equal to 36. It is also a **multiple** of 12 for the same reason (and 1, 2, 4, 6, 9, 18 and 36).
Multiplication	One of the four mathematical operations. Multiplication can be understood as repeated addition or scaling (introduced in Year 3).	The **multiplication** symbol is ×.
Multiply	To increase a quantity by a given scale factor.	I can **multiply** 3 by 4 which is equal to 12.

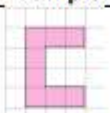
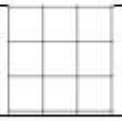
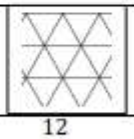
Near double	When two numbers involved in an addition are close in value, such as 23 + 22. The numbers can be treated as exact doubles, followed by compensating.	To calculate 23 + 22, I can use the **near double** strategy. I can double 22 and then add one more.
Non-unit fraction	A fraction with a numerator greater than one.	Two thirds is a **non-unit fraction.**
Numerator	The number written above the vinculum in a fraction. In a measure context, it indicates the specified number of parts out of the whole. In a division context, it is the dividend.	In the fraction one quarter, one is the **numerator**.
Octagon	A polygon with eight sides and eight angles.	
Operation	A mathematical process. The four mathematical operations are addition, subtraction, multiplication and division.	4 + 2 = 6. The **operation** is addition.
Pentagon	A polygon with five sides and five angles.	
Pictogram	A representation of data using pictures or symbols.	
Quadrilateral	A 2D shape with four sides and four angles. which add up to 360 degrees.	
Relationship	The way in which two or more things are connected.	The **relationship** between addition and subtraction is that they are the inverse of each other.
Right angle	An angle of 90 degrees.	A square has four **right angles**.
Rotation	The act of rotating about an axis/centre.	I will **rotate** the square 90 degrees clockwise.
Scale	Equally spaced markings on a measuring device which can be read to quantify a measurement.	Using the **scale** on the ruler, the book measures 15cm.
Symmetry	A shape is symmetrical when it fits exactly onto itself when folded in half.	This triangle has one line of **symmetry**. 
Tally	A form of counting. Each tally is a vertical mark. After the fourth vertical mark, a fifth	Four children have black hair; I will record this as four **tallies**.

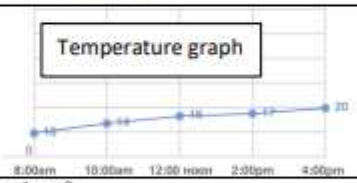
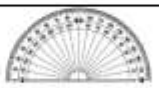
	horizontal/diagonal mark is drawn to create a group of five.	
Temperature	The measure of heat.	Outside has a **temperature** of 15 degrees Celsius.
Unit fraction	A fraction with a numerator of one.	One-third is a **unit fraction**.
Vinculum	A horizontal line that separates the numerator and the denominator in a fraction.	$\frac{1}{4}$ ← vinculum

Year 3	Definition	Example
Acute angle	An angle that is smaller than a right angle.	It is smaller than my right angle checker so this must be an **acute angle**.
Axis (plural: axes)	A real or imaginary reference line. The y-axis (vertical) and x-axis (horizontal) on charts and graphs are used to show the measuring scale or labels for the variables.	The y-**axis** on this bar graph shows you how many pupils preferred each colour.
Bar graph	A representation of data in which the frequencies are represented by the height or length of the bars.	This **bar graph** shows us the preferred colours of the pupils in our Year 3 class.
Columnar addition/subtraction	The formal written algorithms for addition and subtraction that are exemplified in *Mathematics Appendix 1* of the 2014 national curriculum.	Solve the following calculations by using the appropriate method of **columnar addition** or **subtraction**.
Factor	A number, that when multiplied with one or more other factors, makes a given number.	The number six has four **factors**: 1, 2, 3 and 6.
Formal written methods	Exemplified in *Mathematics Appendix 1 (see above)*. As well as including columnar addition and subtraction, these also consist of written algorithms for multiplication and division.	Pupils should only use **formal written methods** for calculations that cannot be efficiently calculated using mental strategies (with or without jottings).
Horizontal	Horizontal refers to planes and line segments that are parallel to the horizon.	The x-axis on a graph should be **horizontal**.
Irregular	In geometry, irregular is a term used to describe shapes that are not regular (see below).	The sides and the angles of this pentagon are not all equal so the pentagon is **irregular**. 
Kilometre	A metric unit measure of length that is equal to one thousand metres.	The distance from the school to Arun's house was exactly one **kilometre**.
Millimetre	A metric unit measure of length that is equal to one thousandth of one metre.	The length of Philippa's ruler is 300 **millimetre**s.

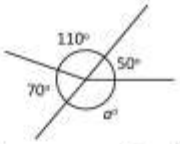
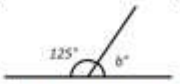
Numeral	A numeral is a symbol (or group of symbols) used to represent a number.	Whole numbers can all be represented as **numerals** consisting of the digits 0 to 9.
Obtuse angle	An angle that is greater than a right angle but less than 180 degrees.	It is greater than my right angle checker so this angle must be **obtuse**.
Parallel	Line segments that can be described as parallel must be on the same plane and will never meet, regardless of how far either or both line segments are extended.	The opposite sides of a square are **parallel**.
Perimeter	The perimeter of a 2-D shape is the total distance around its exterior.	I know that one side of this square is 2cm so it must have a **perimeter** of 8cm.
Perpendicular	A pair of line segments (or surfaces) can be described as perpendicular if they intersect at (or form) a right angle.	The adjacent sides of a rectangle are **perpendicular**.
Place holder	A place holder is a zero used in any place value column (that contains a value of zero) to clarify the relative positions of the digits in other places.	I need to use a **place holder** in the ones column to make it clear that my number is 320 and not 32.
Prism	A prism is a 3-D solid with two identical, parallel bases and otherwise rectangular faces.	A triangular **prism** has five faces, consisting of three rectangles and two triangles which are parallel.
Product	The result you get when you multiply two numbers.	24 is the **product** of 3 and 8.
Regular	Regular 2-D shapes (regular polygons) have angles that are all equal and side lengths that are all equal. Regular 3-D shapes (the Platonic Solids) are those that have congruent (exactly the same) faces of a single regular polygon.	A square is a **regular** 2-D shape because all four angles are right angles and all four sides are the same length. A cube is a **regular** 3-D shape with six identical square faces.
Roman numeral	Roman numerals are a system of symbols used to represent numbers that were developed and used by the Romans. They do not use a place value system.	The number twelve on this clock is represented by the **Roman numerals** XII, which is 10 + 1 + 1.
Round	Approximate a number, normally to the nearest multiple of ten, to make it easier with which to calculate.	I would **round** the number 17 to 20 because it is three away from 20 but seven away from 10.
Square-based pyramid	A pyramid is a 3-D shape with a 2-D shape (which gives the pyramid its name) as a base and triangular faces that taper to a point called a vertex or apex.	This **square-based pyramid** has five faces; one square face and four triangular faces.
Triangle-based pyramid		This **triangle-based pyramid** has four triangular faces.

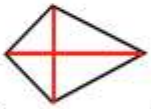
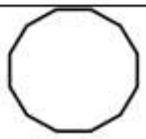
Mathematics
Mastery

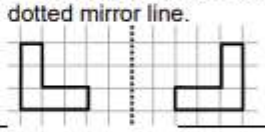
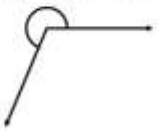
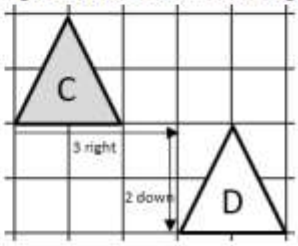
Year 4	Definition	Example
Area	The space a surface takes up inside its perimeter. Area is always measured in square units.	 The **area** is 8 square units.
Associative law	No matter how the parts in an addition or multiplication equation are grouped, the answer will be the same.	(6 + 3) + 2 = 11 6 + (3 + 2) = 11 Addition and multiplication are **associative**. Subtraction and division are not.
Convert	To change from one unit of measurement to another.	2 km can be **converted** to metres – it is equal to 2000 m.
Coordinate	The position of a point, usually described using pairs of numbers. Sometimes called Cartesian coordinates, after the mathematician Rene Descartes.	The **coordinate** (3,4) describes a point that is 3 on the x axis and 4 on the y axis.
Decimal fraction	A fraction expressed in its decimal form.	Half written as a decimal fraction is 0.5.
Distributive law	The process whereby adding some numbers and then multiplying the sum gives the same answer as multiplying the numbers separately and then adding the products.	3 × (2 + 4) = (3 × 2) + (3 × 4) 3 × 12 = (3 × 10) + (3 × 2)
Dividend	The amount that you want to divide.	In '12 ÷ 3 = 4', 12 is the **dividend**.
Divisor	The number you divide by.	In '12 ÷ 3 = 4', 3 is the **divisor**.
Equilateral	Having all sides the same length.	An **equilateral** triangle has three equal sides.
Equivalent	Equivalent means having the same value. Equivalent fractions have the same value.	$\frac{2}{4} = \frac{1}{2}$
Expression	One or a group of numbers, symbols or operators. An expression does not use equality or inequality signs. *Using an equality or inequality sign will give an equation.*	2 × 3 4^2
Grid	A series of evenly divided and equally spaced shapes, usually squares.	 
Improper fraction	A fraction where the numerator is bigger than the denominator. These fractions are therefore greater than one whole.	$\frac{12}{11}$
Integer	A whole number that can be positive or negative.	6 is an integer, 0.6 is not.
Interval	An interval on a graph's axis lies between two values.	If one point on an axis is 50 and the next 60, the **interval** is 10.

Isosceles	Having two sides of equal length. Isosceles triangles have two equal sides; isosceles trapezia have two equal, non-parallel sides.	
Kite	A 2-D shape with two pairs of equal length adjacent sides. The diagonals intersect at right angles.	
Line graph	A graph that uses lines to connect the points on a data chart. Used to present continuous data, such as change over time.	
Mixed numbers	Numbers consisting of an integer and fractional part.	$1\frac{1}{2}; 3\frac{3}{4}$
Negative number	A number that is less than zero. (It is helpful to refer to these numbers as 'negative numbers' rather than 'minus' to avoid confusion with the operation 'minus'.)	-1, -24, -o.5 etc.
Parallelogram	A 2-D shape that has two pairs of parallel sides and equal opposite angles.	
Plot	To mark out a point on a graph or grid.	'**Plot** the point (3,6)' means to draw the precise location of that point, usually shown as a dot or a small cross.
Point	The precise location of a position on a 2-D plane.	An exact place on a graph or on squared paper. A **point** is often represented by a capital letter. 
Positive number	A number that is greater than zero. Zero is neither positive or negative.	3, 32, 0.5
Proper fraction	A fraction with a value less than one.	$\frac{1}{2}, \frac{3}{4}, \frac{5}{8}$
Protractor	A measuring device for measuring the size of an angle. Angles are measured in degrees (°).	
Quotient	The result when the dividend is divided by the divisor.	15 ÷ 3 = **5** **5** is the **quotient**.
Rectilinear	A rectilinear shape has straight line edges which are perpendicular (all meet at right angles).	A rectangle.  A straight-sided shape that can be divided up into other rectangles. 

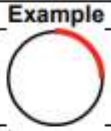
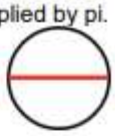
Rhombus	An equilateral parallelogram with four equal length sides.	
Scalene	A scalene triangle has three unequal sides and three unequal angles.	
Short division	A formal written layout where the quotient is calculated showing only one written step.	$5\overline{)385}$ = 77
Short multiplication	A formal written layout where the multiplier is usually 9 or less.	$\begin{array}{r} 782 \\ \times \quad 9 \\ \hline 7038 \end{array}$
Simplify	To write a number or equation in its simplest form.	I can **simplify** $\frac{8}{10}$ to $\frac{4}{5}$.
Square centimetre	A unit of measure for area equal to a square with the dimensions 1 cm by 1cm.	Sometimes referred to as centimetre squared, abbreviated to **cm²**.
Trapezium	A quadrilateral with exactly one pair of parallel sides.	

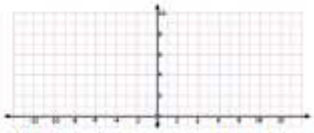
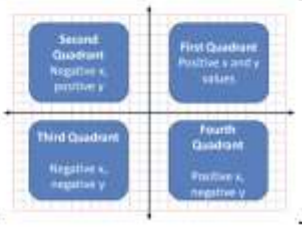
Year 5	**Definition**	**Example**
Angle at a point	Angles that meet at a point that sum to 360°.	
Angle on a line	Angles formed on a straight line that sum to 180°.	
Average (mean)	A measure of central tendency. The mean average of a set of data is the sum of the quantities divided by the number of quantities.	The **mean average** of the set 4, 5, 5, 6 is 5 because (4 + 5 + 5 + 6) ÷ 4 = 5.
Common factor	A factor of two (or more) given numbers.	A **common factor** of 12 and 9 is 3 because 3 × 4 = 12 and 3 × 3 = 12.
Common multiple	A multiple of two (or more) given numbers.	A **common multiple** of 3 and 6 is 12 because 3 × 4 = 12 and 6 × 2 = 12.
Congruent	Used to describe two shapes or figures which are exactly the same size.	The two triangles are **congruent**. If I place one on top of the other, there is no overlap. 
Cube number	The product of three equal factors.	Eight is a **cube number** because $8 = 2 \times 2 \times 2 = 2^3$.
Cubic centimetre	A unit used to measure volume. The space taken up by a cube with edges of length 1 cm or	The volume of this multilink cube is eight **cubic centimetres.**

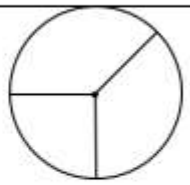
	which measures 1 cm × 1 cm × 1 cm.	
Cubic metre	A unit used to measure volume. The space taken up by a cube with edges of length 1 metre.	The volume of this fridge is two **cubic metres.**
Decagon	A polygon with ten sides and ten angles.	
Degree	The unit of measure for angles.	A right angle is 90 **degree**s.
Diagonal	A straight line segment that joins one vertex to another.	The **diagonals** of a kite are perpendicular 
Divisible	A number is said to be divisible by another if it can be divided by that number without a remainder.	24 is **divisible** by 8. When divided by 8 it gives a quotient of 3, with no remainder.
Dodecagon	A polygon with twelve sides and twelve angles.	
Long division	The formal written algorithm that can be used to divide by a number with two or more digits.	34 12 408 36 48 48 0
Long multiplication	The formal written algorithm that can be used to multiply a number by a number with two or more digits.	34 × 12 68 340 408
Negative integer	A whole number with a value less than zero. Zero is neither positive nor negative.	When the temperature falls below 0° a **negative integer** is used to record it.
Nonagon	A polygon with nine sides and nine angles.	
Percentage	The number of parts per hundred which is written using the % symbol.	30% means for every 100 there are 30.
Polygon	A 2-D shape with three or more straight sides.	Triangles and rectangles are examples of **polygons**.
Polyhedron (pl. polyhedra)	A 3-D shape with flat surfaces that are polygons.	A cuboid is a **polyhedron**. A cylinder is not a **polyhedron** because it has a curved surface.
Prime factor	A factor that is a prime number.	3 and 2 are **prime factors** of 6.

Prime number	A whole number with only two factors, one and the number itself.	2, 3, 5, 7, 11, 13, 17 and 19 are the **prime numbers** less than 20.
Remainder	The amount remaining after division when a whole number answer is needed.	21 divided by four is equal to five with a **remainder** of 1.
Reflection	A mirror image that is equidistant from a mirror line.	The shape has been **reflected** in the dotted mirror line. 
Reflex angle	An angle that is greater than 180°.	
Scale (not to scale)	The ratio of lengths, in a drawing, are in proportion to the measurements of the real object. The lengths are not in proportion when not to scale.	The diagram was not drawn **to scale**. That means I can't use a ruler to measure the sides, because they are not in proportion to the real object.
Square metre	A unit of measure for area. The surface covered by a square with sides of length one metre.	The area of the floor in a room might be measured in **square metres**.
Square number	The product of two equal factors.	9 is a **square number** because $9 = 3 \times 3 = 3^2$.
Tetrahedron	A 3-D shape with four triangular faces.	
Transformation	A collective term for the ways that shapes can be changed, resulting in congruent or similar shapes, i.e. translation, reflection, rotation or enlargement.	Translations and reflections are types of **transformations**.
Translation	When a shape moves so that it is in a different position but retains the same size, area, angles and side length and so is congruent.	Triangle C has been translated three right and two down resulting in triangle D. 

Mathematics
Mastery

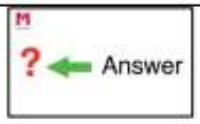
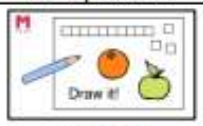
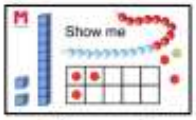
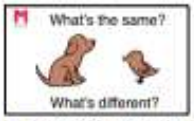
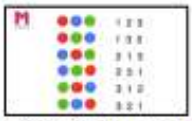
Year 6	Definition	Example
Arc	A portion of the circumference of a circle	
Brackets	The symbols ( ) used to separate parts of a multi-step calculation.	(10 – 2) × 3 = 21
Centre	In a circle, the centre refers to one point that is equidistant to all points around the circumference of the circle.	To draw a circle, I place the point of my pair of compasses at the **centre**.
Circumference	The perimeter/boundary of a circle.	
Compasses	A tool for creating curved lines, arcs and circles.	I can use a pair of **compasses** to draw a circle with a radius of 4 cm.
Common fraction	A fraction written with a numerator and denominator separated by a vinculum.	One quarter can be written as a common fraction, $\frac{1}{4}$.
Degree of accuracy	A description of how accurately a value is communicated.	The **degree of accuracy** needed for the answer is one decimal place.
Diameter	A line from one point of the circumference of a circle to another on the opposite side, which must pass through the centre of the circle.	The circumference of a circle is the **diameter** multiplied by pi. 
Equivalent expression	An expression, which can be algebraic, which is equal in value to another expression.	Find an **equivalent expression** to 17 + 10. 18 + 9 is an **equivalent expression** to 17 + 10.
Factorise	To identify factors of a given number. To express a number as factors.	I can **factorise** 12 by looking at its factor pairs. 1 × 12 = 12, 2 × 6 = 12, 3 × 4 = 12. So the factors of 12 are 1, 2, 3, 4, 6 and 12.
Foot/feet	An imperial unit of measure of length.	I am approximately five **feet** tall.
Formula	An algebraic expression of a rule.	The area of a rectangle can be found by multiplying the width and height. **a = w × h**
Gallon	An imperial unit of measure of volume/capacity.	A **gallon** is approximately 4.5 litres
Imperial unit	A unit of measure once officially used in the UK but is now used less often, except in the context of length. Includes miles, pounds and pints.	Miles are an **imperial unit** to measure length.
Inch	An imperial unit of measure.	An **inch** is approximately 2.2 cm.
Intersect	The point at which two (or more) lines meet is where they intersect.	The x and y axes **intersect** at (0,0)

Metric unit	A standard unit of measure used in the UK and Europe. Includes centimetres, litres and kilograms.	Litres are a **metric unit** used to measure volume.
Mile	An imperial unit of measure of length.	Five **miles** is equivalent to eight kilometres.
Net	A group of 2-D shapes which, when folded and connected, forms a 3-D polyhedron.	The **net** of a cube is comprised of six connected squares.
Order of operations	The internationally agreed order to complete operations in a multi-step equation with multiple operations.	(3 + 4) × 2 = □ The **order of operations** dictates that the operation within the brackets is completed first.
Origin	The point at which axes in a coordinates grid cross; the point (0,0).	 The **origin** is indicated by the blue dot.
Ounce	An imperial unit of measure of mass.	The newborn baby had a mass of 6 pounds and 3 **ounces**.
Pie chart	A representation of a set of data where each segment represents one group in proportion to the whole.	
Pint	An imperial unit of measure.	I found a **pint** of milk on my doorstep.
Pound (mass)	An imperial unit of measure of mass.	The new-born baby had a mass of 6 **pounds** and 3 ounces.
Proportion	A comparison between two or more parts of a whole or group. Proportion expresses a part-whole relationship. This may be represented as a fraction, a percentage or a decimal.	Two thirds of a class were boys. The **proportion** of the class that is girls is one third.
Quadrant	One of four regions into which a coordinates grid is divided.	

Radius	A line from one point of the circumference of a circle to the centre of the circle.	
Ratio	A comparison between two or more parts of a whole or group. Ratio expresses a part-part relationship. This is usually represented in the form a:b.	For every 4 tulips there are 7 daffodils. The **ratio** of tulips to daffodils is 4:7.
Similar	Similar shapes are those which have the same internal angles and where the side lengths are in the same ratio or proportion. Enlarging a shape by a scale factor (for example by doubling all side lengths) creates a similar shape.	All squares are **similar** to one another.
Square millimetre	The area of a square with sides 1 mm.	The smallest squares on graph paper have an area of one **square millimetre.**
Square kilometre	The area of a square with sides 1 km.	The area of England is 130 279 **square kilometres.**
Vertically opposite angles	Angles which are positioned opposite to one another when two lines intersect.	 The purple angles indicated are **vertically opposite angles.**

Appendix 3 – Ideas for Depth - Example

Ideas for Depth

 **'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 this 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!
 **'Show me!'** Convince me that you are right.	 **'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...? What came before? What comes next? Explain how you know
 **'What's the same? What's different?'** Can you find anything that is the same about these two numbers/shapes/calculations? Now can you find something that is different?	 **Maths story'** Make up a real-life story using your equation/numbers or shapes. Try to use the star words.
 **'Have you found all possibilities?'** Is there more than one way of completing this? Is there more than one answer? Have you found them all?	 **'Odd one out'** Find an odd one out and explain why it doesn't fit. Does your partner agree with you? Could another one be the odd one out? Why?