Mathematics Policy

Date agreed by Governors	Spring 2016
Reviewed	Autumn 2018
Reviewed	Autumn 2021
Reviewed	Autumn 2024
Next Review	**Autumn 2026**

Linked Documents
National Curriculum 2014
Teaching and Learning Policy
Assessment Policy
Marking and Feedback Policy

The United Nations Convention on the Rights of the Child (UNCRC) articles which inform this policy are:

- Article 3: The best interest of the child must be top priority in all decisions and actions that affect children
- Article 12: Every child has the right to express their views, feelings and wishes in all matters affecting them, and to have their views considered and taken seriously.
- Article 28: Every child has the right to education. Discipline in schools must respect children's dignity and their rights.
- Article 29: Education must develop every child's personality, talents and abilities to the full. It must encourage the child's respect for human rights, as well as respect for their parents, their own and other cultures, and their environment.
- Article 31: Every child has the right to relax, play and take part in a wide range of cultural and artistic activities.

School's Purpose: To prepare pupils for lifelong success

School's Vision: At Godwin Junior School we:

- Value everyone
- Instil a love of learning
- Seek and encourage talent
- Inspire resilient learners
- Open minds to develop responsible global citizens
- Nurture confident, articulate individuals

Statement of intent

At Godwin Junior School we are committed to ensuring that all pupils are able to recognise the importance of maths as a highly interconnected discipline which is essential to everyday life, critical to science, technology and engineering, necessary for financial literacy and most forms of employment. We want all of our children to enjoy mathematics, to be curious learners and to persevere in order to experience success in the subject. We deliver lessons that are creative and engaging to enable children to make rich connections across mathematical ideas to develop fluency, mathematical reasoning and competence in solving increasingly sophisticated problems.

To ensure that our pupils' mathematical understanding is built upon solid foundations, we follow the mastery approach; concrete resources and pictures are used to support learning before moving on to the abstract. Differentiation is achieved by emphasising deep knowledge and through individual support and small group intervention. Our Learning Powers Approach helps support children in maths to embrace their mistakes as this is an essential part of learning helping them to develop their perseverance and develop their collaborative and independent skills when they are challenged.

Statement of implementation

We use an approach to mastery to ensure that every child develops an understanding and enthusiasm for Maths. Teachers carefully plan open-ended, challenging questions which stimulate our learner's curiosity in order for them to collaborate in making connections, identifying patterns and drawing conclusions about mathematical concepts and problem-solving. Misconceptions are addressed as they arise and teachers actively engage children in proving their ideas through oral or written work. We are confident that this mastery-based approach enthuses children about maths and ensures they can master mathematical skills and concepts which instil a love of learning as they progress through our school and beyond.
The structure of the daily maths lesson begins with Fluent in Ten, aimed to develop pupil fluency and curriculum retention. The lessons will then follow the format detailed below.
The lesson begins with the 'In Focus' activity. The purpose of this part of the lesson is to raise curiosity and generate discussion amongst pupils around the concept to be studied in the lesson. It often is a problem-solving activity and once the pupils have had time to think and talk about the problem, the class teacher will then lead the class in a discussion - inviting pupils to agree, build or challenge each other's responses. This ensures that all learners are engaged and that all contributions are valued.
Children will then work on a 'Guided Practice' activity, where they will work either individually or with an adult. At this point, the children will work at their own pace.
Once the 'Guided Practice' task has been achieved the children will move to an 'Independent' activity. When this is completed, pupils will work on a suitable challenge. At all points in the lesson, all children will be working on the same topic. The teacher will provide targeted group support whilst motivating and inspiring all learners in order to develop their resilience. All lessons will be conducted in an environment of challenge, pace and a sense that all can and will achieve to be their best. Problem-solving aids pupils in developing their mathematical reasoning as well as allowing them to articulate their ideas. Through careful assessment and planning, teachers ensure that not only are all topics covered but that the topics are revisited strategically to embed understanding and long-term retention.
At least once a week, pupils are set a 'Journaling' task; this can be a task within a lesson or form the whole lesson. Here pupils will be encouraged to apply their mathematical thinking through a variety of different methods: group journaling, jottings and identifying and explaining mistakes. This allows them to further develop their Learning Powers through collaboration, evaluating their learning and persevering.
Teaching staff consider and plan for the needs of all pupils within the maths lessons in order to support and challenge them accordingly. Working closely with the school Inclusion Leader we explore strategies that can be used to create an inclusive learning environment for all. Teachers offer the necessary support and challenge for each individual to make progress. We ensure that maths is taught in creative and engaging lessons using a wide array of manipulatives to aid and support our children in their learning. We also offer

intervention groups that allow for further opportunities for pre and post-learning. Children are taken in small groups to review topics or prepare for lessons to come. Through continued assessment and discussions with all adults and children concerned, misunderstandings or gaps in learning are regularly addressed on an individual, group or class basis as necessary.
Long-term and medium-term planning informs teachers in their short-term planning of the subject and ensures complete coverage of the Maths Programmes of Study for each year. Our spiralling curriculum allows for topics to be revisited several times over the year to ensure that the knowledge becomes embedded.
The three key aspects of fluency, reasoning and problem solving are integral to all planning and practice in maths. The children are given the opportunity for varied and frequent practice of their maths skills, with a focus on recalling and applying their knowledge rapidly and accurately. Reasoning is incorporated in our lessons as our children need to be able to describe, explain, convince, justify and prove their thinking, to be successful in this subject. Challenging and targeted questioning and modelled thinking by teachers is used to create an atmosphere of challenge and high expectation. Over the course of study, teaching is designed to help learners to remember in the long term the content they have been taught and to integrate new knowledge into larger concepts.
Correct mathematical vocabulary is an essential part of each lesson and our pupils need to understand this within the area they are studying and be able to make rich connections across other areas within this subject. Each lesson provides our learners with the opportunity to reason through their ideas and use their mathematical language to explore a line of enquiry and problem-solve routine and non-routine problems.
Through our maths curriculum, we aim to develop our Learning Powers, embedding essential skills that our pupils can use in all aspects of their learning. We also offer a wealth of enrichment activities to promote maths within our children's lives including extra-curricular maths activities.
We aim to encourage the deepest of learning for our pupils, so that their knowledge can be transferred and applied in many contexts including other subjects e.g. science and art, as well as their everyday lives. Maths is widely promoted across the school and our classrooms have Working Walls that are utilised to support learning.
Teacher observations, subject leader monitoring - including pupil interviews - and focussed feedback combined with continued assessment in class ensures that teaching is responsive, targeted and effective - at all times, for all children, including those with special educational needs.
At Godwin Junior School we offer continued professional development and support to all of our teaching community so that they possess the confidence and subject knowledge to deliver their lessons effectively. A wide variety of resources and equipment to support learning in maths is available. The use of interactive whiteboards ensures that electronic teaching materials and visual aids are always available to enhance understanding in the subject.

Statement of Impact

The impact of our mathematics curriculum is that children understand the relevance and importance of what they are learning in relation to real-world concepts. Our learners tell us, through pupil voice surveys, that maths is promoted as being an exciting and enjoyable subject in which they can investigate and ask questions; they know - through the use of our Learning Powers - that it is reasonable to make mistakes because this can strengthen their understanding through the journey to finding an answer. This is evident through their high standard of work in which they clearly take pride; the components of the teaching sequences demonstrate good coverage of fluency, reasoning and problem-solving.

Our school promotes high standards for both teachers and pupils alike. Through robust monitoring, both internal and external, we ensure these expectations are met. This in turn results in our learners being confident to 'have a go' and choose the equipment they need to help them to learn, along with the strategies they think are best suited to each problem. Godwin pupils have a good understanding of their strengths and targets for development in maths and what they need to do to improve. The components of the teaching sequences demonstrate good coverage of fluency, reasoning and problem-solving. Our high-quality teaching, feedback and interventions support children to strive to be the best mathematicians they can be, ensuring all

pupils have a good understanding of maths and that they leave Godwin with a skill set that they can continue to develop throughout their educational careers.

Journaling

Journaling activities are provided weekly to help develop children's reasoning skills. For more information see the Journaling Guidance - Appendix 2.

Classroom Norms

In order to support a Mastery approach to and develop Learning Powers in all pupils we have a classroom ethos in which:

1. Everyone can learn mathematics to the highest level.
2. It's not "I can't do it", it's "I can't do it yet".
3. Mistakes are valuable.
4. Questions are important.
5. Mathematics is about creativity, fluency, reasoning and problem solving.
6. Mathematics is about making connections and communicating what we think.
7. Depth is much more important than speed.
8. Maths lessons are about learning, not performing.

Times Tables

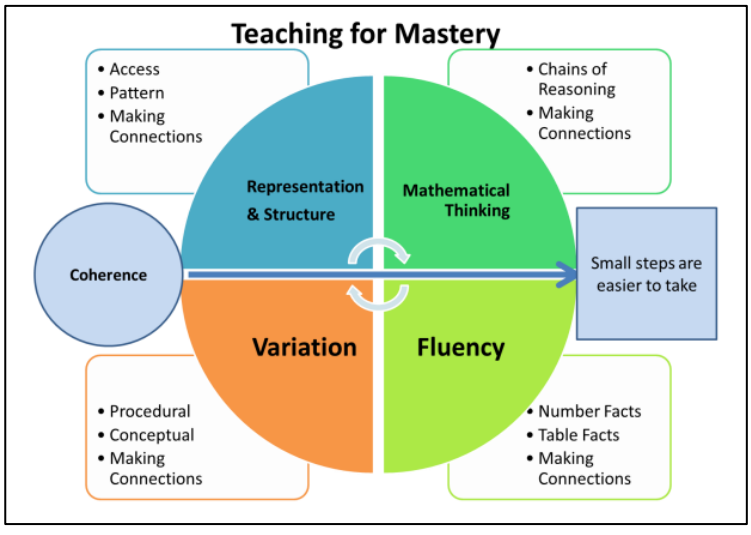
By the end of Year 4, our pupils are expected to be able to rapidly recall the 12 x 12 times table and related division facts. This is vital as these facts are intrinsic to so many areas of maths. In addition, all Year 4 children complete the national Multiplication Tables Check (MTC). As well as being a focus of teaching and learning, class teachers run intervention groups with pupils to ensure that they are fluent in recalling these facts. Each child has a times table booklet that pupils work through, achieving bronze, silver and gold status for each multiplication set.

Maths at home

To support and encourage a love of maths outside of school, we subscribe to Times Tables Rock Stars (TTRS) and Mathletics. Pupils are encouraged to engage in TTRS regularly. Additionally, class teachers set weekly differentiated homework, linked to the current unit of learning on Mathletics – this should be completed in the timeframe suggested by the child's teacher.

Planning

The maths curriculum at Godwin is planned to deliver the programmes of study within the National Curriculum.



Teaching staff are provided with a Medium Term Plan (MTP) adapted from the NCETM Curriculum Prioritisation Map to ensure all content is covered throughout the year. Teaching staff plan together and are responsible for generating the Learning Questions for each lesson. During the planning stage teachers must ensure that are considering the Five Big Ideas of Teaching for Mastery (see below) and underpinning these with our Learning Powers during the course of each unit.
Teachers create detailed lesson presentations and resources, based on the prior learning and needs of the pupils. The Medium Term Plan (MTP) lesson presentations are reviewed by the Maths Subject Leader on a regular basis. Feedback is given to individuals and support is offered as and when a need is identified.

Maths intervention
Intervention sessions have been timetabled for maths specialist TAs to pre-teach topics to pupils that may need additional input. In addition, interventions are also run to deliver support to those children who are working below the expected standard to develop their understanding of core mathematical concepts.

Inclusion
We aim to provide learning opportunities that are matched to the needs of children with Special Educational Needs through appropriate differentiation. Work in mathematics takes into account the targets set for individual children in their Special Education Needs and Disability Support Plans or Education Health Care Plans. For some children who have significant learning needs, their planning follows a personalised curriculum which is planned by teachers and then delivered by teachers or teaching assistants. This is based on their SEND Annual Review Action Plan outcomes and is supplemented by guidance given by visiting specialist teachers and therapists.

Cross-Curricular Links
Mathematics is taught mainly as a discrete subject, but every effort is made to link it with other areas of the curriculum. Opportunities are sought to draw mathematical experiences out of a wide range of activities. This will allow children to begin to use and apply mathematics in real life contexts.

Assessments
Assessment is a vital tool in the teaching of mathematics, designed to monitor children's progress and measure attainment. Pupils are expected to know, apply and understand the skills and processes specified in the relevant programme of study as set out in Statutory Requirements of the National Curriculum. We also draw on the non-statutory requirements to extend our children and provide an appropriate level of challenge.

Teachers are responsible for assessing and recording children's progress in mathematics. Maths objectives are in the front of each child's book and allow the teacher and child to both see the progress that is being made and to identify next steps.

Assessment includes formative, summative and evaluative elements to enable effective planning. Teacher assessment will be continuous throughout the Key Stage and evaluative to ensure any problem areas are addressed through the planning and delivery of mathematics.

Feedback and Marking
Responsive in-lesson marking allows for misconceptions to be addressed in the moment and allows pupils to be challenged to move on to more complex problems. Postlessons, work is marked on a daily basis; in accordance with the Marking and Feedback Policy. This enables to teachers to address misconceptions or provide the next steps for each pupil and supports assessment for learning so teachers can appropriately plan and deliver of subsequent lessons.

The Learning Environment

An organised, informative and stimulating learning environment can assist children in recalling key aspects of their learning and making progress.

Each class has a working maths display which reflects the concepts the children are currently studying. Children's own work will be displayed (within their classroom and around the school) to celebrate their work and encourage them to take pride in their achievements.

Additionally, each working wall features examples of stem sentences, methods of calculations, teacher workings and key vocabulary.

Teachers routinely refer to this display and children are encouraged to use it as a resource to develop their understanding of key concepts.

Maths Subject Leader

The Maths Subject Leader is responsible for improving the standards of teaching and learning in Maths through:

- Regularly working in partnership with NCETM MathsHub working groups to gain a greater understanding of the latest research in the teaching and learning of maths and evaluating their fit for Godwin and disseminating this to staff where appropriate.
- Undertaking evaluation and monitoring activities.
- Identifying strengths and areas for development across year groups and the school.
- Drafting and implementing an Action Plan to address areas for development.
- Evaluating the impact of their own actions and adjusting future plans accordingly.
- Supporting colleagues' development by providing examples of excellent practice which they can view, discussing aspects of learning and teaching (such as modelling or providing feedback) and by providing support with planning.
- Taking the lead in policy development.
- Considering the training needs of the staff and supporting colleagues in their Continuous Professional Learning (CPL).
- Identifying and reviewing resources, both online and real world, that can be used to aid the teaching and learning of maths.

To ensure learning and teaching in maths is of a consistently high-quality throughout the school, the Subject Leader also evaluates the extent to which children are supported to make good progress through:

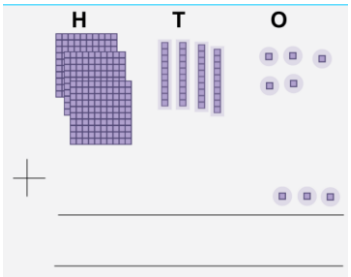
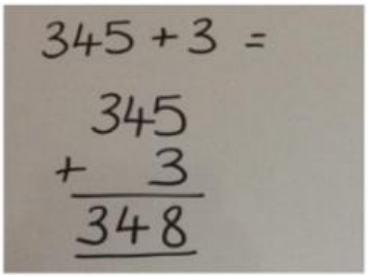
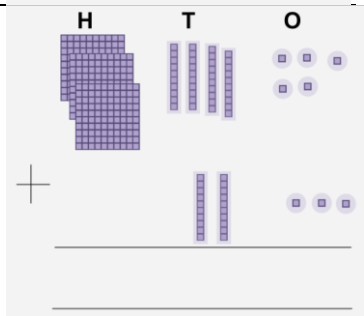
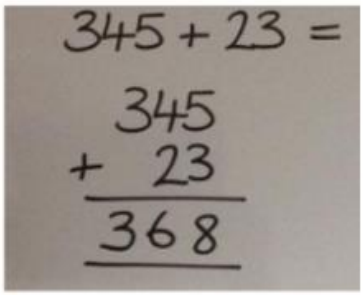
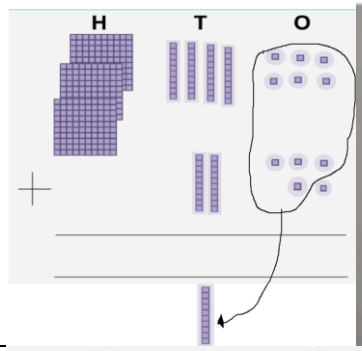
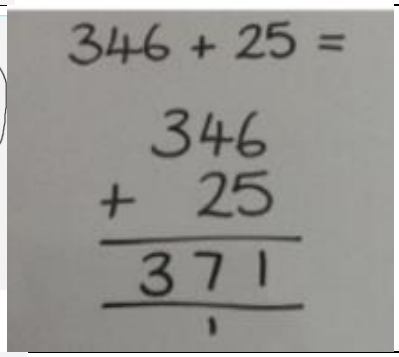
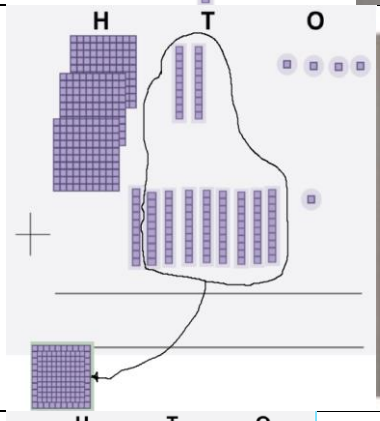
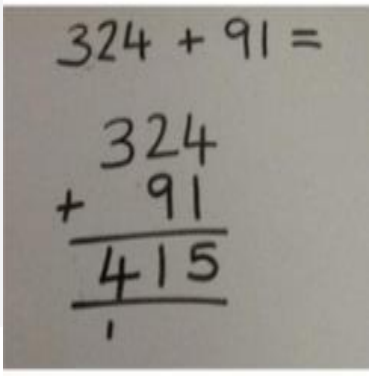
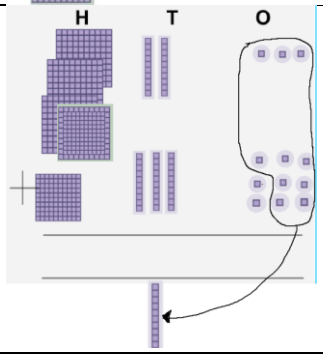
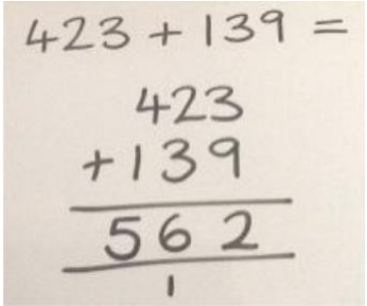
- Monitoring assessment data and the qualitative comments made in Pupil Achievement Meetings.
- Reviewing evidence of the children's work and observing maths lessons across the school.
- Assessing the quality of planning, teaching and feedback to pupils.
- Appraising the quality of the learning environment.
- Providing summary reports which evaluate strengths and weaknesses and indicate areas for further improvement.
- Meeting with the link-governor to discuss progress towards the school development targets as well as developments within the subject.

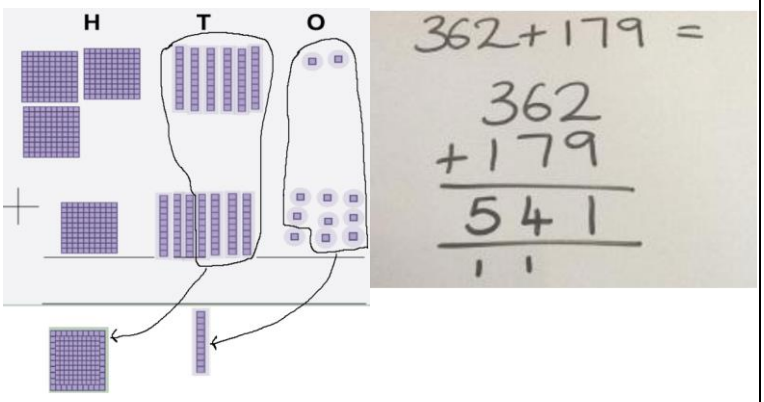
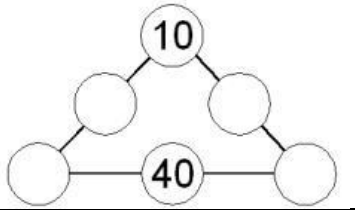
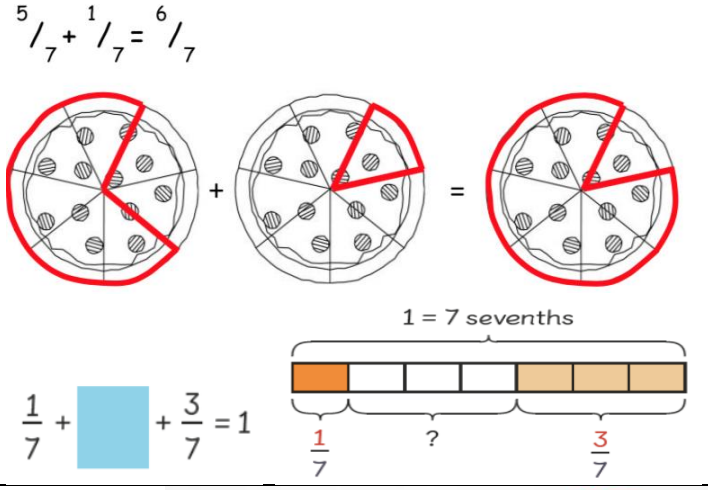
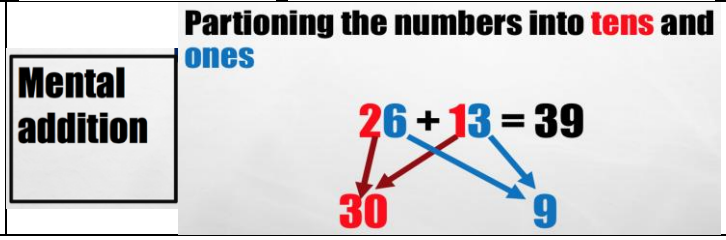
Appendix 1
Calculation Policy

Addition

Year 3

VOCABULARY: add, increase, exchange, re-group, total, plus, sum, addend, commutative, more, altogether, column addition, estimate, inverse, double, near double, one more, ten more... one hundred more, how many more to make ...? how many more is... than ...? how much more is...?, tens boundary, hundreds boundary

Method	**Example/Representation:**
HTO + O (that lie within the tens boundary).	 
HTO + TO (that lie within the tens boundary).	 
HTO + TO (that cross the tens boundary).	 
HTO + TO (that cross the hundreds boundary).	 
HTO + HTO (that cross the tens boundary).	 

HTO + HTO (that cross the tens and hundreds boundaries).	
Solve one and two step addition problems (including missing number problems) using concrete objects and pictorial representations.	This number triangle has missing numbers. The numbers along each edge must add up to 90. Put all the numbers: 20, 30, 50 and 60 in the circles to make the totals correct. 
Pupils practise adding fractions with the same denominator through a variety of increasingly complex problems to improve fluency.	
	

MENTAL STRATEGIES:

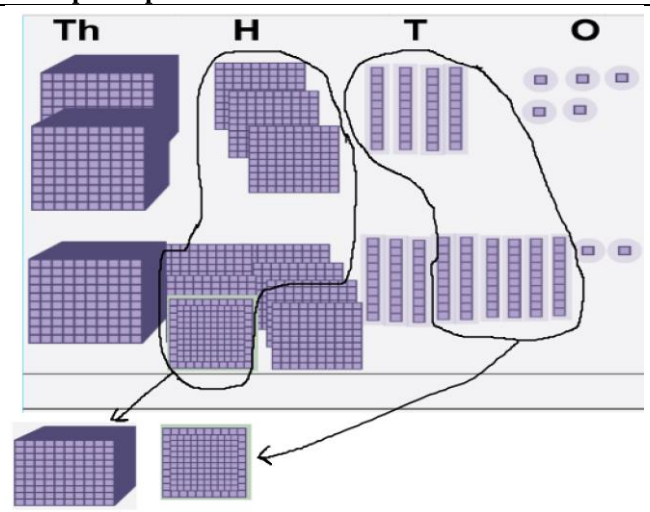
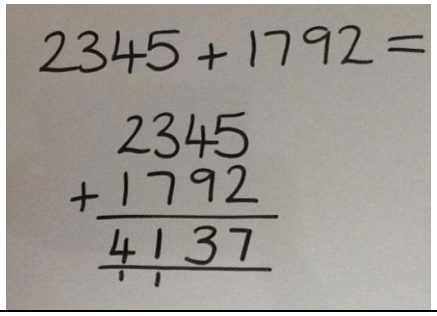
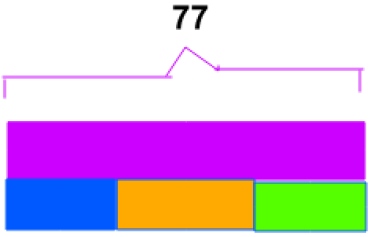
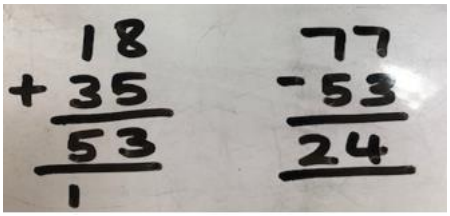
Add numbers mentally, including:

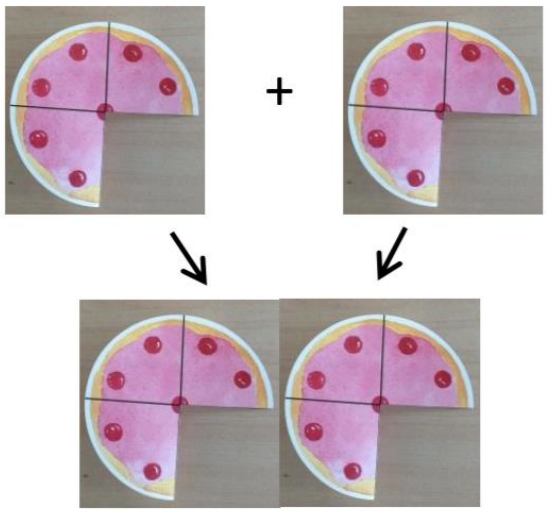
- a three-digit number and a single digit number
- a 3-digit number and multiples of 10
- a 3-digit number and multiples of 100

- Estimate the answer to a calculation and use inverse operations to check answers.
- Know number pairs that total 1000 (multiples of 100).
- Calculate 10 or 100 more than any given number.

Year 4

VOCABULARY: add, addition, more, plus, increase, sum, addend, commutative, total, altogether, exchange, re-group, double, near double , tens boundary, hundreds boundary, thousands boundary, inverse

Method	**Example/Representation:**
Add numbers with up to 4-digits, using the formal written method of column addition.	 
Solve two-step problems using formal jottings and explain reasoning behind their calculations (Singapore Bar method).	Seb has 77 cubes. He builds two towers. One tower uses 18 cubes and one tower uses 35 cubes. How many cubes does he have left over?  

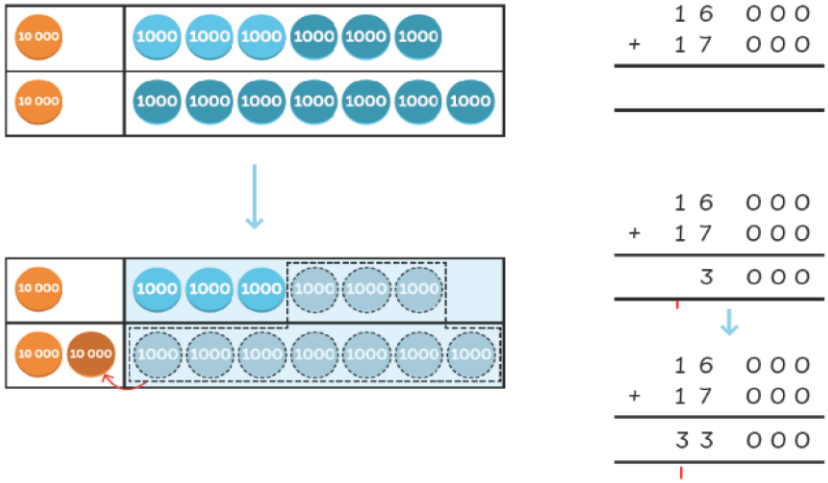
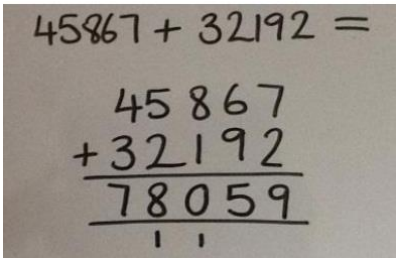
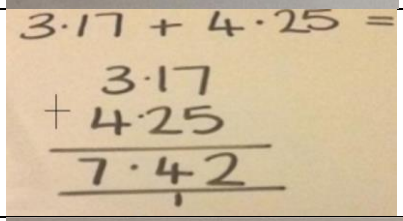
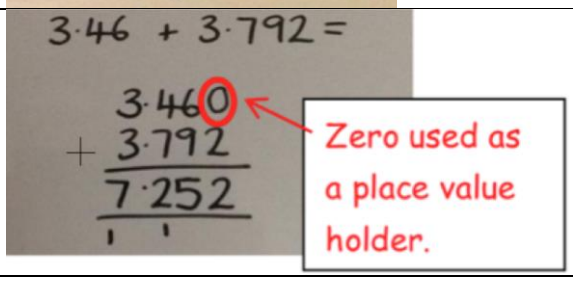
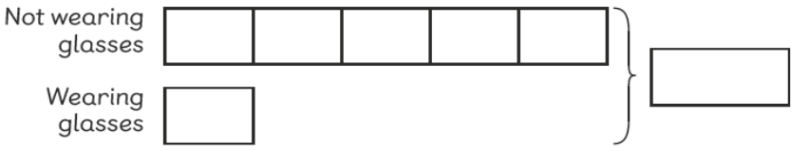
Pupils continue practise in adding fractions with the same denominator to become fluent through a variety of increasingly complex problems beyond one whole.	$^{3}/_{4} + {}^{3}/_{4} = {}^{6}/_{4}$ 

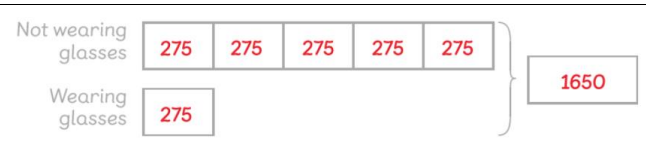
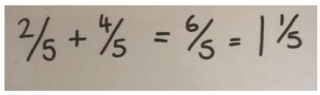
MENTAL STRATEGIES:

- Add numbers mentally, including: a four digit number and multiples of one thousand
- Use knowledge of doubles to derive related facts (e.g 15 + 16 = 31 because 15 + 15 = 30 and 30 + 1 = 31).
- Know number pairs that total 1000 (multiples of 10) .
- Estimate the answer to a calculation and use inverse operations to check answers.

Year 5

VOCABULARY: Efficient written method, add, addition, addend, commutative, more, plus, increase, sum, total, altogether, score, tens boundary, hundreds boundary, thousands boundary, ones boundary, tenths boundary, inverse

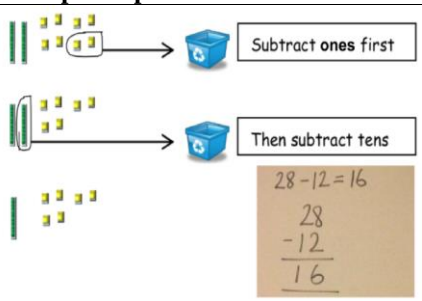
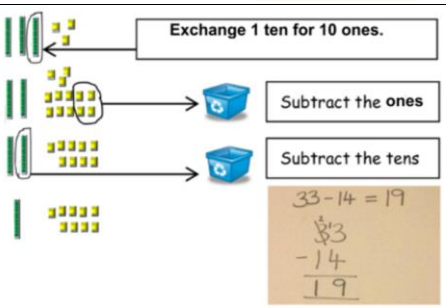
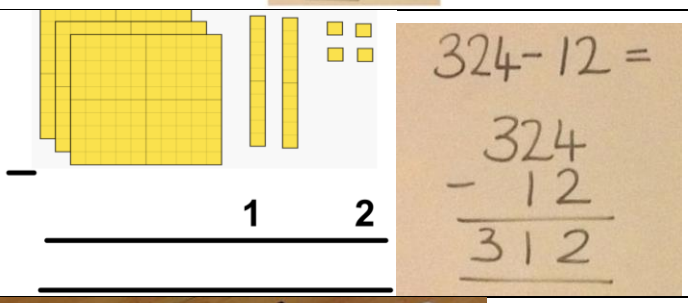
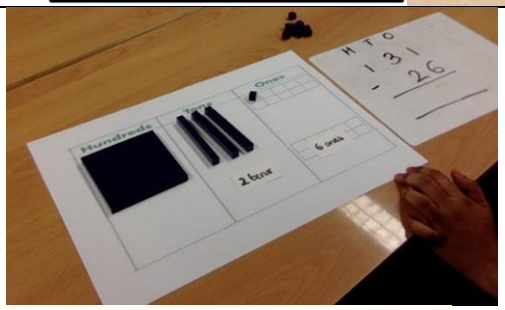
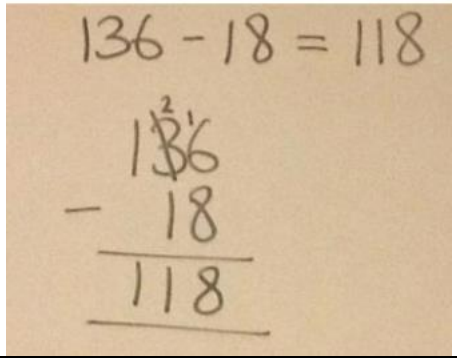
Method	**Example/Representation:**
Children will add numbers with more than 4-digits using the formal written method of column addition.	 
Add decimal numbers with the same number of decimal places, using the formal written method column addition.	
Add decimal numbers with a different number of decimal places, using column addition using 0 as a place value holder.	
Solve multi-step problems (that may include subtraction) using formal jottings and explaining reasoning behind their choice of operation and calculation. (Singapore Bar Method can be used).	There are 857 boys and 793 girls in a school. The number of pupils not wearing glasses is 5 times the number of those who are wearing glasses. How many pupils are not wearing glasses in this school?  Example answer (Answer can be shown using different methods).

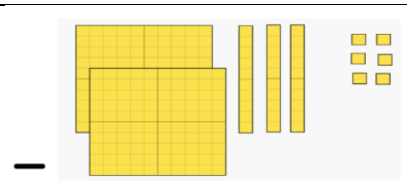
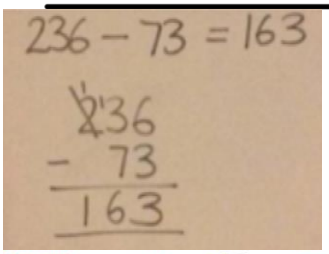
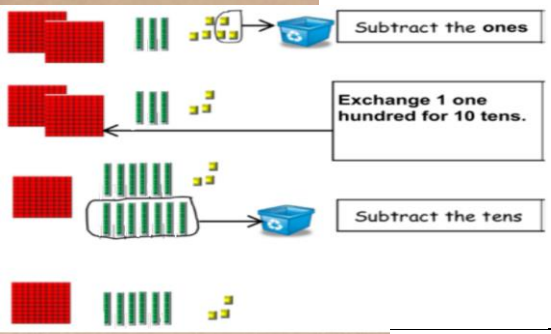
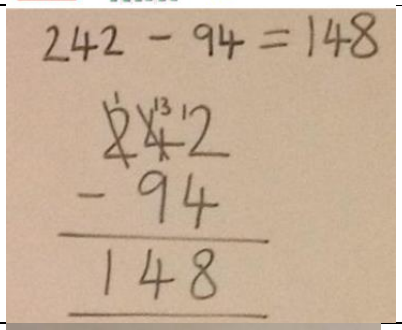
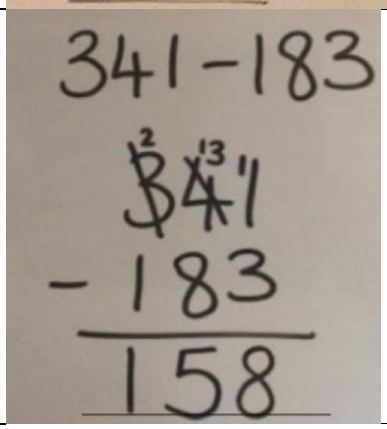
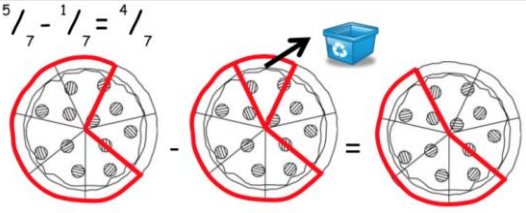
	 857 +793 = 1650 1650 ÷ 6 = 275 275 x 5 = 1375 There are 1375 pupils not wearing glasses.
Practise adding fractions where calculations exceed one as a mixed number	  
MENTAL STRATEGIES: • Add numbers mentally with increasingly large numbers (e.g 10,162 + 2,300 = 12,462). • Mentally add tenths (e.g 0.2 + 0.6 = 0.8) and 1-digit whole numbers and tenths (8 + 0.3 = 8.3). • Use number bonds to 100 knowledge to calculate complements to one using hundreths (e.g 0.83 + 0.17 = 1). • Use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy.	

Subtraction

Year 3

VOCABULARY: leave, subtract, less, minus, minuend, subtrahend, column subtraction, inverse, exchange, how many are left/left over?, difference between, how many more/fewer is... than...?, how much more/less is...?, Is the same as, equals, sign. multiples of tens and hundreds.

Method	**Example/Representation:**
TO - TO (that lie within the tens boundary) in columns and record as column subtraction.	
TO - TO (that cross the tens boundary) in columns and record as column subtraction.	
HTO - TO (that lie within the tens boundary) in columns and record as column subtraction.	
HTO - TO (that cross the tens boundary) in columns and record as column subtraction.	 

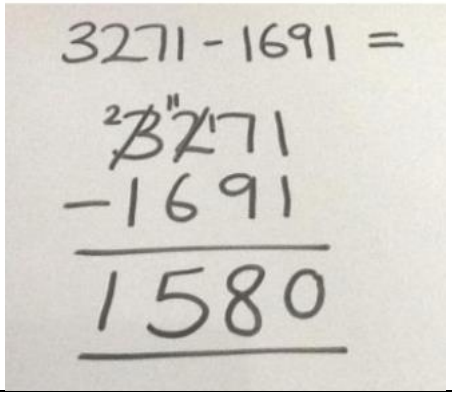
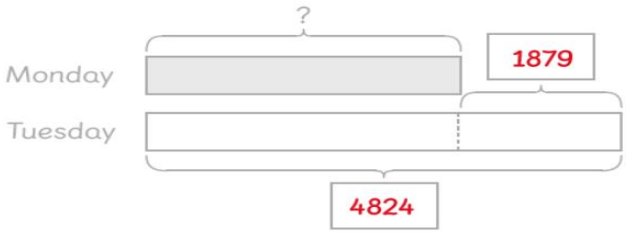
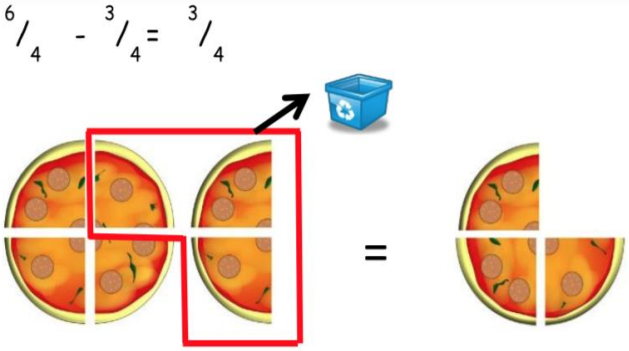
HTO - TO (that cross the hundreds boundary) in columns and record as column subtraction.	 7 3  
HTO - TO (that cross the hundreds and tens boundary) in columns and record as column subtraction.	
HTO - HTO (that cross the hundreds and tens boundary) in columns and record as column subtraction with decomposition.	
Solve one and two-step subtraction problems (including missing number problems).	Fill in the missing number: 
Practise subtracting fractions with the same denominator, through a variety of increasingly complex problems to improve fluency.	
Mental strategies	

Subtract numbers mentally, including:

- Subtracting a single digit number from a 3-digit number.
- Subtracting a multiple of 10 from a 3-digit number.
- Subtracting a multiple of 10 from a 3-digit number.
- Estimate the answer to a calculation and use inverse operations to check answer.

Year 4

VOCABULARY: subtract, subtraction, minus, minuend, subtrahend, decrease, leave, how many are left/left over?, difference between, how many more/fewer is... than...?, how much more/less is...?, Is the same as, equals, sign. Column subtraction, decomposition, exchange, multiples of thousand, inverse.

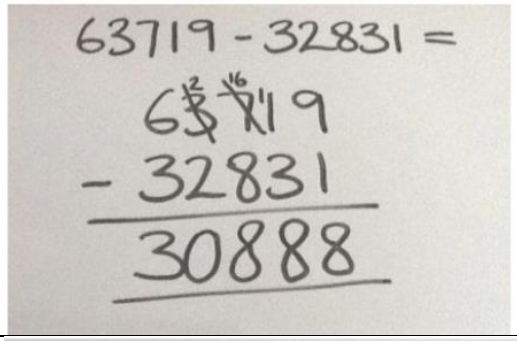
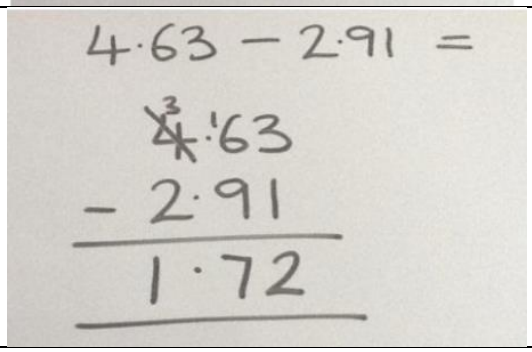
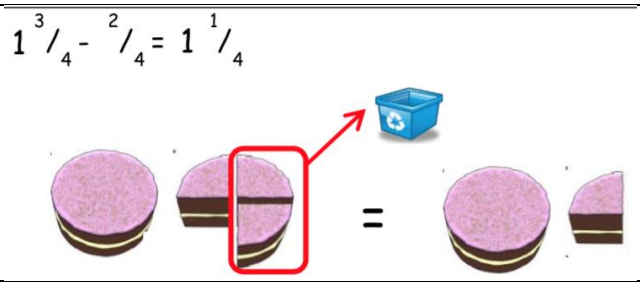
Method	**Example/Representation:**
Subtract numbers with up to 4-digits, using the formal written method of column subtraction.	
Solve two-step problems using formal jottings and explaining reasoning behind their choice of operation and calculations. (If required, Singapore Bar Method can be used).	4824 people visited the museum on Tuesday. 1879 more people visited the museum on Tuesday than visited on Monday. How many people visited the museum over the two days?  
Pupils continue practising subtracting fractions with the same denominator, to become fluent through a variety of increasingly complex problems beyond one whole.	

Mental strategies

- Subtract numbers mentally, including:
- Subtracting multiples of one thousand from a 4-digit number
- Use of number pairs that total 1000 (multiples of 10) to calculate subtraction (e.g 1000 – 300 = 700)
- Estimate the answer to a calculation and use inverse operations to check answers

Year 5

VOCABULARY: efficient written method, subtract, subtraction, minus, minuend, subtrahend, decrease, difference between, inverse, decimals, ones and tenths boundary, column subtraction, decomposition, exchange.

Method	**Example/Representation:**
Subtract numbers with more than 4-digits, using the formal written method of column subtraction.	
Subtract decimal numbers with the same number of decimal places.	
Solve multi-step problems using formal jottings and explaining reasoning behind their calculations.	A shelf holds 15 books. Jason has 56 books. Jason thinks that he needs 5 shelves to hold all of his books. Do you agree with him? Explain your answer.
Practise subtracting fractions where calculations exceed one as a mixed number.	

Mental Strategies

- Subtract increasingly large numbers mentally (e.g 12, 654 – 1,341 = 11, 213).
- Mentally subtract tenths (e.g 0.7 - 0.5 = 0.2) and 1-digit whole numbers and tenths (8 - 0.3 = 7.7).
- Use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy.

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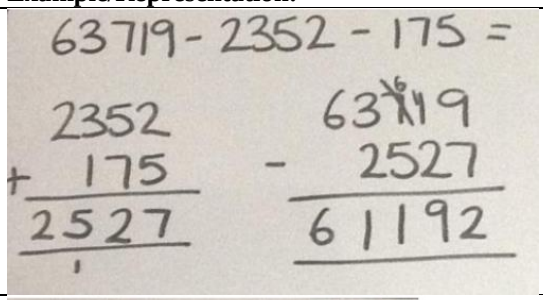
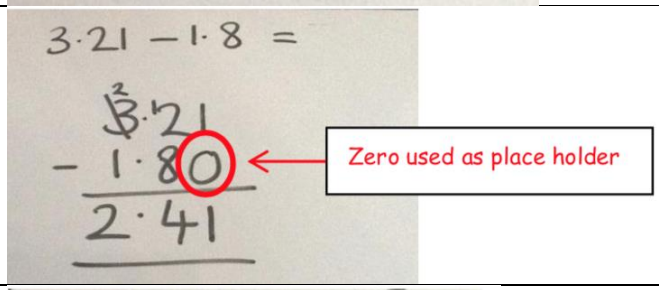
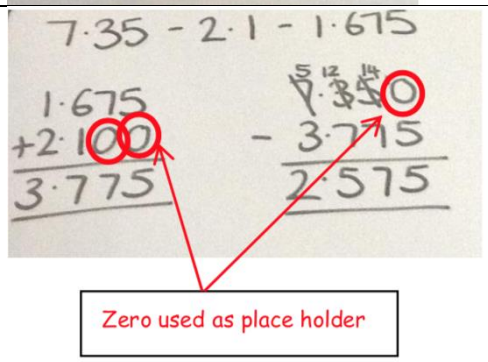
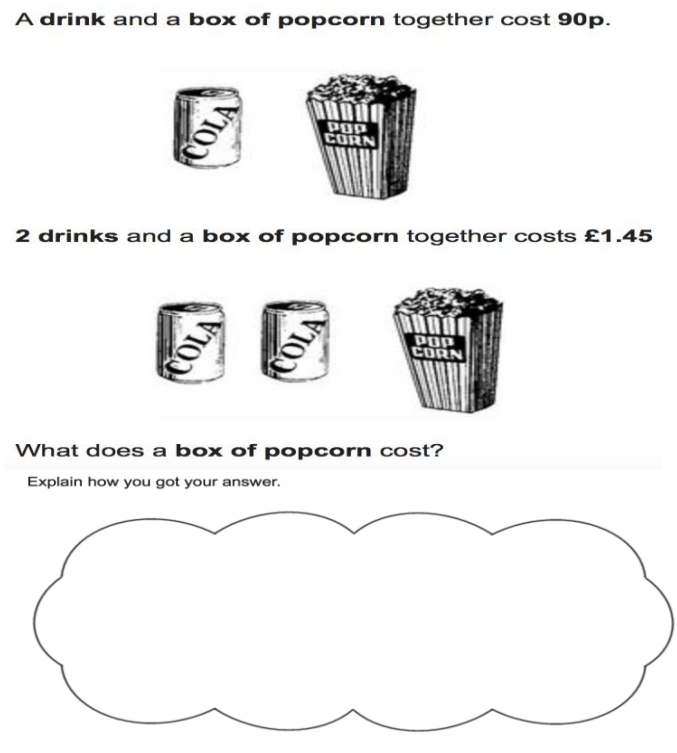
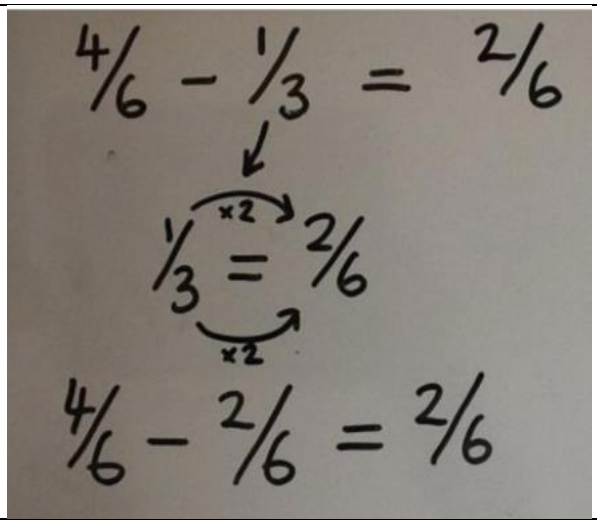
Year 6

VOCABULARY: order of operations, subtract, decrease, difference, inverse, decimals, ones , tenths and hundredths boundary, column subtraction, exchange.

Method	**Example/Representation:**
Subtract several numbers of increasing complexity and be taught to combine some of the numbers so that the subtraction can be completed.	
Children will subtract decimal numbers with a different number of decimal places.	
Subtract several decimal numbers with a different number of decimal places, then be taught to combine some of the numbers so that the subtraction can be completed.	
Solve multi-step problems using formal jottings and explaining reasoning behind their calculations.	

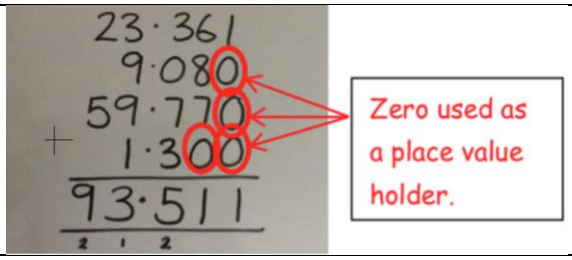
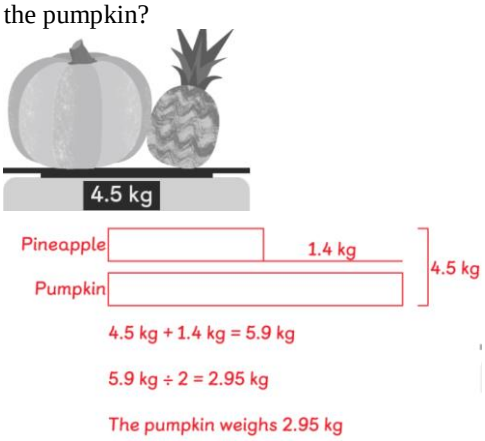
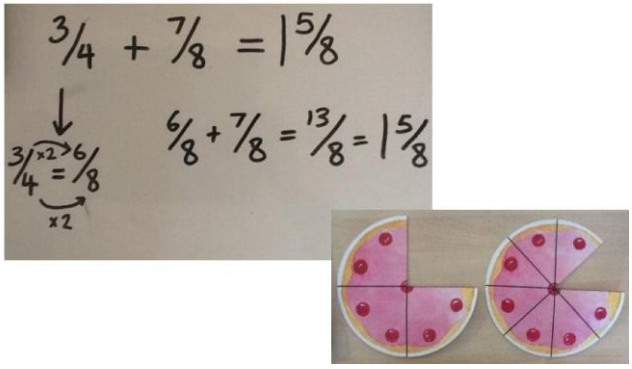
Subtract fractions and mixed numbers with different denominators, using the concept of equivalent fractions.	

Mental strategies

- Subtract increasingly large numbers mentally (e.g 12, 654 – 1,341 = 11, 213).
- Subtract decimal numbers mentally (up to 2 decimal places).
- Use estimation to check answers to calculations and determine, in the context of a problem, levels of accuracy.

Year 6

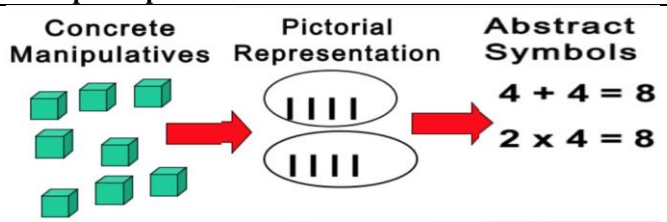
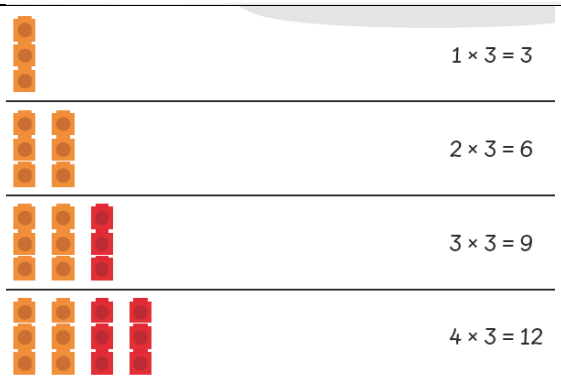
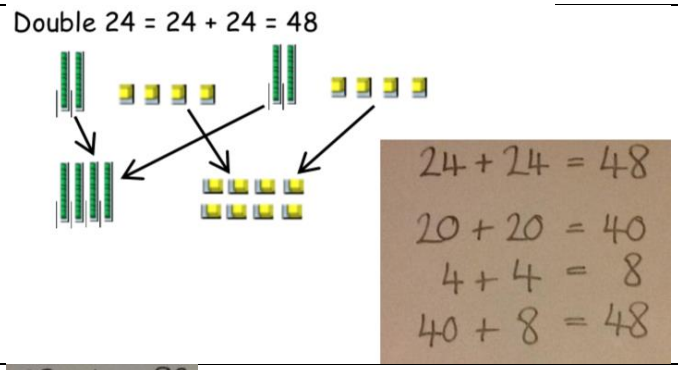
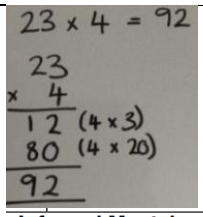
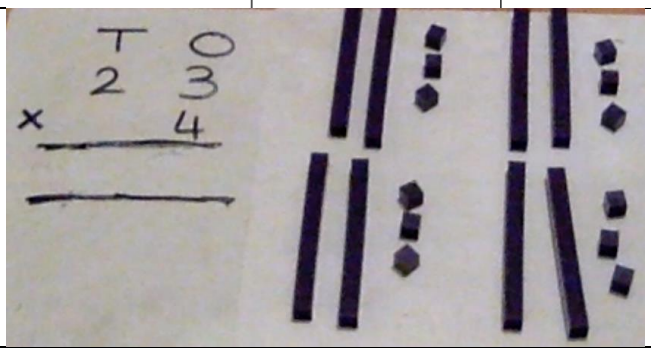
VOCABULARY: order of operations, column addition, add, addend, commutative, associative, in total, answer, tens boundary, hundreds boundary, thousands boundary, millions boundary, ones boundary, tenths boundary, hundredths boundary, decimal place, inverse

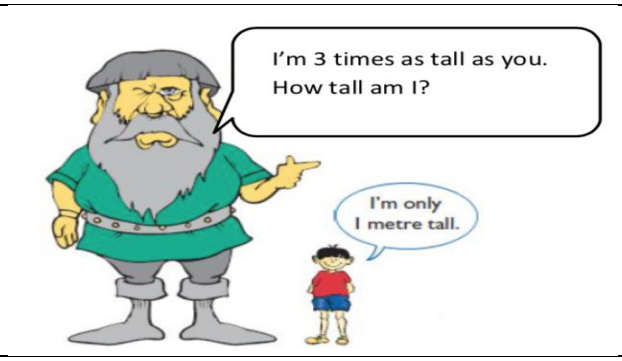
Method	**Example/Representation:**
Add several numbers of increasing complexity.	81,059 + 3,668 + 15,301 +20,551 =120,579 81,059 3,668 15,301 + 20,551 120,579 1111
Add several decimals numbers with a different number of decimal places.	
Solve multi-step problems (that may include subtraction) using formal jottings and explaining reasoning behind their calculations. (Singapore Bar Method can be used)	A pineapple is 1.4kg lighter than a pumpkin. What is the weight of the pumpkin? 
Add fractions and mixed numbers with different denominators, using the concept of equivalent fractions.	
MENTAL STRATEGIES: Add numbers mentally with increasingly large numbers (e.g 10,162 + 2,300 = 12,462). Add decimal numbers mentally (up to 2 decimal places). Use estimation to check answers to calculations and determine, in the context of a problem, levels of accuracy.	

Multiplication

Year 3

VOCABULARY: multiply, multiplicand, multiplier, multiplicand, product, commutative, times, groups of, equal groups of, multiple of, multiplied by, estimate, inverse, grid multiplication, expanded column multiplication, partition.

Method	Example/Representation:
	
Recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables.	
Learn to calculate doubles of 2-digit numbers through partitioning.	
Multiply numbers (TO x O) through partitioning and the formal written method.	 **Informal Mental Jottings:** 36 x 4 = 144 30 x 4 = 120 6 x 4 = 24 **Expanded multiplication:** 36 x 4 = 144 36 x 4 24 (6 x 4) 120 (30 x 4) 144 **Short multiplication** (formal): 36 x 4 = 144 36 x 4 144
Watch video for example	

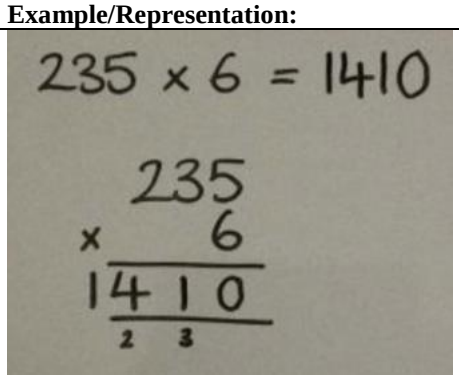
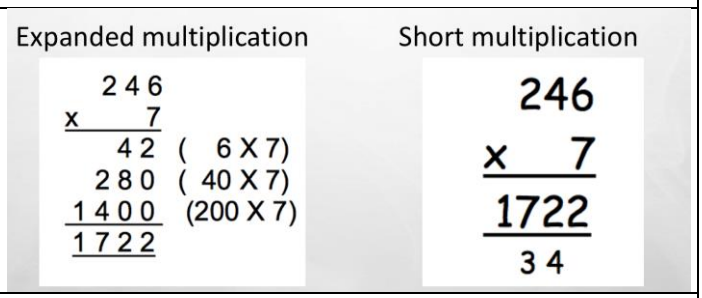
Children will solve problems involving multiplication, including scaling.	

MENTAL STRATEGIES:

- Count forwards and backwards in multiples of 4, 8, 50 & 100.
- Know the 3, 4 and 8 times tables (in and out of order).
- Connect the 2, 4 and 8 times tables through doubling.
- Use knowledge of place value to calculate multiplication (e.g. 2 x 2 = 4, 2 x 20 = 40, 2 x 200 = 400).

Year 4

VOCABULARY: multiply, multiplicand, multiplier, product, multiplied by, short multiplication, partition, distributive law, commutative, groups of, multiply, times, multiples, inverse

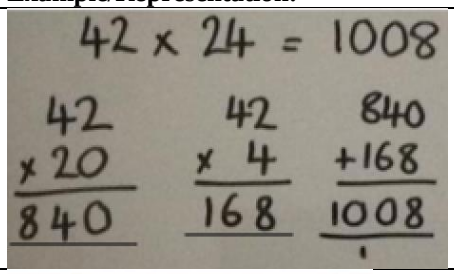
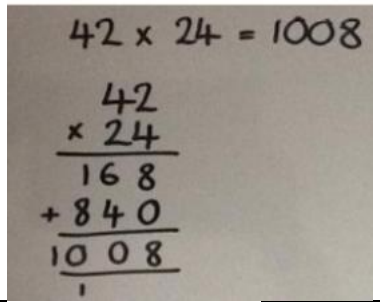
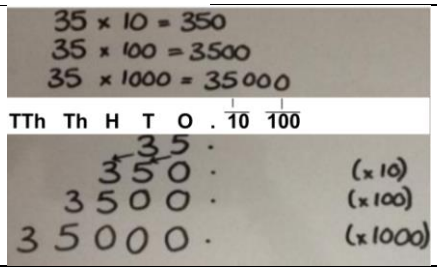
Method	**Example/Representation:**
Multiply numbers (TU x O) by partitioning the 2-digit number and using two short multiplications along with addition to solve the problem.	
Multiply numbers (HTU x O) using the formal written method of short multiplication.	
Solve problems involving multiplying and adding to multiply two or three-digit numbers by one digit.	Harriet has 7 friends who each have 24 apples. Joseph has 3 friends who each have 27 apples. How many apples do Harriet and Joseph's friends have altogether?

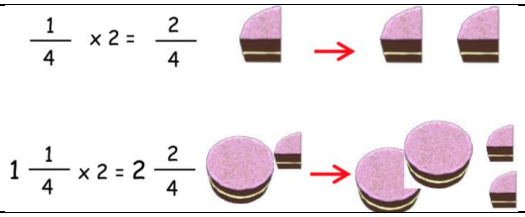
MENTAL STRATEGIES:

- Know all times tables up to and including 12 x 12 (by the end of Year 4).
- Recognise and use factor pairs (e.g factor pairs for numbers up to and including 10).
- Know that TU x 5 is TU x 10 then divide by 2 (e.g 18 x 5 = (18 x 10) ÷ 2 = 90).
- Know that TU x 9 is TU x 10 then subtract TU (e.g 18 x 9 = (18 x 10) – 18 = 162).

Year 5

VOCABULARY: multiplicand, multiplier, product, commutative, composite numbers, prime number, prime factor, cube number, square number, derive, factor pairs, formal written method, times, multiply, multiplied by, multiple of, short multiplication, partition, long multiplication, scaling, decimal place, ones, tenths and hundreds.

Method	**Example/Representation:**
Multiply numbers (TO x TO) by partitioning the second 2-digit number and using two short multiplications along with addition to solve the problem.	
Multiply numbers (TOx TO) using the formal written method of long multiplication.	
Multiply numbers (HTO x TO) using the formal written method of long multiplication.	124 × 26 becomes 1 2 1 2 4 × 2 6 7 4 4 2 4 8 0 3 2 2 4 1 1 Long multiplication
Multiply numbers (ThHTO x TO) using the formal written method of long multiplication.	3216 x 17 = 54672 1 1 4 3 2 1 6 x 1 7 2 2 5 1 2 3 2 1 6 0 5 4 6 7 2
Multiply whole numbers and those involving decimals by 10, 100 and 1000, by moving the digits around the fixed decimal on a place value grid.	
Children will solve problems involving multiplication, including scaling.	Alfie runs 3400m on Sports Day. His friend, Harry, runs three times as far. How far does Harry run?

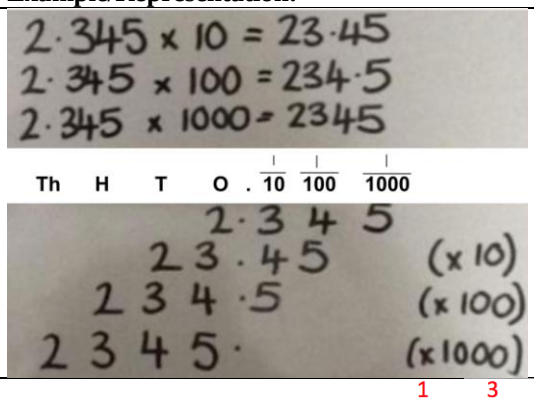
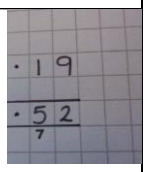
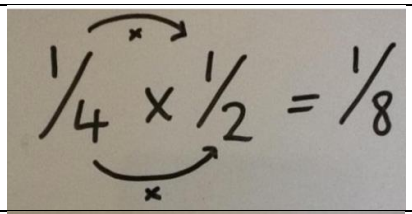
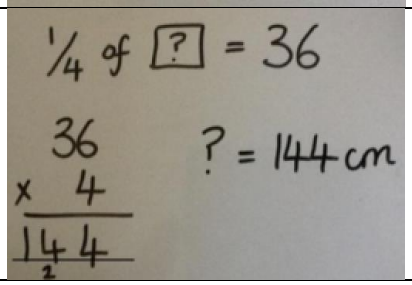
With the use of materials and diagrams, pupils will multiply proper fractions and mixed numbers by whole numbers	

MENTAL STRATEGIES:

- Recognise and calculate factor pairs for any number.
- Use times table knowledge to derive multiples of any number.
- Establish whether a number is a prime number (up to 100) or a composite number (not prime) and recall prime numbers up to 19.
- To know what a square number is and recall all square numbers (up to and including 144).
- To know what a cube number is and recall the first 5 cube numbers.

Year 6

VOCABULARY: multiplicand, multiplier, product, commutative, associative, common factors, multiples, prime, formal written method, multiply, multiplied by, multiple of, short and long multiplication, partition, scaling, decimal place, ones, tenths and hundredths.

Method	**Example/Representation:**
Multiply numbers by 10, 100 and 1000, where the answers are up to three decimal places.	
Multiply one-digit numbers with up to two decimal places by whole numbers using: - Short multiplication when multiplying by a single digit. - Long multiplication when multiplying by a 2-digit number.	
Multiply multi-digit numbers up to 4 digits, by a 2-digit whole number, using the formal written method of long multiplication.	3 2 6 2 4 3 9 x 1 7 1 7 0 7 3 2 4 3 9 0 4 1 4 6 3 1 1 2 3 . 1 2 x 1 2 4 6 . 2 4 2 3 1 . 2 0 2 7 7 . 4 4
Multiply simple pairs of fractions, writing the answer in its simplest form.	
Pupils use their understanding of the relationship between unit fractions and division, to work backwards by multiplying a quantity that represents a unit fraction.	

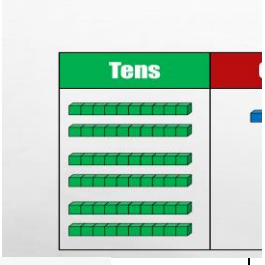
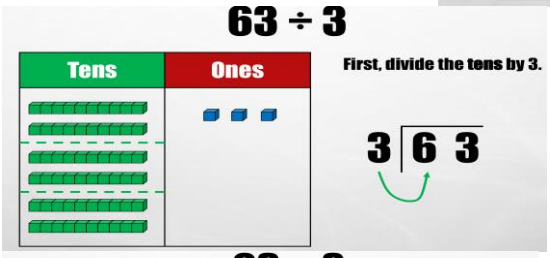
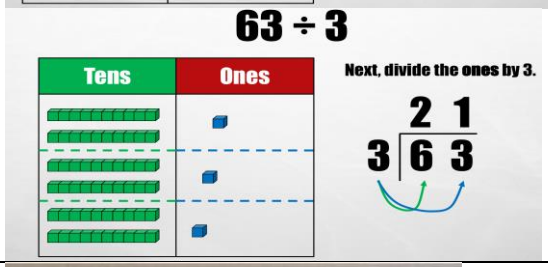
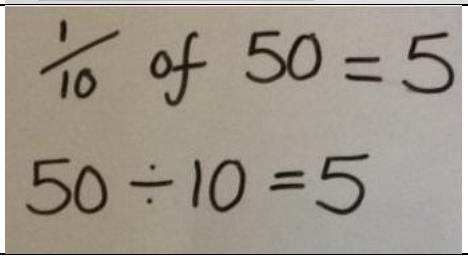
MENTAL STRATEGIES:

- Identify common factors, common multiples and prime numbers.
- Use common factors to simplify fractions mentally.
- Use estimation to check answers to calculations and determine, in the context of a problem, levels of accuracy.

Division

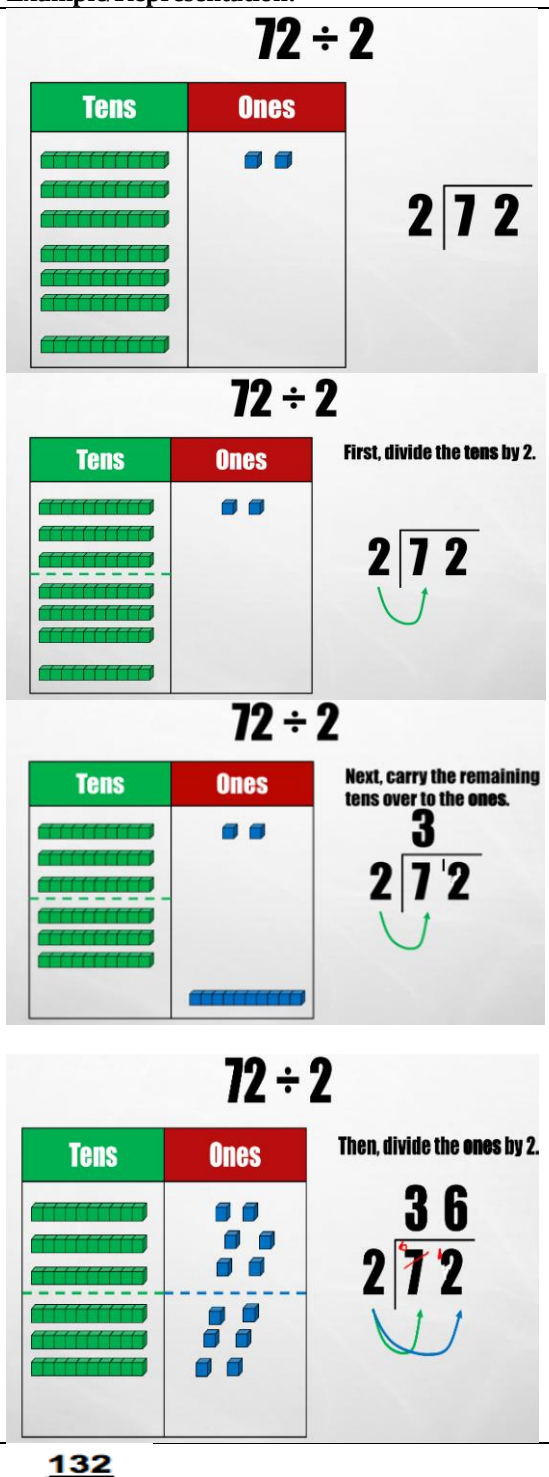
Year 3

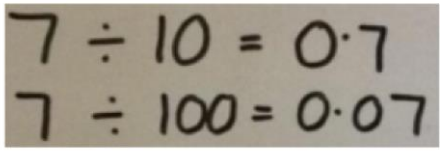
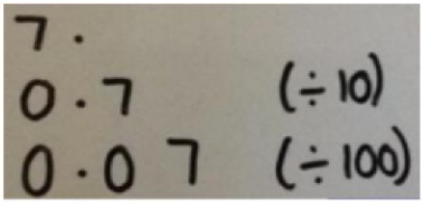
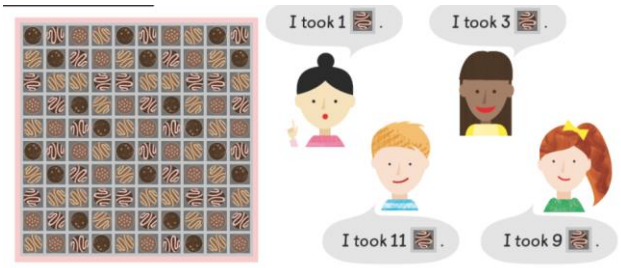
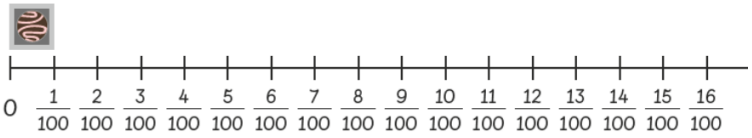
VOCABULARY: divided by, divide, divided into, grouping, divisor, short division, remainder, inverse divisor, dividend, quotient

Method	**Example/Representation:**
Use practical resources to support the expanded division method, that should lead onto the short division method. (TO ÷ O and HTO ÷ O)	Expanded division Children should be taught to make links with their times tables knowledge, to help partition numbers in different ways. $30 \div 5 = 6$ $30 \div 5 \equiv 6$ $51 \div 3 \equiv 17$ $5 \overline{)10 + 10 + 10}$ (2 + 2 + 2) $5 \overline{)20 + 10}$ (4 + 2) $3 \overline{)30 + 21}$ (10 + 7) Short division By the end of the year short division without carrying over. $4 \overline{)8\ 8}$ (2 2) $8 \overline{)8\ 8\ 8}$ (1 1 1)   
Pupils connect tenths to place value, decimal measures and that tenths is to divide by 10.	
MENTAL STRATEGIES: • Know the division facts from the 3, 4 and 8 times tables. • Use knowledge of place value to calculate division (e.g. 14 ÷ 2 = 7, 140 ÷ 2 = 70, 1400 ÷ 2 = 700).	

Year 4

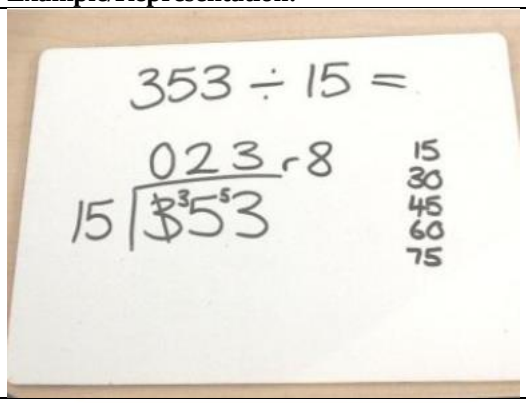
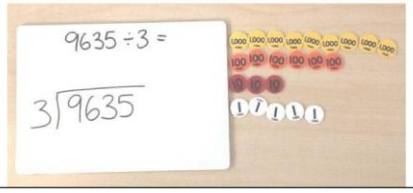
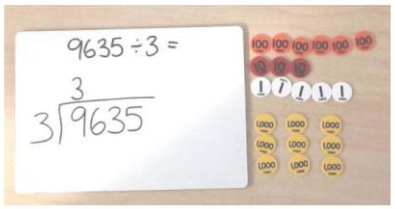
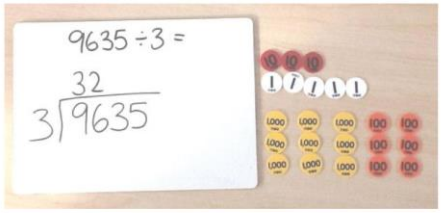
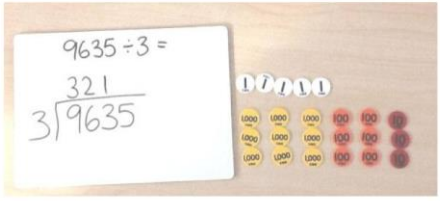
VOCABULARY: factor, divisor, dividend, quotient, divided by, divided into, remainders, divisible by, equivalent, short division, derive, inverse, remainder, multiples, exchange

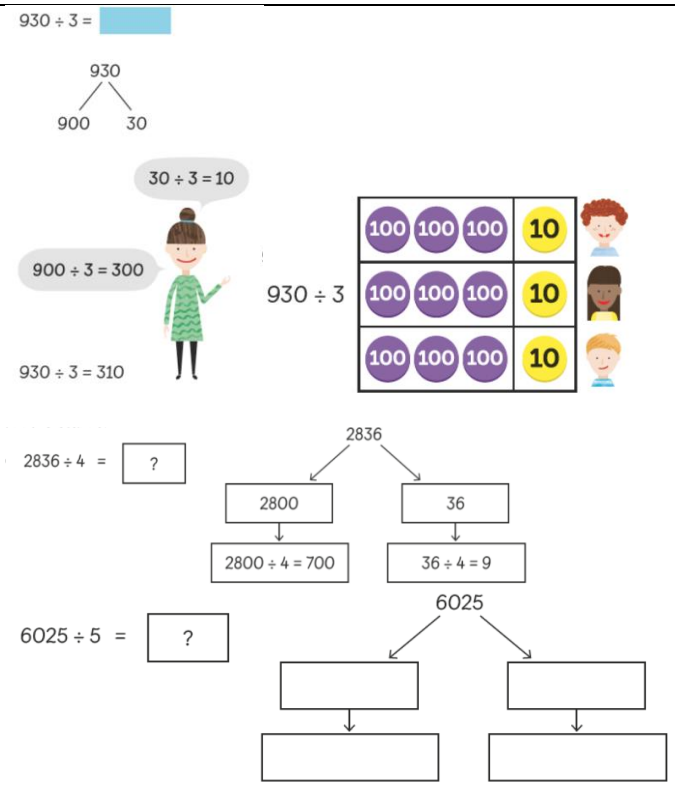
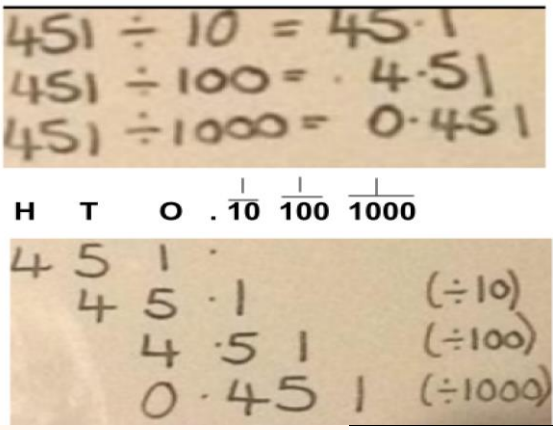
Method	**Example/Representation:**
Use practical resources, to support solving division number sentences with remainders.	
Use practical resources to support the short division method, where exchange across place value columns occurs. (HTO ÷ O)	132 3 396 102 3 306 0 82 4 328

Find the effect of dividing a 1 or 2-digit number by 10 and 100; identifying the value of the digits in the answer as ones, tenths and hundredths.	  
Count up and down in hundredths; recognise that hundredths arise when dividing an object by a hundred and dividing tenths by ten.	Counting in hundredths  How much chocolate did each of them take? The box of chocolates is made up of 100 pieces. is 1 hundredth of the box.  
MENTAL STRATEGIES: • Know all related division facts for all times tables up to 12 times table (by the end of Year 4).	

Year 5

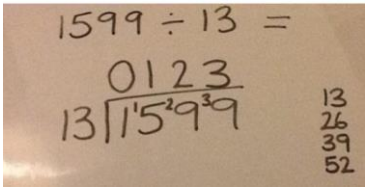
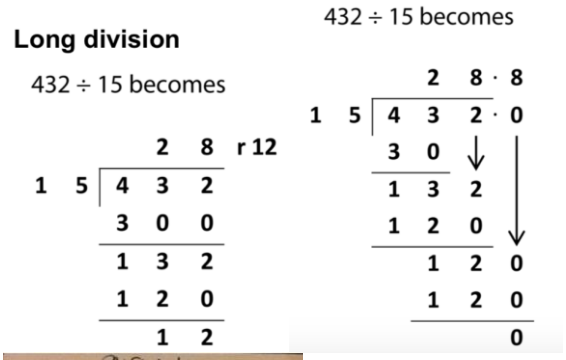
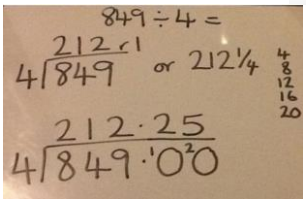
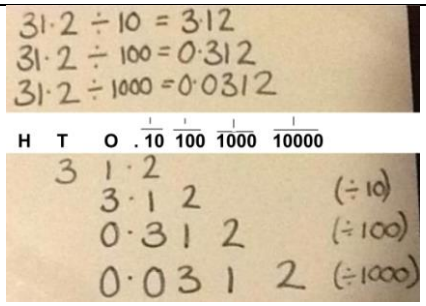
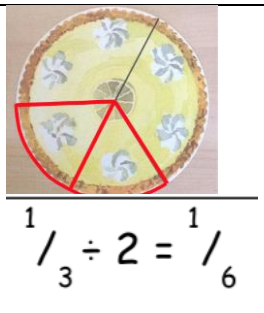
VOCABULARY: divide divisor, dividend, quotient, divided by, divided into, divisible by, remainder, quotient, inverse, decomposing, factor, decimal place, ones, tenths, scaling, short division

Method	**Example/Representation:**
Use short division to solve division number sentences with remainders. (HTO ÷ TO)	
Use practical resources, to support solving division number sentences with remainders. (ThHTO ÷ O)	 Create the dividend using Place Value counters.  Group the 1000s counters according to the divisor and write the number of groups above the line in the thousands column.  Group the 100s counters according to the divisor and write the number of groups above the line in the hundreds column.  Group the 10s counters according to the divisor and write the number of groups above the line in the tens column.

	
Divide whole numbers and those involving decimals by 10, 100 and 1000 by moving the digits around the fixed decimal.	
Children will solve problems involving division, including scaling.	Four children take some food and drink on a picnic. They share equally: 24 chocolate sweets 12 rounds of sandwiches 6 oranges 3 bags of crisps 1.5 litres of lemonade Explain how you can use scaling to calculate how much of each item they receive.
MENTAL STRATEGIES: • Multiply and divide numbers mentally drawing upon known facts. • Associate fractions with division.	

Year 6

VOCABULARY: divide, divisor, dividend, quotient, divided by, divided into, divisible by, remainder, factor, inverse, decimal place, ones, tenths, hundredths, scaling, formal written methods.

Method	**Example/Representation:**
Divide numbers up to 4 digits by a two-digit whole number, using the formal written method of division.	
Interpret remainders as whole number remainders, fractions or decimals.	 
Divide decimal numbers with up to 3 decimal places by 10, 100 and 1000, by moving the digits around a fixed decimal.	
Divide proper fractions by whole numbers.	
MENTAL STRATEGIES: • Use estimation to check answers to calculations and determine, in the context of a problem, levels of accuracy. • Calculate a fraction of an amount.	

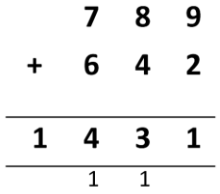
Source: Mathematics National Curriculum - September 2013

This appendix sets out some examples of formal written methods for all four operations to illustrate the range of methods that could be taught. It is not intended to be an exhaustive list, nor is it intended to show progression in formal written methods.

Addition and subtraction

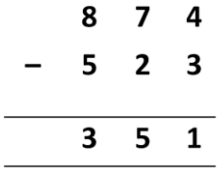
For

789 + 642 becomes



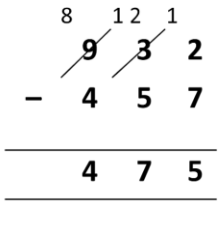
Answer: 1431

874 – 523 becomes



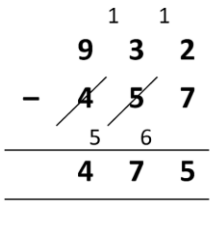
Answer: 351

932 – 457 becomes



Answer: 475

932 – 457 becomes

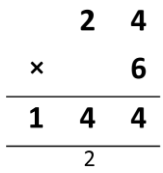


Answer: 475

multiplication, some pupils may include an addition symbol when adding partial products. For division, some pupils may include a subtraction symbol when subtracting multiples of the divisor.

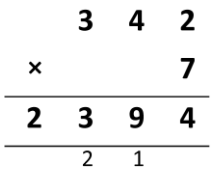
Short multiplication

24 × 6 becomes



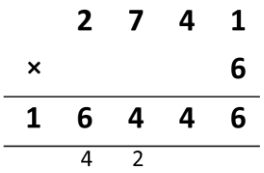
Answer: 144

342 × 7 becomes



Answer: 2394

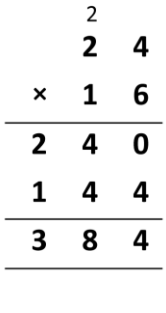
2741 × 6 becomes



Answer: 16 446

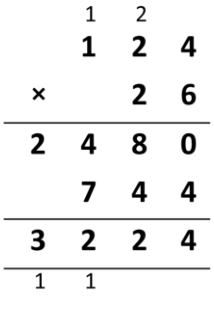
Long multiplication

24 × 16 becomes



Answer: 384

124 × 26 becomes



Answer: 3224

124 × 26 becomes

Answer: 3224

Short division

98 ÷ 7 becomes

$$\begin{array}{r} 1\ 4 \\ 7\overline{)\ 9\ 8} \\ {\scriptstyle 2} \end{array}$$

Answer: 14

432 ÷ 5 becomes

$$\begin{array}{r} 8\ 6\ \text{r}\ 2 \\ 5\overline{)\ 4\ 3\ 2} \\ {\scriptstyle 3} \end{array}$$

Answer: 86 remainder 2

496 ÷ 11 becomes

$$\begin{array}{r} 4\ 5\ \text{r}\ 1 \\ 11\overline{)\ 4\ 9\ 6} \\ {\scriptstyle 5} \end{array}$$

Answer: $45\frac{1}{11}$

Long division

432 ÷ 15 becomes

$$\begin{array}{r} 2\ 8\ \text{r}\ 12 \\ 15\overline{)\ 4\ 3\ 2} \\ 3\ 0\ 0 \\ \hline 1\ 3\ 2 \\ 1\ 2\ 0 \\ \hline 1\ 2 \end{array}$$

Answer: 28 remainder 12

432 ÷ 15 becomes

$$\begin{array}{r} 2\ 8 \\ 15\overline{)\ 4\ 3\ 2} \\ 3\ 0\ 0 \quad 15\times 20 \\ \hline 1\ 3\ 2 \\ 1\ 2\ 0 \quad 15\times 8 \\ \hline 1\ 2 \end{array}$$

$\frac{\cancel{12}}{\cancel{15}} = \frac{4}{5}$

Answer: $28\frac{4}{5}$

432 ÷ 15 becomes

$$\begin{array}{r} 2\ 8\cdot 8 \\ 15\overline{)\ 4\ 3\ 2\cdot 0} \\ 3\ 0 \\ \hline 1\ 3\ 2 \\ 1\ 2\ 0 \\ \hline 1\ 2\ 0 \\ 1\ 2\ 0 \\ \hline 0 \end{array}$$

Answer: 28·8

Godwin Junior School

Ideas for journaling

Five types of journaling:

Journal entries follow a simple format. The date and title are at the top of the page, followed by a problem to solve, and space for your learner to respond underneath.

There are five different types of journal entries:

1. Descriptive

2. Evaluative

3. Creative

4. Investigative

5. Formative

1. Descriptive journaling

Descriptive questions ask children to describe the methods they have used or explain a concept. For example, 'How do you multiply a two-digit number by another two-digit number?' or 'Describe a square.' Descriptive journaling lets you see if learners have misconceptions or gaps in their understanding.

To get your learners started, ask them to:

- Write a set of instructions
- Take photos of concrete manipulatives and explain how they used them
- Write a letter to another child
- Create a poster to explain a concept
- Write a reflection of the lesson
- Annotate their drawings and diagrams

It's important to emphasise the mathematical language that you want your class to include. Displaying vocabulary, using prompt sheets, and modelling will help them with correct terminology.

2. Evaluative journaling

Evaluative tasks ask children why they chose a method and how helpful it was to solve the problem. Children must justify the choices that they've made.

Questioning can help children to verbalise their thinking. Ask your learners:

- Which method was best for solving this problem?
- Why did you choose this way?
- How can you show me that this method is most efficient?
- Why don't you recommend this strategy?
- How do you know I am wrong?

3. Creative journaling

Creative journaling lets children develop models and stories to show their understanding. For example, 'The answer is 25. What could the question be?' Creative journaling lets you challenge all learners by providing low threshold–high ceiling problems.

To get your learners started, ask them to:

- Create their own number puzzle
- Write a new word problem for a friend to solve
- Give them an answer and ask them what the question might be
- Write a story to go with a calculation

Some children will find it hard to know where to start. Providing word banks, templates, and modelled examples can be very useful for them.

4. Investigative journaling

Children can explore a problem and record their findings, such as, 'I buy a toy in a shop. I get 20p change. What coins did I get?' This helps them to make connections to previous learning and verbalise their ideas.

Scaffolded support can help children who might struggle to know where to begin. This could include:

- Providing examples of different methods
- Photos and diagrams of modelled examples

- Group or paired journaling
- Sentence starters
- Speech bubbles for children to write sentences in
- Using concrete manipulatives and taking photos of the process

5. Formative journaling

Children show you what they have learned and understood in formative journal entries. This is an opportunity for them to reflect on what they found challenging and why. Formative journals are a great way to assess and record progress.

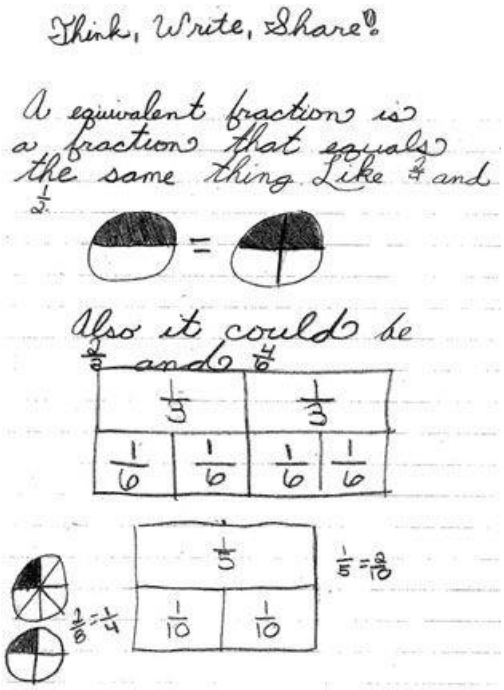
You might ask your class:

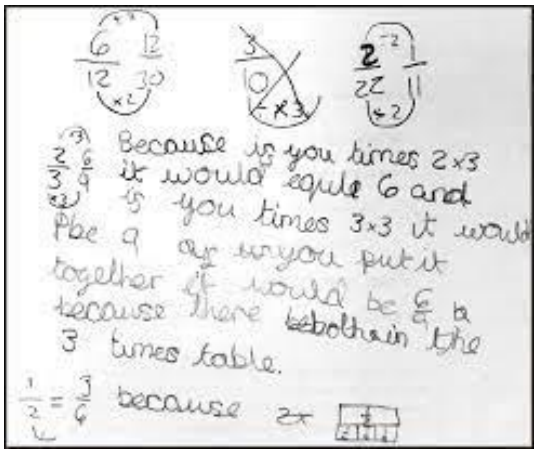
- What mistakes did you make? How did you learn from them?
- What did you notice?
- What did you know before and what do you know now?
- Does this remind you of any other work you've done?
- What does this tell you?

Examples of journal activities in the classroom

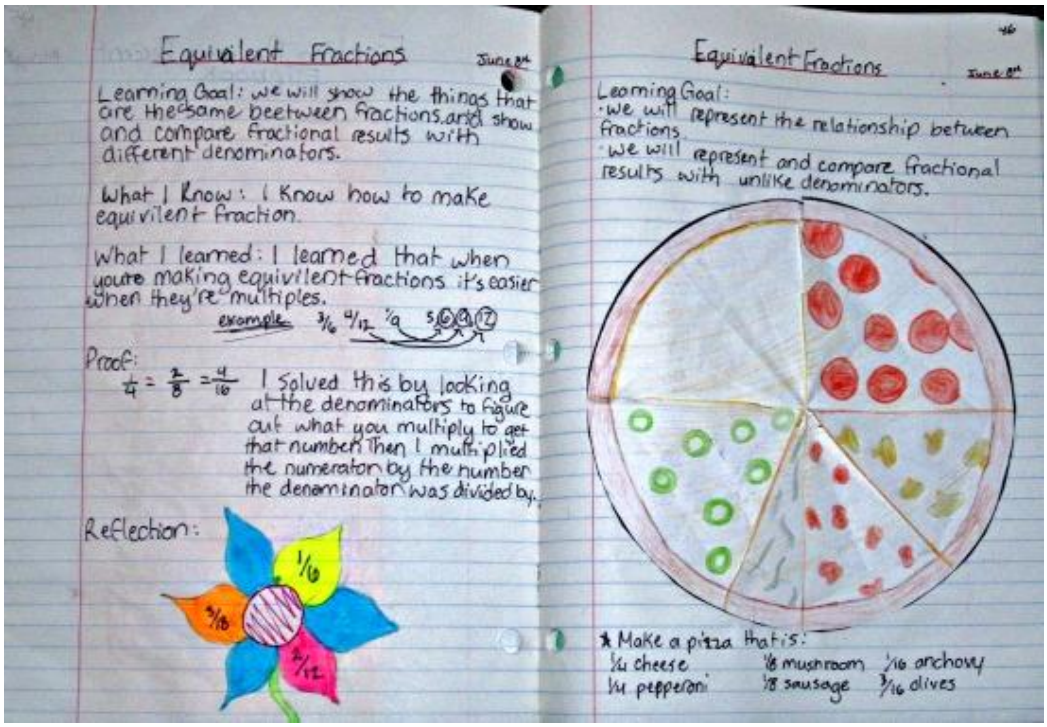
Jottings - diagrams - pictorial representations- written explanations

Explanations should become less descriptive and more evaluative as children progress through school.



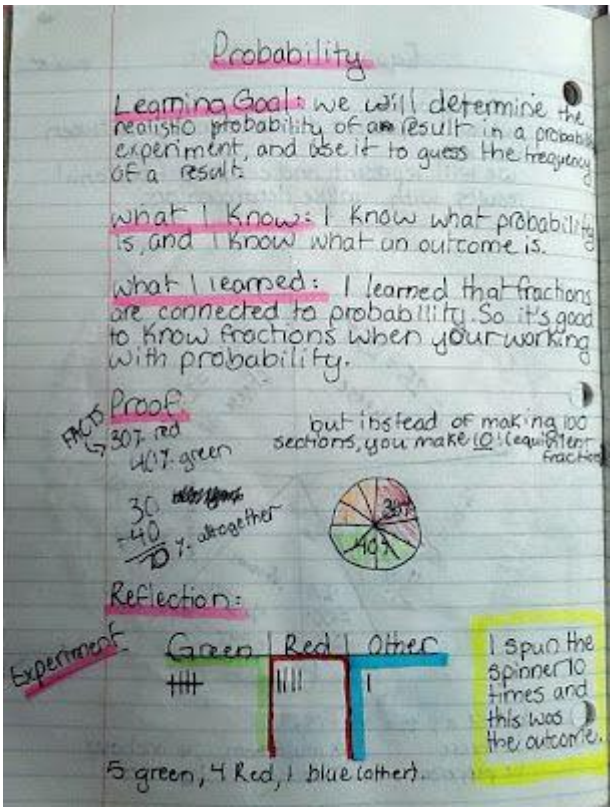


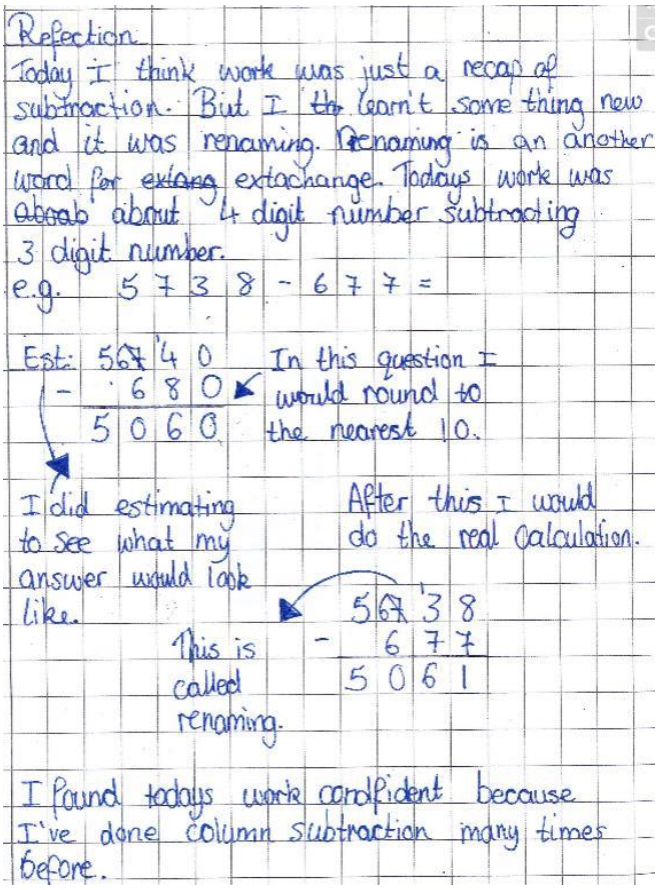
Encourage children to show and articulate their understanding of the connection between concrete, pictorial representations and the abstract.



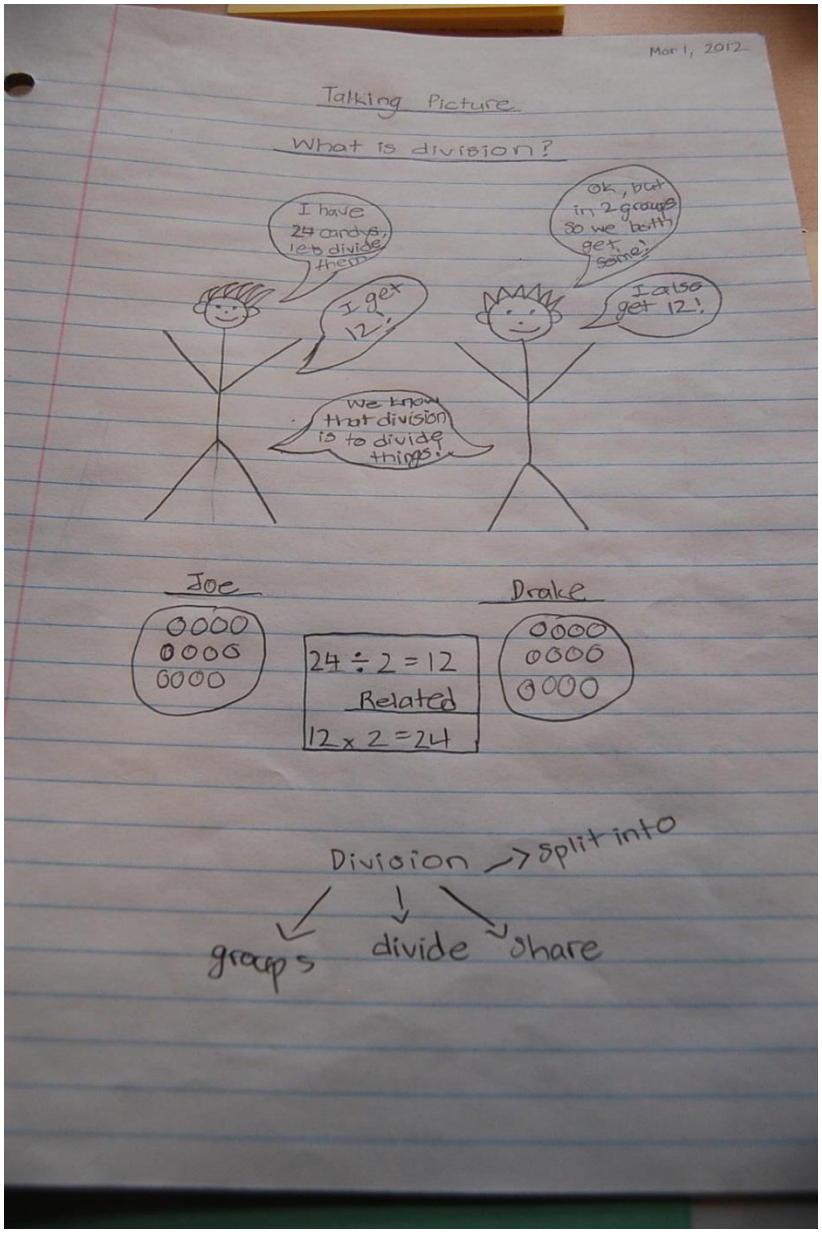
End of lesson/unit reflections

Encourage children to make generalisations in their reflections.





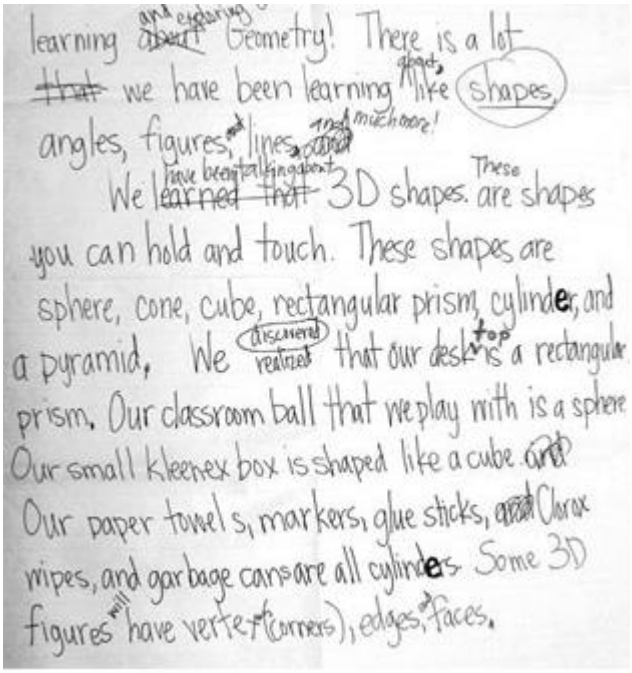
Use of speech bubbles to encourage reasoning/written explanations:

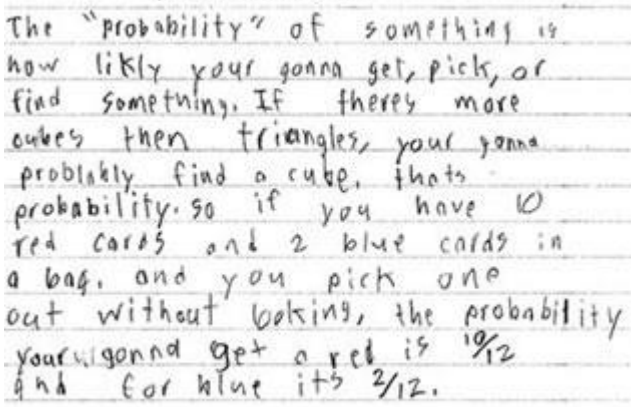


Write a letter to someone explaining a concept/method/pattern

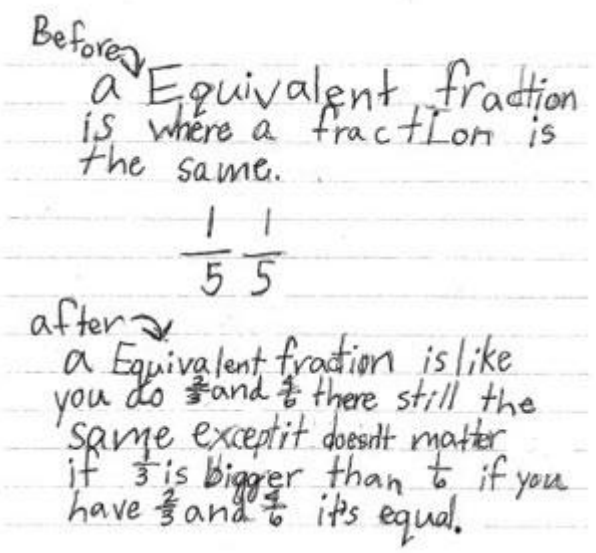
Children could write to:

· Another year group · Another teacher· The Head Teacher · The Maths Leader · A celebrity · An alien · A parent · A younger sibling


learning and exploring Geometry! There is a lot that we have been learning about like shapes, angles, figures, lines and more! We have been talking about 3D shapes. These are shapes you can hold and touch. These shapes are sphere, cone, cube, rectangular prism, cylinder, and a pyramid. We discovered that our desk top is a rectangular prism. Our classroom ball that we play with is a sphere. Our small kleenex box is shaped like a cube and Our paper towels, markers, glue sticks, and Clorox wipes, and garbage cans are all cylinders. Some 3D figures will have vertex (corners), edges, faces.


probability.

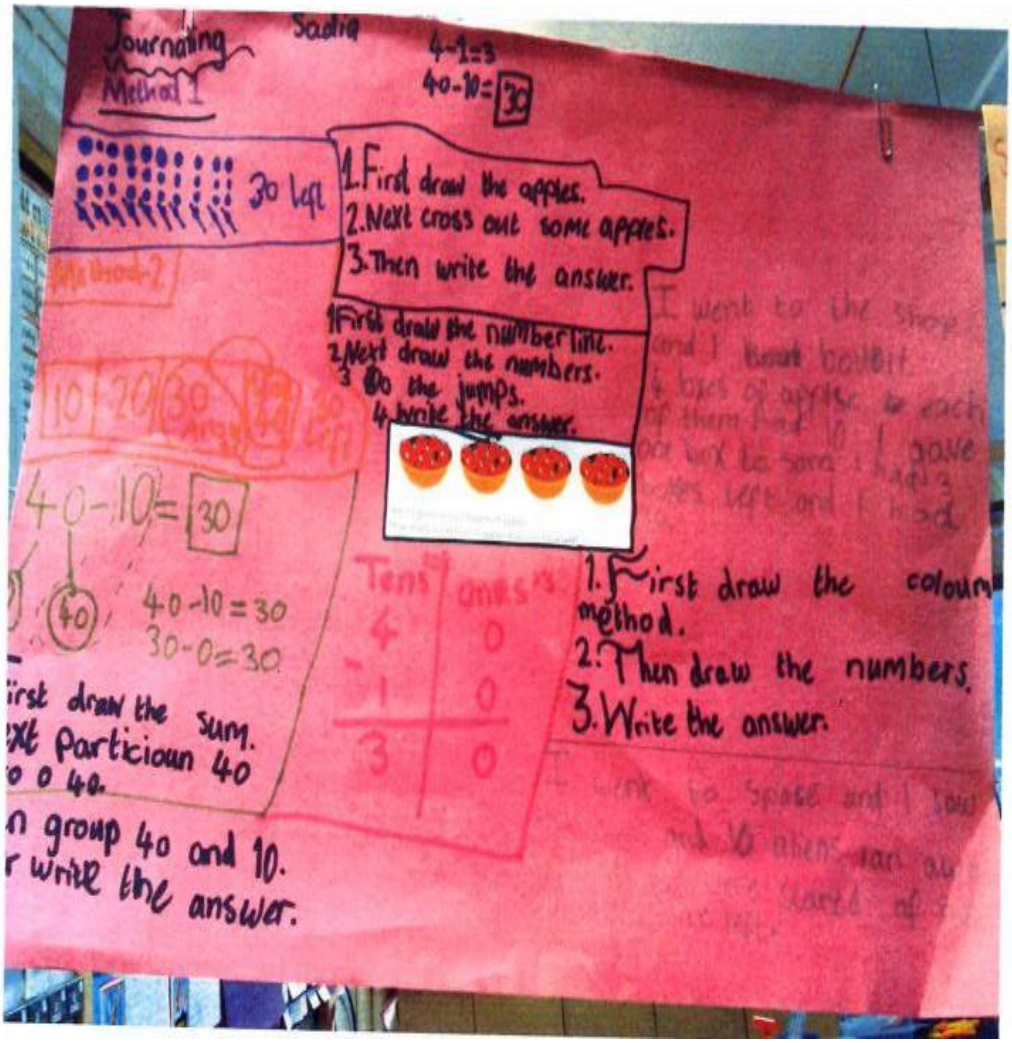
The "probability" of something is how likly your gonna get, pick, or find something. If theres more cubes then triangles, your gonna probably find a cube, thats probability. so if you have 10 red cards and 2 blue cards in a bag, and you pick one out without looking, the probability your gonna get a red is 10/12 and for blue it's 2/12.


Before
a Equivalent fraction is where a fraction is the same.

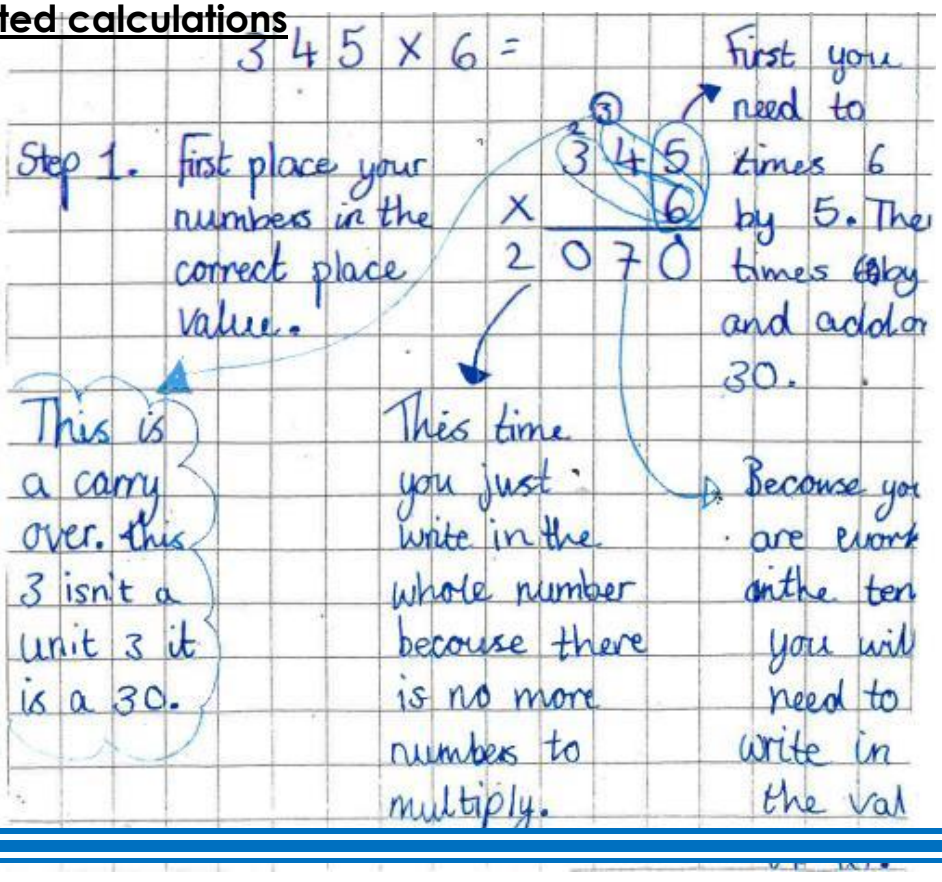
$\frac{1}{5}$ $\frac{1}{5}$

after
a Equivalent fraction is like you do $\frac{2}{3}$ and $\frac{4}{6}$ there still the same exceptit doesnt matter if $\frac{1}{3}$ is bigger than $\frac{1}{6}$ if you have $\frac{2}{3}$ and $\frac{4}{6}$ its equal.

Group Journaling

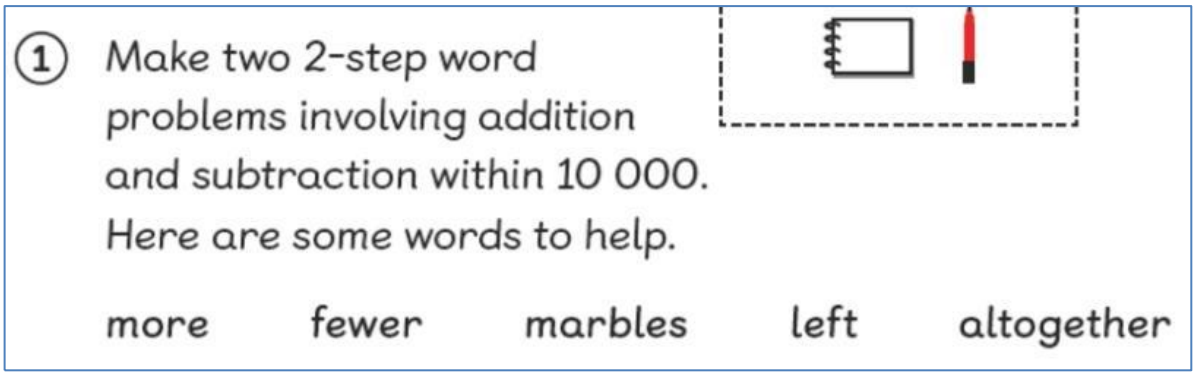


Annotated calculations



Children write their own world problems.

Provide templates and word banks MNP is a good source for these. You could also use data or graphs with missing information



Exploring mistakes:

Provide pupils with a deliberate mistake that has been made and ask them to identify the mistake and explain the correct method.

Concept Cartoons:

Children to record their own thoughts or even create their own concept cartoons.

Reasoning resources:

MNP books

https://www.ncetm.org.uk/teaching-for-mastery/mastery-materials/primary-mastery-professional-development/

https://mathshub.thirdspacelearning.com/resources?text=reasoning

https://www.ncetm.org.uk/classroom-resources/pm-reasoning-skills/

https://whiterosemaths.com/resources/primary-resources/primary-sols/

https://www.ncetm.org.uk/teaching-for-mastery/mastery-materials/primary-mastery-professional-development/