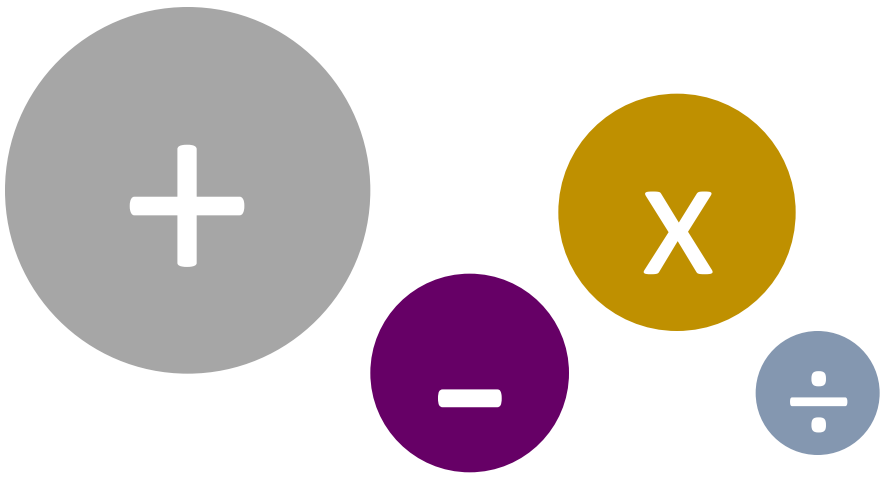
Marden Bridge Middle School

Believe, achieve, succeed

Calculation Policy

2023



Through our mathematics curriculum at Marden Bridge Middle School, we have developed a mastery approach to our teaching and learning, ensuring that children develop skills sequentially using a small step, approach and building a depth of understanding for each mathematical skill. Our curriculum aims to support children with 'bridging the gap' between abstract mathematical concepts and concrete representations so that they can manipulate and visually represent their ideas, accessing mathematical learning by problem-solving and the use of rich language.

We aim to encourage a love of mathematics, through designing engaging lessons that are full of practical hands-on activities designed to stimulate and promote reasoning skills and problem-solving. Our lessons involve the use of manipulatives to explore concepts and maths talk to investigate ideas and strategies to support learning. The use of concrete resources further supports children to deepen their understanding of mathematical concepts and make connections that allows them fully comprehend written methods.

In order to develop these skills children must have a firm understanding of written and mental calculations. This documents details the methods we use at Marden Bridge along with key vocabulary that will support children in their journey of mathematics. These methods have been produced in line with the National Curriculum (DfE, 2013). Our calculation policy is displayed in all classrooms across school regardless of curriculum area. Numeracy across the curriculum, is essential in building children's understanding of mathematics using various real life contexts.

Throughout this document the use of key terminology and STEM sentences are clearly signposted. Promoting and using the correct mathematical language is critical to embedding a good mathematical understanding. All new vocabulary is carefully introduced at appropriate times with concrete and pictorial representations to support learning. High expectations of the correct language is expected across the curriculum promoting written explanations and reasoning.

National Curriculum

Addition and Subtraction

Key Stage 2 : Add and subtract whole numbers with more than 4 digits, including using formal written methods.
Add and subtract numbers mentally.
Use rounding to check answers to calculations.
Solve addition and subtraction multi-step problems in contexts, deciding which operation and methods to use and why.

Key Stage 3 : Use the four operations, including formal written methods, applied to integers, decimals, and fractions, all both positive and negative.
Recognise and use relationships between operations including inverse operations.
Interpret fractions and percentages as operators.
Use approximation through rounding to estimate answers and calculate possible resulting errors.

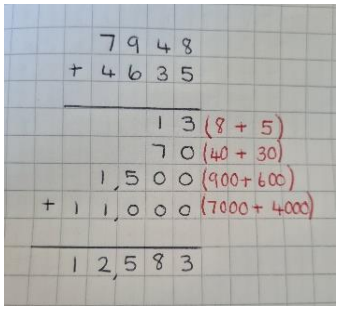
Multiplication and Division

Key Stage 2 : Multiply numbers up to 4 digits by a one- or two-digit number using a formal written method, including long multiplication for two-digit numbers
Multiply and divide numbers mentally drawing upon known facts
Divide numbers up to 4 digits by a one-digit number using the formal written method of short division and interpret remainders appropriately.
Multiply and divide whole numbers and those involving decimals by 10, 100 and 1000
Solve problems involving multiplication and division, including scaling by simple fractions and problems involving simple rates.

Key Stage 3 : Interpret when the structure of a numerical problem requires additive, multiplicative or proportional reasoning.
Understand that a multiplicative relationship between 2 quantities can be expressed as a ratio or a fraction.
Use the concepts and vocabulary of prime numbers, factors, multiples, common factors, common multiples, hcf, lcm, prime factorisation, including using product notation and the unique factorisation property.
Divide a given quantity into 2 parts in a given part:part or part:whole ratio; express the division of a quantity into 2 parts as a ratio.
Apply the four operations in algebraic contexts.

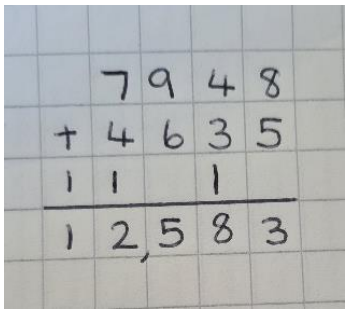
Addition and Subtraction Written Methods

Formal Written Method for addition (expanded)



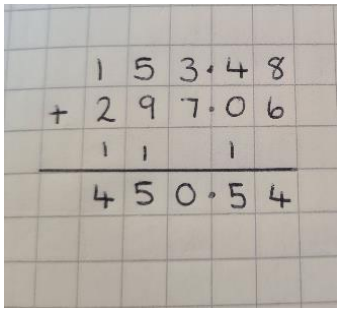
Introduction to the column method through partitioning. This should be introduced alongside the concrete and pictorial representations. Addition starts from the right hand column (in this case the ones).

Formal Written Method for addition



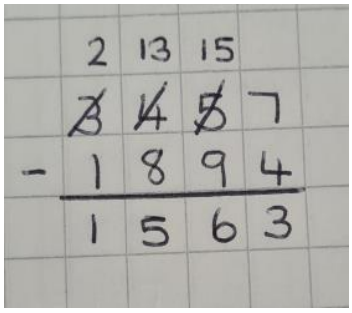
When setting up the formal written method children should leave a line underneath their calculation. This space should be used to record any exchanges that may take place. Missing a line allows children to clearly record their exchanges to be included in the next step.

Formal Written Method for addition involving decimals



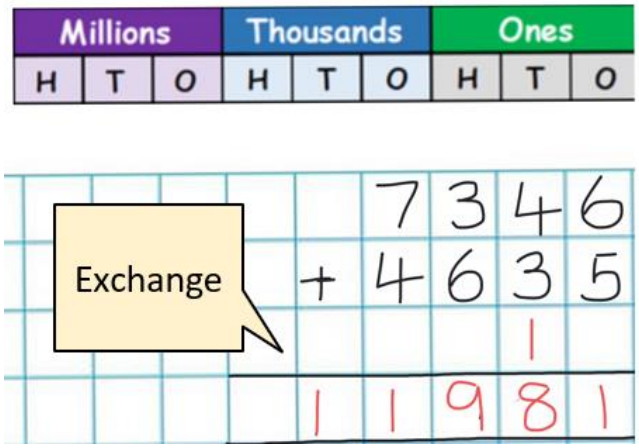
When using the formal written method to add decimals children should again set out their calculation ensuring they leave a line below to record any exchanges. Note the decimal point does not have its own column.

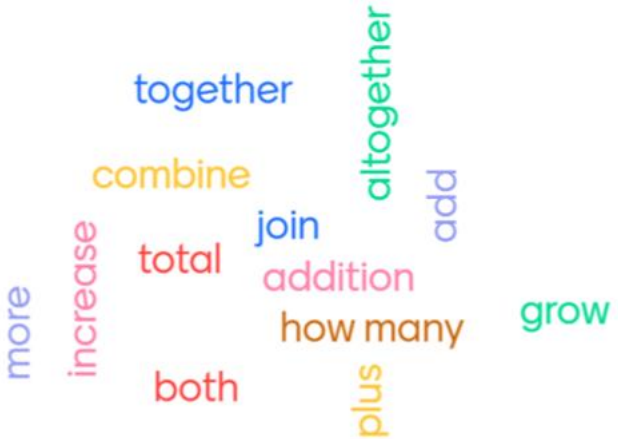
Formal Written Method for subtraction



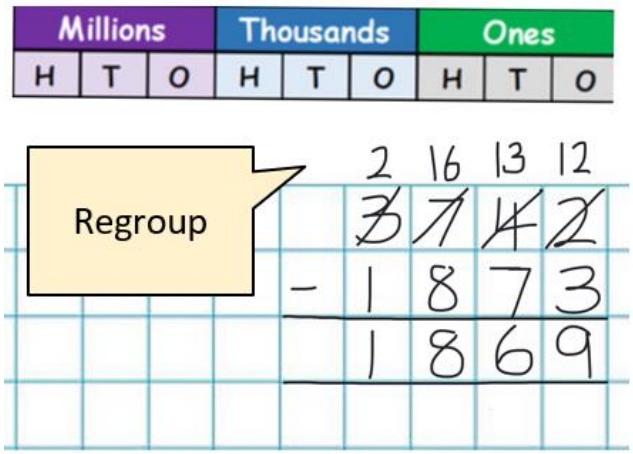
When using the formal written method for subtraction it is important to leave a line above the calculation. This is to allow for any regrouping which may need to take place. Note that this is clearly written above the original number.

Addition and Subtraction
STEM Sentences and Key Vocabulary





Addition is commutative.
If the column sum is equal to ten or more, we must exchange.
If we change the order of the addends, the sum remains the same.
If one addend is increased by an amount and the other addend is decreased by the same amount, the sum remains the same.
I have added ___ to this addend so I must subtract ___ from the other addend to keep the sum the same.



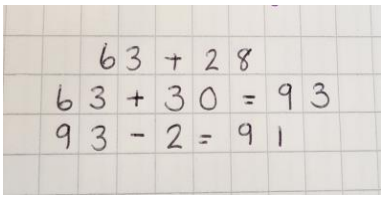
Subtraction is not commutative
If there is an insufficient number to subtract from in a given column, we must regroup from the column to the left.
The more we subtract, the less we are left with. The less we subtract, the more we are left with.
If the minuend and the subtrahend are changed by the same amount, the difference remains the same.
In a balanced equation, If I add an amount to the minuend or subtrahend, I need to add the same amount to the subtrahend or minuend

Addition and Subtraction
Mental Strategies

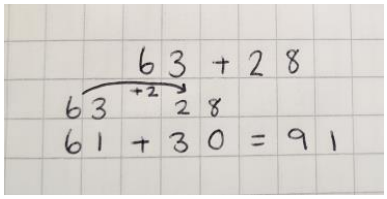
At Marden Bridge we routinely focus on using mental strategies to develop a deeper conceptual understanding and a comfortability with number. We use number talks throughout both key stages to help pupils develop their computational fluency and flexible thinking. These strategies provide opportunities to clarify and communicate their own ideas, consider and try other strategies, investigate and apply mathematical connections and relationships. Pupils use these strategies to build a variety of techniques, learning from their mistakes in order to solve problems.

Addition

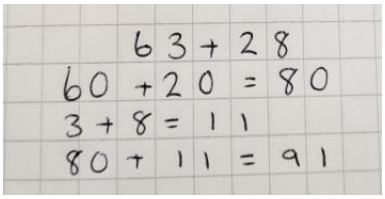
Round then adjust



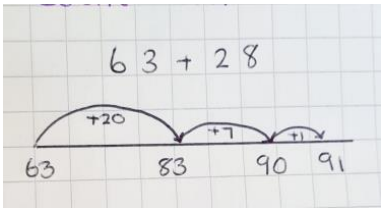
Take and Give



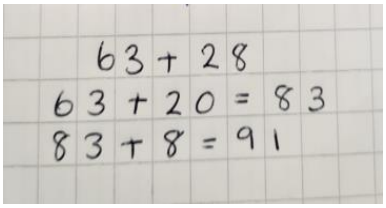
Partition



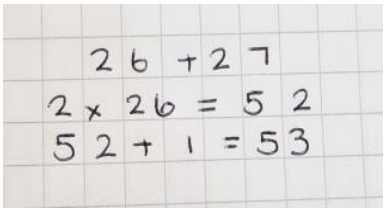
Count on



Break apart

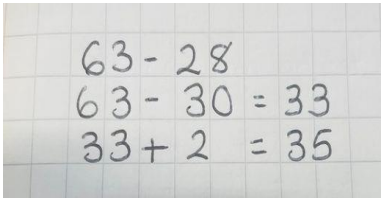


Near doubles

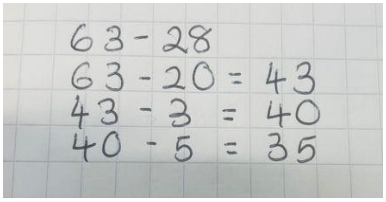


Subtraction

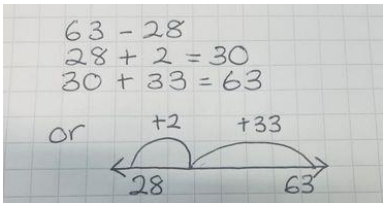
Round to a multiple of ten



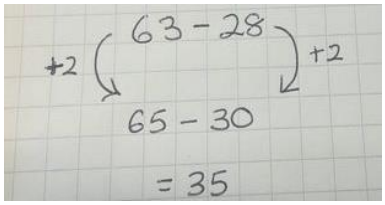
Partition



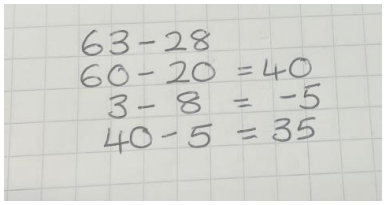
Count on



Constant Difference

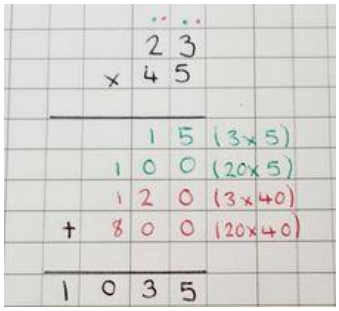


Using negatives



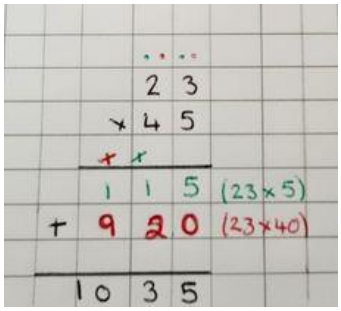
Multiplication and Division Written Methods

Formal Written Method for multiplication (expanded)



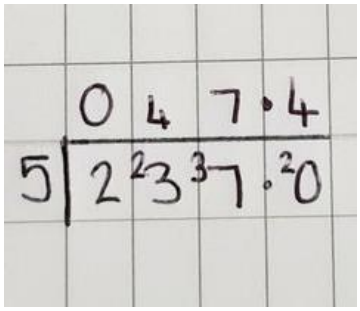
Introduced alongside the grid method to aid understanding. Each multiplication calculation is recorded. Multiplication starts from the right hand column (in this case the ones).

Formal Written Method for multiplication



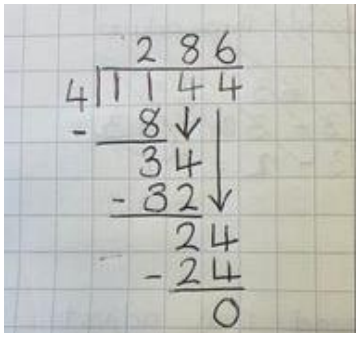
Children use the short written method using exchanging with numbers appropriate to their current level of attainment. The digit exchanged goes underneath the answer. This is introduced alongside the grid method which children should be familiar with from year 4.

Formal Written Method for short division



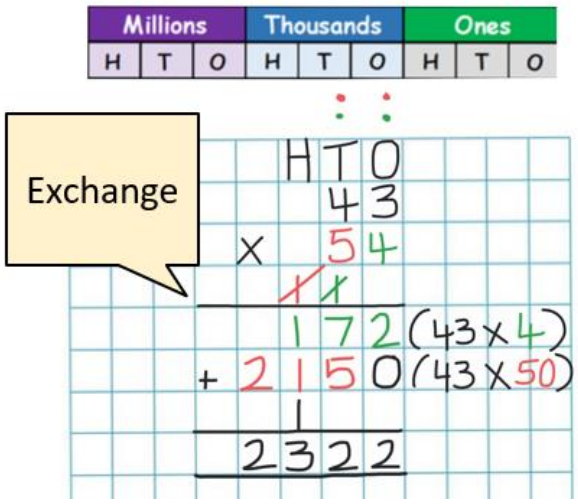
Children consolidate their previous learning of the formal method in year 5. Key vocabulary such as divisor, dividend and quotient are introduced.

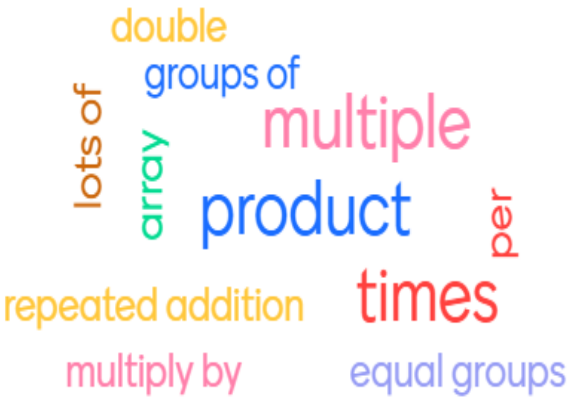
Formal Written Method for long division



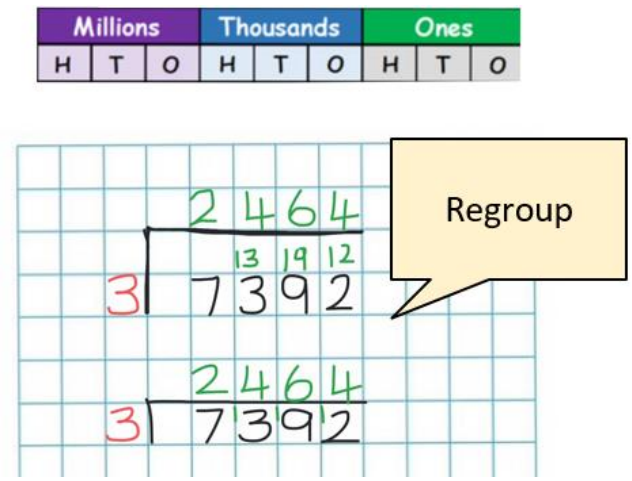
Children are introduced to the formal written method for long division in year 6. The children are supported in this method by DMSB (Divide, Multiply, Subtract, Bring down).

Multiplication and Division
STEM Sentences and Key Vocabulary





Multiplication is commutative.
Factor times factor is equal to the product
To multiply two two-digit numbers, first multiply by the ones, then multiply by the tens, then add them together.
To multiply a three-digit number by a two-digit number, first multiply by the ones, then multiply by the tens, then add them together.



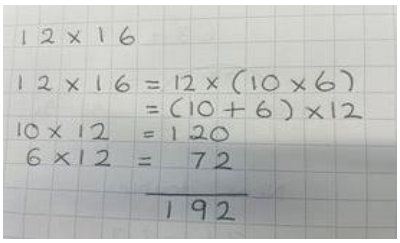
Division is not commutative.
Dividend divided by divisor is equal to the quotient.
If there is an insufficient number to subtract from in a given column, we must regroup from the column to the left.
If the dividend is a multiple of the divisor there is no remainder. If the dividend is not a multiple of the divisor. Thre is a reaminader.
The remainder is always less than the divisor.

Multiplication and Division Mental Strategies

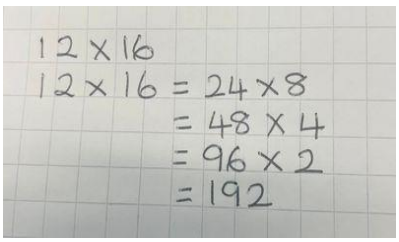
At Marden Bridge we routinely focus on using mental strategies to develop a deeper conceptual understanding and a comfortability with number. We use number talks throughout both key stages to help pupils develop their computational fluency and flexible thinking. These strategies provide opportunities to clarify and communicate their own ideas, consider and try other strategies, investigate and apply mathematical connections and relationships. Pupils use these strategies to build a variety of techniques, learning from their mistakes in order to solve problems.

Multiplication

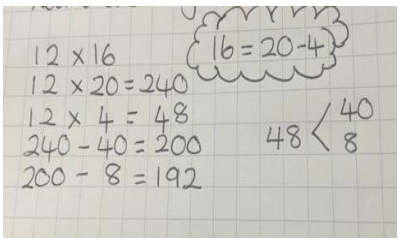
Break a factor



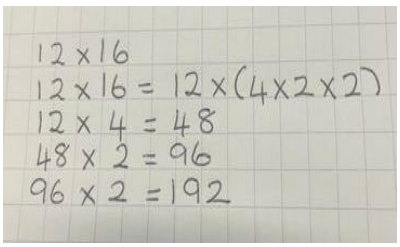
Halving and Doubling



Round and Adjust

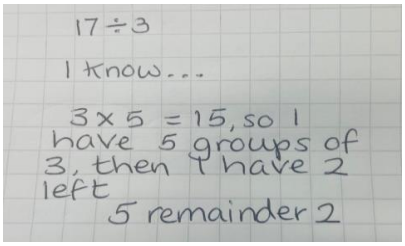


Factor a Factor

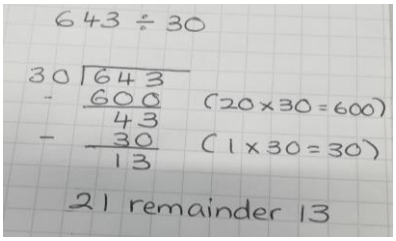


Division

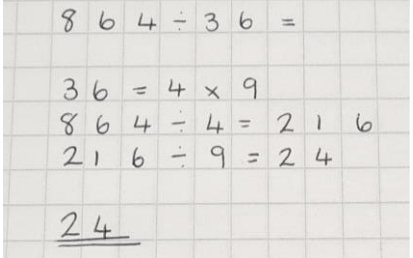
Multiply instead



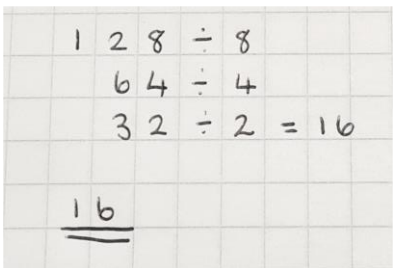
Chunking



Using Factors

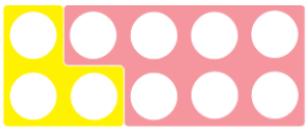


Half and then Half

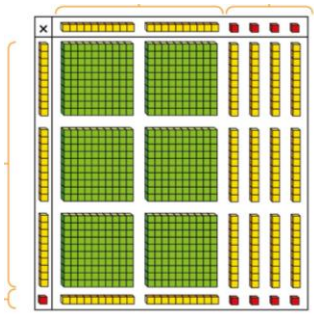


Representations

Using both physical manipulatives and ICT we allow children to explore new concepts. Manipulatives can be a great way of supporting your children to develop and deepen their understanding of new concepts. It can also aid them in solving tricky problems.



numicon



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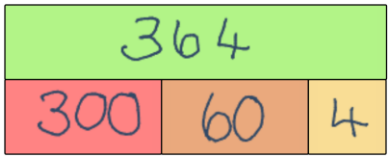
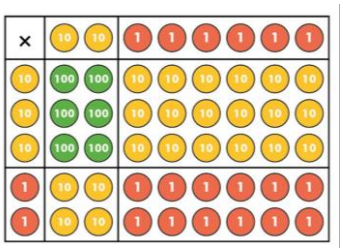
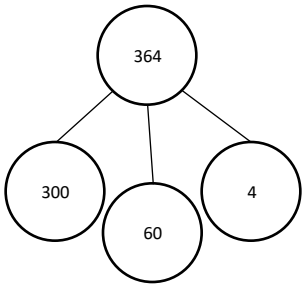


bar model

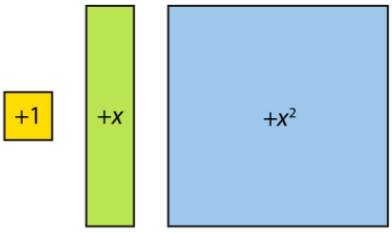
tens frames



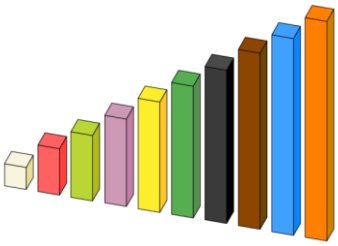
place value counters



part whole model



algebra tiles



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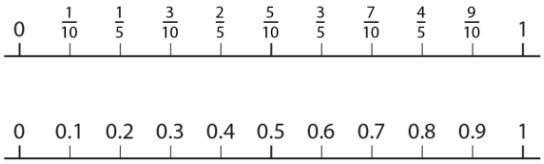

number lines

1000	2000	3000	4000	5000	6000	7000	8000	9000
100	200	300	400	500	600	700	800	900
10	20	30	40	50	60	70	80	90
1	2	3	4	5	6	7	8	9

gattegno chart