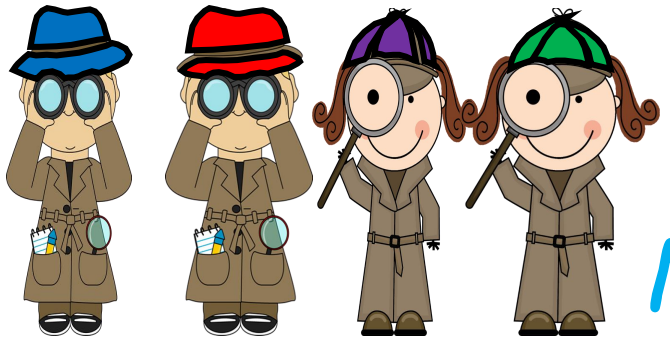
TRIMLEY ST. MARTIN



Mathematics Policy

Trimley St Martin Primary School
Mrs. J MacFarlane – Mathematics Lead
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Mathematics Policy

At Trimley St Martin

We have the power to be passionate about every child achieving maths mastery. A mathematical concept or skill has been mastered when, through exploration, clarification, practice and application over time. a person can represent it in multiple ways,

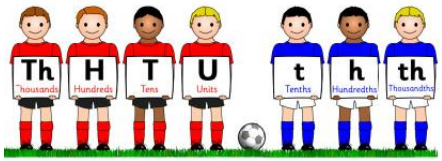
We have the power to enable all of our children to have the mathematic language to be able to communicate related ideas, and can think mathematically with the concept so that they can independently apply it to a totally new problem in an unfamiliar situation.

We have the power to offer all of our children the opportunity to use a wide variety of equipment and visual images. We move between concrete, pictorial and abstract, weaving reasoning and problem solving into every lesson. Children love talking about maths and love to embrace challenge.

Mathematical Learning for the Mathematician....

Number:

Place



Addition and Subtraction

Multiplication and Division

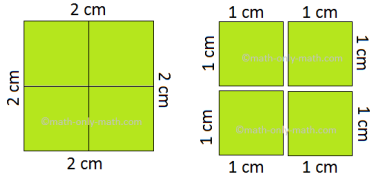
Fractions

Decimals

Measurement:

Length and Perimeter

Area

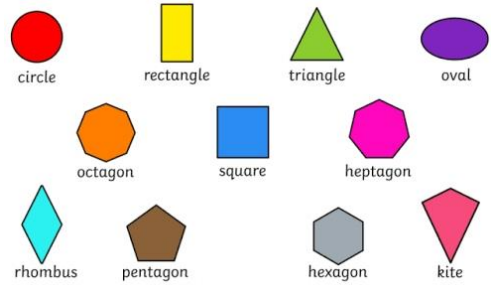


Money

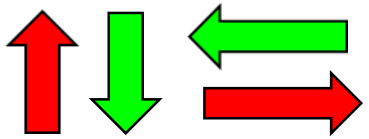
Time

Geometry:

Properties of Shape



Position and Direction

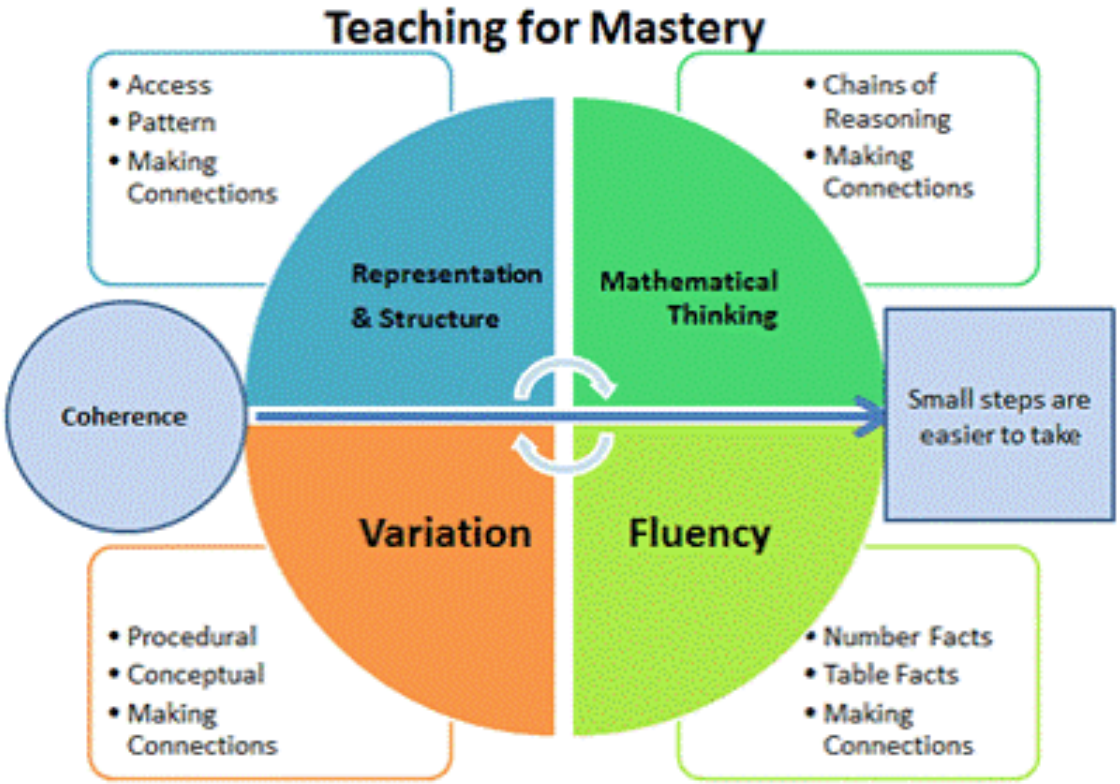


_Statistics

Our Curriculum For Mathematics:

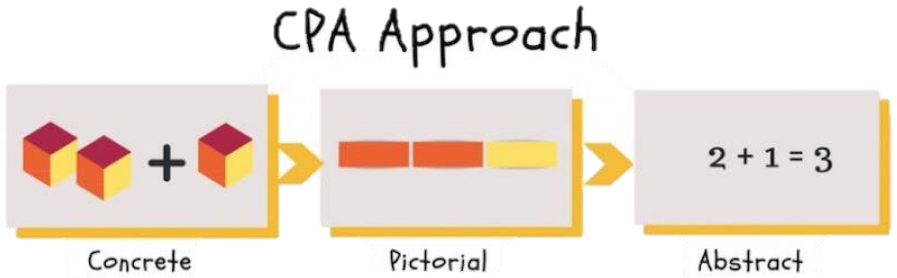
Intent:

At Trimley St Martin we believe mathematics should be taught in a very thorough and consistent approach within every classroom to enable every child to use this knowledge to make well informed decisions and develop a clear understanding of the world around them.



Implementation:

We follow a mastery approach to mathematics and we work hard to ensure mathematical lessons are challenging and informative in order to capture children's interest and bring mathematics alive, making it real and in context. Teaching sequences follow the Concrete, Pictorial ,Abstract.



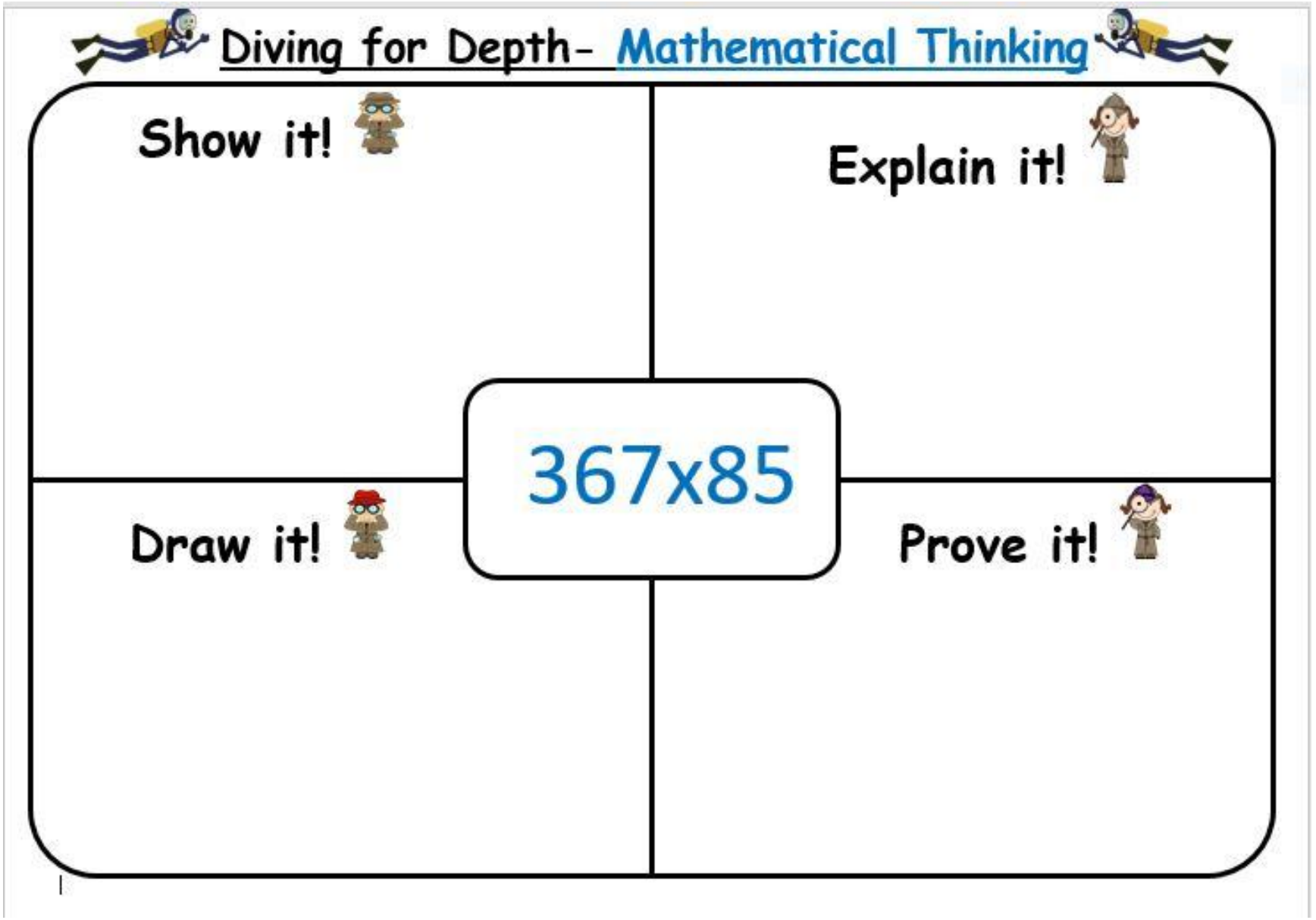
Impact:

Mathematics will then equip Trimley St Martin students with the skills to problem solve and progress in the future within the world. Mathematics will help Trimley St Martin children to build resilience. This will help give them direction and resilience in life. Teaching will be highly modelled and then allow children to develop knowledge through questioning and debating approaches and methods for themselves.

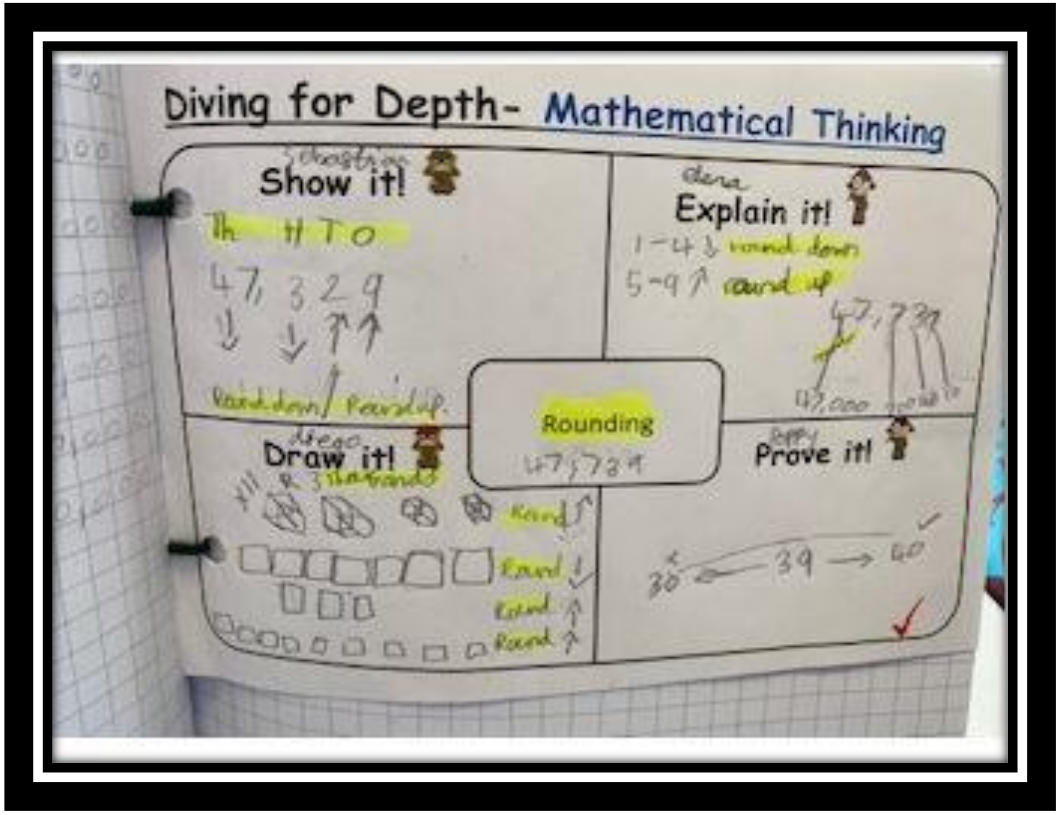
We use Mathematics Detectives to help us with our Mathematical Thinking!

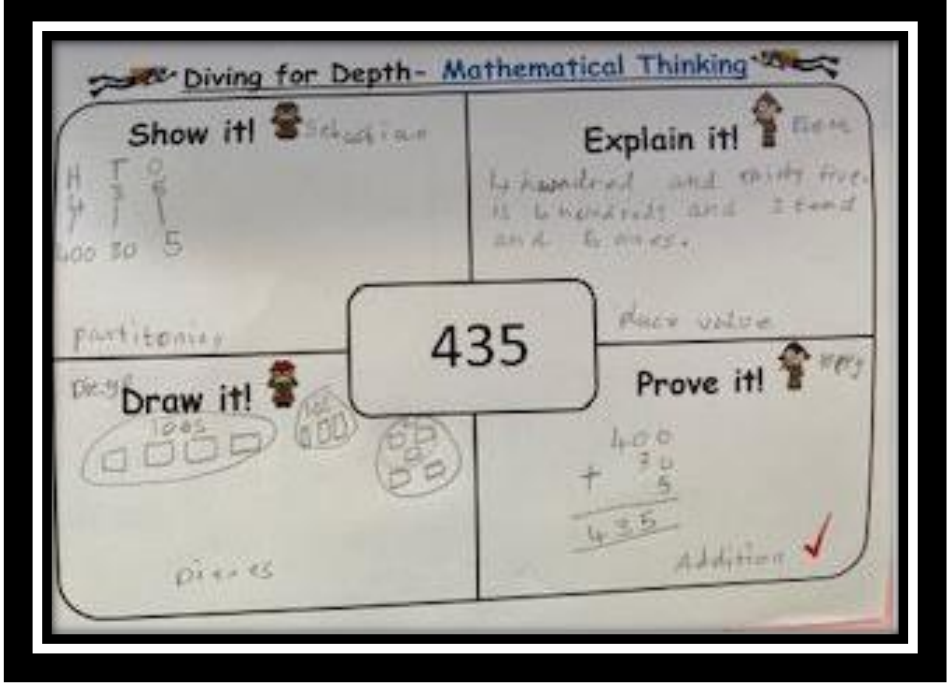
Sebastian Show It !	Diago Draw it!	Poppy Prove it!	Elena Explain it!

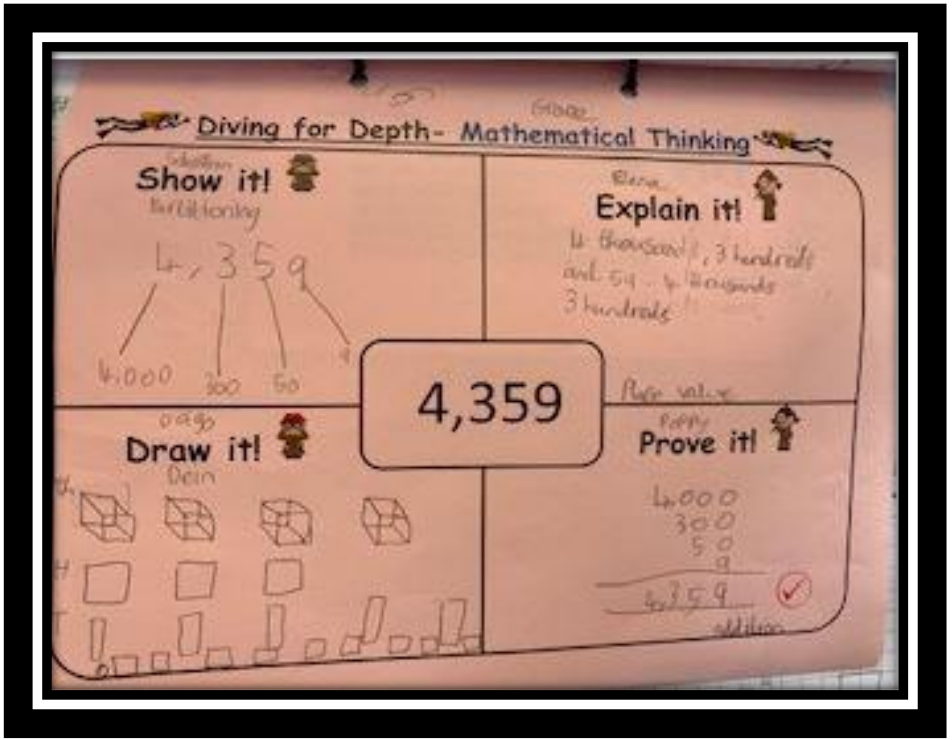
We use Mathematics Detectives to help us with our Mathematical Thinking!



Examples…


Diving for Depth- Mathematical Thinking
Show it!
Explain it!
Rounding
47,739
Draw it!
Prove it!


Diving for Depth- Mathematical Thinking
Show it!
Explain it!
435
Draw it!
Prove it!


Diving for Depth- Mathematical Thinking
Show it!
Explain it!
4,359
Draw it!
Prove it!

Put Your Mathematical Detectives' Glasses On. Use these questions to help you.

Convince me!

How do you know that you are correct?

Can you convince me that this is not a correct answer?

How can you prove... disprove... to support your argument?

What information could you use to support this view?

Evaluate it!

How would you rate your choice of method?

What choices would you make if you were to solve the problem again?

Why would it be better that you do it this way?

What is the importance of...?

Explain it!

Can you explain the problem to me in your own words?

How did you reach your answer?

What is the relationship between..?

What conclusions can you draw?

Why do you think that this is the case?

Prove it!

How would you independently prove that you have a correct answer?

Can you use another method of representation to help you do this?

What examples can you find to support this?

What non-examples can you find?

Draw It!

How will you solve this problem using what you have learnt?

Would you be able to use the above method to solve a different problem?

Can you invent your own method?

Can you invent your own problem?

Response Time : We use Mathematics Detectives to help us with our Mathematical Thinking!

R.T

Who did you use today?

Sebastian Show It!

Diego Draw It !

Poppy Prove It!

Elena Explain It!

An Example of a Y1-Y6 LO/SC from the Teaching Sequence....

Year 5 Addition and Subtraction

Learning Line

Success Criteria

Working towards:

- Add and Subtract two and three digit numbers.

On Target:

- Add whole numbers with more than digits. (using the column method).
- Subtract whole numbers with more than 4 digits. (using the column method).
- Round to estimate and approximate.
- Use inverse operations addition and subtraction.
- Solve Multi step addition and subtraction problems.

Greater Depth:

- Solve addition and subtraction multi step problems in context deciding, deciding and explaining which operations to use and why.

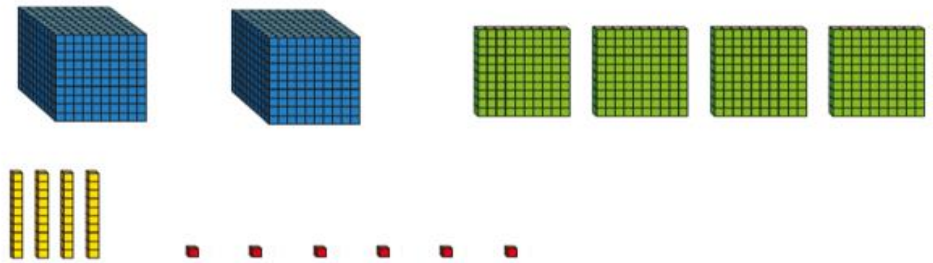
Addition and Subtraction Vocabulary

Addition
Subtraction
Equals
Column Method
Place Holder
Estimate
Approximate
Multistep Problems
Efficient
Exchange
Sum
Inverse
Operations

An Example of Exit Cards from the Teaching Sequence....

EXIT TICKET

What number is represented



_____

EXIT TICKET

Partitioning

3,245 is equal to _____ thousands, _____ hundreds,

_____ tens and _____ ones.

How can we use the Learning Gems in Mathematics?

Look back on, correct and edit own and other people's calculations and misconceptions .

Work with others to investigate and problem solve.

Develop independence in tackling problems and applying know methods to new situations.

Focus and concentrate on longer tasks.

Explore the use of adventurous methods.

Write creatively and different methods to solve problems.

Work over time on a piece of investigation and problem solving.

Key Skills: Number & Place Value

1	Read and write numbers to 10 in numerals	*YR*
2	Read and write numbers 11 to 20 in numerals	*YR*
3	Count backwards within 20 from any given number	*YR*
4	Identify 1 more or 1 less than a given number	*YR*
5	Order and compare numbers up to 20 using language 'more' and 'fewer'	*YR*
6	Count in multiples of 10 up to 100	*Y1*
7	Count backwards in multiples of 10 within 100	*Y1*
8	Read and write numbers to 100 in numerals, recognising the place value of each digit	*Y1*
9	Count backwards within 100 from any given number	*Y1*
10	Identify 1or 10 more or less than a given number	*Y2*
11	Compare and order numbers from 0-100 using <> and = signs	*Y2*
12	Read and write 3-digit numbers in numerals, recognising the place value of each digit	*Y3*
13	Find 10 or 100 more or less than a given number	*Y3*
14	Read and write 4-digit numbers in numerals, recognising the place value of each digit	*Y3*
15	Round any number to the nearest 10, 100 or 1000	*Y4*
16	Read and write numbers to at least 1 million	*Y5*
17	Compare and order numbers up to 1 million	*Y5*
18	Round any number to a given degree of accuracy	*Y6*

Key Skills: Addition & Subtraction

1	Recognise number bonds to 10	*Y1*
2	Recognise number bonds for numbers within 10	*Y1*
3	Add single digit numbers	*Y1*
4	Subtract single digit numbers	*Y1*
5	Subtract single digit numbers from numbers up to 20	*Y1*
6	Add a two-digit number and 1s	*Y2*
7	Add a two-digit number and 10s	*Y2*
8	Add a pair of two-digit numbers	*Y2*
9	Subtract a two-digit number and 1s	*Y2*
10	Subtract a two-digit number and 10s	*Y2*
11	Subtract a pair of two-digit numbers	*Y2*
12	Use the inverse relationship to solve missing number problems	*Y2*
13	Add numbers mentally, including: a three-digit number and 1s, 10s or 100s	*Y3*
14	Subtract numbers mentally, including: a three-digit number and 1s, 10s or 100s	*Y3*
15	Add numbers with 3 or more digits using a formal written method	*Y3*
16	Subtract numbers with 3 or more digits using a formal written method	*Y3*

Key Skills: Multiplication & Division

1	Double numbers up to 10	*Y1*
2	Halve numbers up to 20	*Y1*
3	Calculate and write mathematical statements using the (X) and (=) signs, using tables they know	*Y2*
4	Calculate and write mathematical statements using the (÷) and (=) signs, using tables they know	*Y2*
5	Calculate mentally 2-digit times 1-digit numbers	*Y3*
6	Divide numbers going beyond 12 times the number using the tables that they know	*Y3*
7	Multiply two-digit and three-digit numbers by a one-digit number using formal written layout	*Y4*
8	Use known multiplication facts to calculate division with remainders	*Y4*
9	Identify multiples and factors of a number, and use the vocabulary of common factors and prime numbers	*Y5*
10	Multiply numbers of up to 4 digits by a two-digit number using a formal written method	*Y5*
11	Divide numbers of up to 4 digits by a one-digit number using a formal method	*Y5*
12	Divide numbers of up to 4 digits by a two-digit number using a formal method	*Y6*

Key Skills: Fractions

1	Recognise and find half or a quarter of an object, shape or quantity	*Y1*
2	Recognise, name and find 1/3, ¼, 2/4 and ¾ of a shape, set of objects or quantity.	*Y2*
3	Find and write fractions of amounts including unit and non-unit fractions with small denominators	*Y3*
4	Add and subtract fractions with the same denominator	*Y4*
5	Recognise and find equivalent fractions	*Y4*
6	Recognise mixed numbers and improper fractions and convert from one to the other	*Y5*
7	Use common factors to compare and order fractions	*Y5*
8	Add and subtract fractions with denominators that are multiples of the same number	*Y5*
9	Use common factors to simplify fractions	*Y6*
10	Multiply a proper fraction by a whole number	*Y6*
11	Multiply pairs of proper fractions	*Y6*
12	Divide fractions including fractions by whole numbers, whole numbers by fractions and pairs of fractions.	*Y6*

Key Skills: Decimals & Percentages

1	Recognise that decimals come from splitting ones into smaller parts and count up or down in tenths	*Y3*
2	Add numbers with one decimal place	*Y3*
3	Subtract numbers with one decimal place	*Y3*
4	Round decimals with one decimal place to the nearest whole number.	*Y4*
5	Recognise and count up or down in hundredths	*Y4*
6	Add numbers with two decimal places	*Y4*
7	Subtract numbers with two decimal places	*Y4*
8	Recognise the decimal equivalents of ¼ ½ and ¾	*Y4*
9	Multiply and divide whole numbers and decimals by 10, 100 and 1000	*Y5*
10	Recognise the % symbol and know the equivalence between common fractions, decimals and percentages	*Y5*
11	Find percentages of amounts	*Y6*

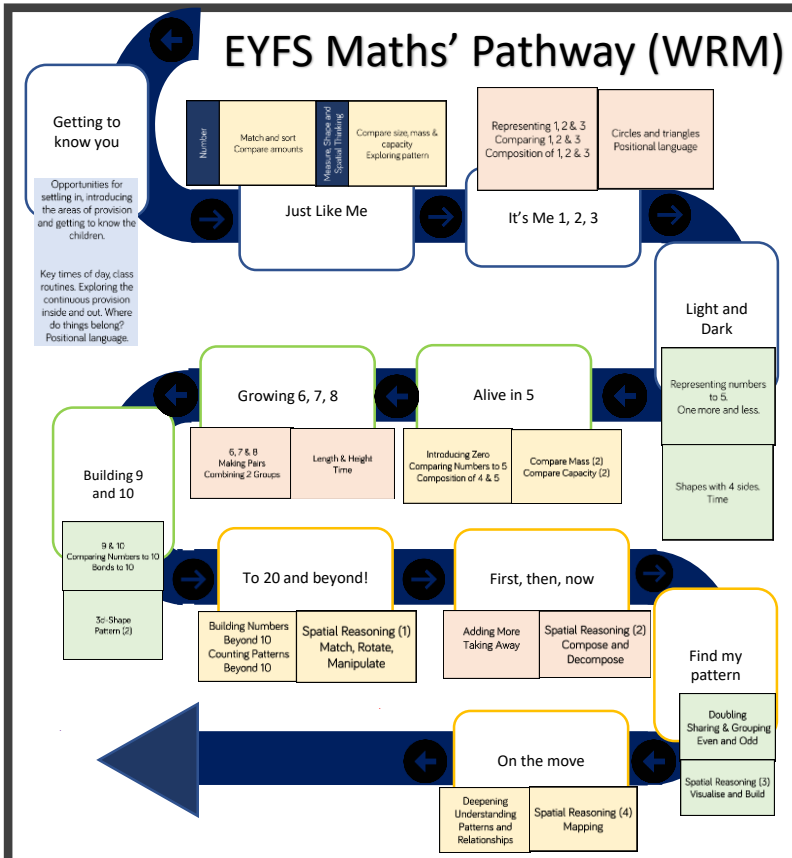
Please refer to:

TSM – Calculation Policy for coverage and methods in your Year Group

	EYFS/Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Addition	Combining two parts to make a whole: part whole model. Starting at the bigger number and counting on- using cubes. Regrouping to make 10 using ten frame.	Adding three single digits. Use of base 10 to combine two numbers.	Column method- regrouping. Using place value counters (up to 3 digits).	Column method- regrouping. (up to 4 digits)	Column method- regrouping. Use of place value counters for adding decimals.	Column method- regrouping. Abstract methods. Place value counters to be used for adding decimal numbers.
Subtraction	Taking away ones Counting back Find the difference Part whole model Make 10 using the ten frame	Counting back Find the difference Part whole model Make 10 Use of base 10	Column method with regrouping. (up to 3 digits using place value counters)	Column method with regrouping. (up to 4 digits)	Column method with regrouping. Abstract for whole numbers. Start with place value counters for decimals- with the same amount of decimal places.	Column method with regrouping. Abstract methods. Place value counters for decimals- with different amounts of decimal places.

Multiplication	Recognising and making equal groups. Doubling Counting in multiples Use cubes, Numicon and other objects in the classroom	Arrays- showing commutative multiplication	Arrays 2d × 1d using base 10	Column multiplication- introduced with place value counters. (2 and 3 digit multiplied by 1 digit)	Column multiplication Abstract only but might need a repeat of year 4 first(up to 4 digit numbers multiplied by 1 or 2 digits)	Column multiplication Abstract methods (multi-digit up to 4 digits by a 2 digit number)
Division	Sharing objects into groups Division as grouping e.g. I have 12 sweets and put them in groups of 3, how many groups? Use cubes and draw round 3 cubes at a time.	Division as grouping Division within arrays- linking to multiplication Repeated subtraction	Division with a remainder-using lollipop sticks, times tables facts and repeated subtraction. 2d divided by 1d using base 10 or place value counters	Division with a remainder Short division (up to 3 digits by 1 digit- concrete and pictorial)	Short division (up to 4 digits by a 1 digit number including remainders)	Short division Long division with place value counters (up to 4 digits by a 2 digit number) Children should exchange into the tenths and hundredths column too

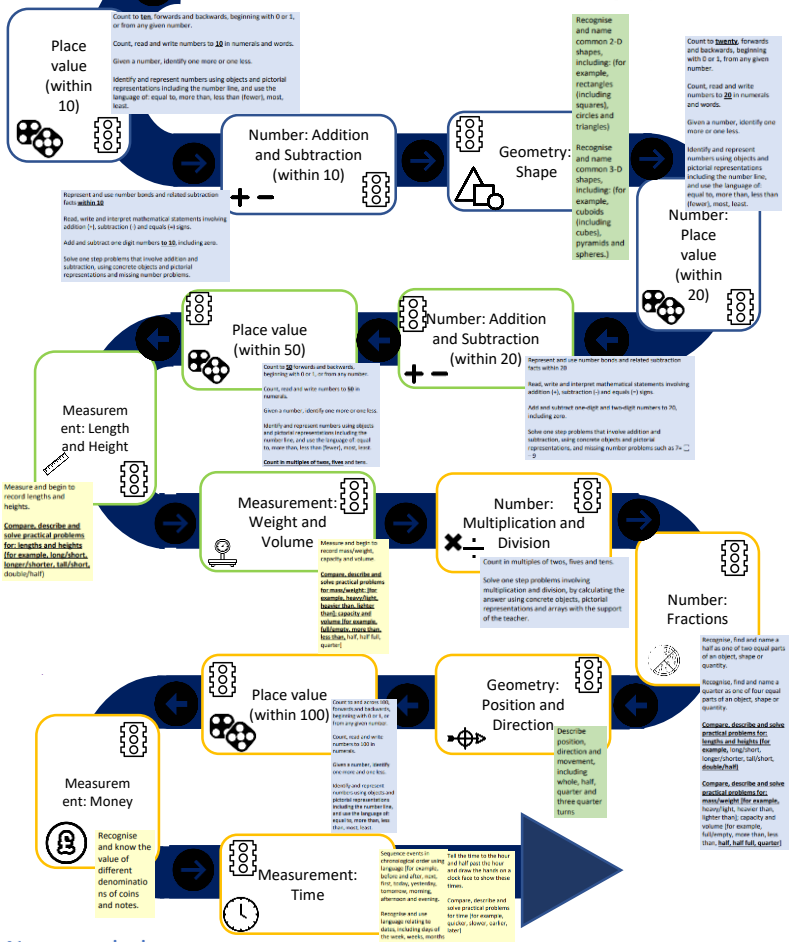
EYFS Maths' Pathway (WRM)



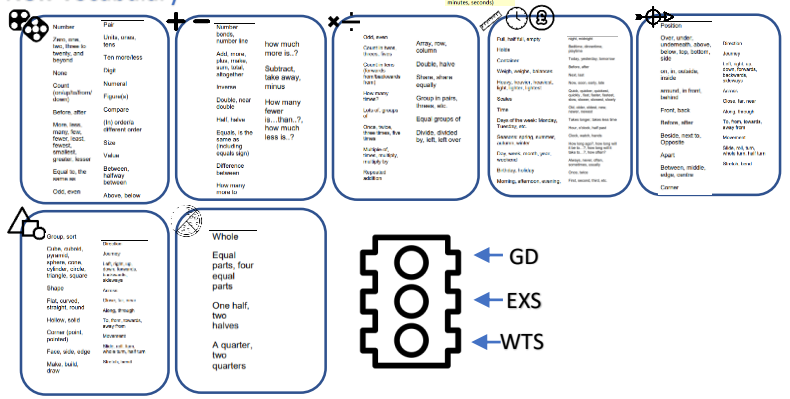
New vocabulary

Number and Place Value	Addition and Subtraction	Multiplication and Division	Measure	Geometry (position and direction)	Geometry (Properties of shape)	Fractions	General/problem solving.
Number	Number line	Odd, even	Full, half, empty	Over, under, underneath, above, below, top, bottom, side	Sort	Whole	Listen, join in
One, two, three to twenty and beyond.	Add, more, plus, make, sum, total, altogether	Double, halve	Holds	On, in, outside, inside	Cube, cuboid, pyramid, sphere, cone, cylinder, circle, triangle, square	Equal	Say, think, imagine, remember
None	Double	Share, share equally	Container	In front, behind	Shape	One half	Start from
Count on/up/to/from/down	Half, halve	Group in pairs	Weigh, weighs, balance	Front, back	Flat, curved, straight, round		Look at, point to
Before, after	Equals, is the same (including equals sign)	Equal groups of	Heavy, heavier, heaviest, light, lighter, lightest	Before, after	Solid		Put
More, less, many, few, fewer, fewest, smaller, smallest	How many more to make…? How many more is,,, then,,,? How much more is…?	Divide	Scales	Beside, next to	Corner		What comes next?
Equal to, the same as	Subtract, take away, minus.		Time	Middle	Face, side		Find, use, make, build
Odd, even			Days of the week: Monday, Tuesday etc.	Up, down, forwards, backwards. Sideways	Make, build, draw		Tell me, describe, pick out, talk about, explain, show me
Digit			Seasons: Spring, Summer, Autumn, Winter	Close, far			Read, write
Numeral			Days, week, month, year, weekend	Through			Tick, draw a line, ring
Compare			Birthday, holiday	Towards, away from			Cost
Order			Morning, afternoon, evening, night	Side, roll, turn			Count, work out
Size			Bedtime,				Number line, number track, number square, number cards
Value Between, halfway between							

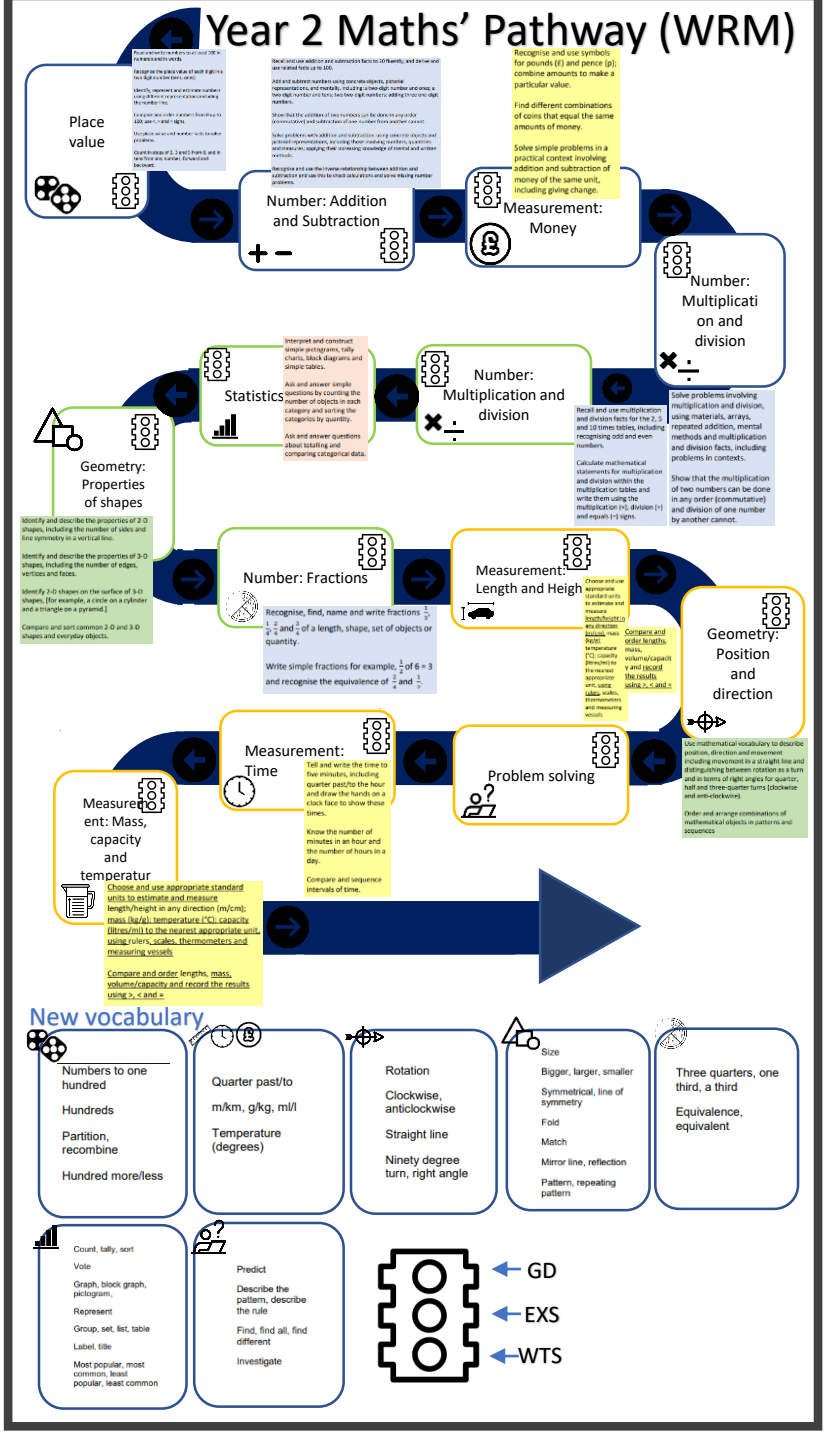
Year 1 Maths' Pathway (WRM)



New vocabulary



Year 2 Maths' Pathway (WRM)



Year 3 Maths' Pathway (WRM)

Place value

Identify, represent and estimate numbers using different representations.

Find 10 or 100 more or less than a given number

Recognise the place value of each digit in a three-digit number (hundreds, tens, ones).

Compare and order numbers up to 1000

Read and write numbers up to 1000 in numerals and in words.

Solve number problems and practical problems involving these ideas.

Count from 0 in multiples of 4, 8, 50 and 100

Number: Addition and Subtraction

Add and subtract numbers mentally, including: a three-digit number and ones; a three-digit number and tens; a three digit number and hundreds.

Add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction.

Estimate the answer to a calculation and use inverse operations to check answers.

Solve problems, including missing number problems, using number facts, place value, and more complex addition and subtraction.

Number: Multiplication and Division

Count from 0 in multiples of 4, 8, 50 and 100

Recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables.

Write and calculate mathematical statements for multiplication and division using the multiplication tables they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods.

Solve problems, including missing number problems, involving multiplication and division, including positive integer scaling problems and correspondence problems in which *n* objects are connected to *m* objects.

Number: Multiplication and division

Recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables.

Write and calculate mathematical statements for multiplication and division using the multiplication tables they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods.

Solve problems, including missing number problems, involving multiplication and division, including positive integer scaling problems and correspondence problems in which *n* objects are connected to *m* objectives.

Measurement: Money

Add and subtract amounts of money to give change, using both £ and p in practical contexts.

Statistics

Interpret and present data using bar charts, pictograms and tables.

Solve one-step and two-step questions [for example, 'How many more?' and 'How many fewer?'] using information presented in scaled bar charts and pictograms and tables.

Measurement: Length and Perimeter

Measure, compare, add and subtract: lengths (m/cm/mm); mass (kg/g); volume/capacity (l/ml).

Measure the perimeter of simple 2D shapes.

Number: Fractions

Count up and down in tenths; recognise that tenths arise from dividing an object into 10 equal parts and in dividing one-digit numbers or quantities by 10

Recognise and use fractions as numbers: unit fractions and non-unit fractions with small denominators.

Number: Fractions

Recognise, find and write fractions of a discrete set of objects: unit fractions and non-unit fractions with small denominators.

Solve problems that involve all of the above.

Recognise and show, using diagrams, equivalent fractions with small denominators.

Compare and order unit fractions, and fractions with the same denominators

Add and subtract fractions with the same denominator within one whole [for example, $\frac{2}{7} + \frac{4}{7} = \frac{6}{7}$]

Solve problems that involve all of the above.

Measurement: Time

Tell and write the time from an analogue clock, including using Roman numerals from I to XII and 12-hour and 24-hour clocks

Estimate and read time with increasing accuracy to the nearest minute.

Record and compare time in terms of seconds, minutes and hours.

Use vocabulary such as o'clock, a.m./p.m., morning, afternoon, noon and midnight

Know the number of seconds in a minute and the number of days in each month, year and leap year.

Compare durations of events [for example to calculate the time taken by particular events or tasks].

Measurement: Mass and Capacity

Measure, compare, add and subtract: lengths (m/cm/mm); **mass (kg/g); volume/capacity (l/ml).**

Geometry: Properties of shape

Recognise angles as a property of shape or a description of a turn.

Identify right angles, recognise that two right angles make a half-turn, three make three quarters of a turn and four a complete turn; identify whether angles are greater than or less than a right angle.

Identify horizontal and vertical lines and pairs of perpendicular and parallel lines.

Draw 2-D shapes and make 3-D shapes using modelling materials.

Recognise 3-D shapes in different orientations and describe them.

New vocabulary

- Numbers to one thousand
- Column addition and subtraction
- Product
- Multiples of four, eight, fifty and one hundred
- Scale up
- Twelve-hour/twenty-four-hour clock
- Roman numerals I to XIII
- Greater/less than ninety degrees
- Orientation (same orientation, different orientation)
- Horizontal, vertical, perpendicular and parallel lines
- Numerator, denominator
- Unit fraction, non-unit fraction
- Compare and order
- Tenths
- Chart, bar chart, frequency table, Carroll diagram, Venn diagram
- Axis, axes
- Diagram

Year 4 Maths' Pathway (WRM)

Place value

Count in multiples of 6, 7, 9, 25 and 1000.

Find 1000 more or less than a given number.

Recognise the place value of each digit in a four digit number (thousands, hundreds, tens and ones).

Order and compare numbers beyond 1000.

Identify, represent and estimate numbers using different representations.

Round any number to the nearest 10, 100 or 1000.

Solve number and practical problems that involve all of the above and with increasingly large positive numbers.

Count backwards through zero to include negative numbers.

Read Roman numerals to 100 (I to C) and know that over time, the numeral system changed to include the concept of zero and place value.

Number: Addition and Subtraction

Add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate.

Estimate and use inverse operations to check answers to a calculation.

Solve addition and subtraction two step problems in contexts, deciding which operations and methods to use and why.

Measurement Length and Perimeter

Measure and calculate the perimeter of a rectilinear figure (including squares) in centimetres and metres.

Convert between different units of measure [for example, kilometre to metre]

Number: Multiplication and division

Recall and use multiplication and division facts for multiplication tables up to 12 × 12.

Count in multiples of 6, 7, 9, 25 and 1000

Use place value, known and derived facts to multiply and divide mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together three numbers.

Solve problems involving multiplying and adding, including using the distributive law to multiply two digit numbers by one digit, integer scaling problems and harder correspondence problems such as n objects are connected to m objects.

Number: Multiplication and division

Recall and use multiplication and division facts for multiplication tables up to 12 × 12.

Use place value, known and derived facts to multiply and divide mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together three numbers.

Recognise and use factor pairs and commutativity in mental calculations.

Multiply two digit and three digit numbers by a one digit number using formal written layout.

Solve problems involving multiplying and adding, including using the distributive law to multiply two digit numbers by one digit, integer scaling problems and harder correspondence problems such as n objects are connected to m objects.

Measurement: Area

Find the area of rectilinear shapes by counting squares.

Number: Fractions

Recognise and show, using diagrams, families of common equivalent fractions.

Count up and down in hundredths; recognise that hundredths arise when dividing an object by one hundred and dividing tenths by ten.

Solve problems involving increasingly harder fractions to calculate quantities, and fractions to divide quantities, including non-unit fractions where the answer is a whole number.

Add and subtract fractions with the same denominator.

Number: Decimals

Recognise and write decimal equivalents of any number of tenths or hundredths.

Find the effect of dividing a one or two digit number by 10 or 100, identifying the value of the digits in the answer as ones, tenths and hundredths

Solve simple measure and money problems involving fractions and decimals to two decimal places.

Convert between different units of measure [for example, kilometre to metre]

Number: Decimals

Compare numbers with the same number of decimal places up to two decimal places.

Round decimals with one decimal place to the nearest whole number.

Recognise and write decimal equivalents to $\frac{1}{4}$, $\frac{1}{2}$ and $\frac{3}{4}$.

Find the effect of dividing a one or two digit number by 10 or 100, identifying the value of the digits in the answer as ones, tenths and hundredths

Measurement: Money

Estimate, compare and calculate different measures, including money in pounds and pence.

Solve simple measure and money problems involving fractions and decimals to two decimal places.

Statistics

Interpret and present discrete and continuous data using appropriate graphical methods, including bar charts and time graphs.

Solve comparison, sum and difference problems using information presented in bar charts, pictograms, tables and other graphs.

Measurement: Time

Convert between different units of measure [for example, kilometre to metre; hour to minute]

Read, write and convert time between analogue and digital 12- and 24-hour clocks.

Solve problems involving converting from hours to minutes; minutes to seconds; years to months; weeks to days.

Geometry: Properties of shape

Identify acute and obtuse angles and compare and order angles up to two right angles by size.

Compare and classify geometric shapes, including quadrilaterals and triangles, based on their properties and sizes.

Identify lines of symmetry in 2-D shapes presented in different orientations.

Complete a simple symmetric figure with respect to a specific line of symmetry.

Geometry: Position and direction

Describe positions on a 2-D grid as coordinates in the first quadrant.

Plot specified points and draw sides to complete a given polygon.

Describe movements between positions as translations of a given unit to the left/ right and up/ down.

New vocabulary

- Tenths, hundredths
- Decimal (places)
- Round (to nearest)
- Thousand more/less than
- Negative integers
- Count through zero
- Roman numerals (I to C)

- Convert

- Multiplication facts (up to 12x12)
- Division facts
- Inverse
- Derive

- Coordinates
- Translation
- Quadrant
- x-axis, y-axis
- Perimeter and area

- Equivalent decimals and fractions

- Continuous data
- Line graph

GD
EXS
VTS

Year 5 Maths' Pathway (WRM)

Place value

Read, write, order and compare numbers to at least 1000000 and determine the value of each digit.

Count forwards or backwards in steps of powers of 10 for any given number up to 1000000.

Interpret negative numbers in context, count forwards and backwards with positive and negative whole numbers including through zero.

Round any number up to 1000000 to the nearest 10, 100, 1000, 10000 and 100000

Solve number problems and practical problems that involve all of the above.

Read Roman numerals to 1000 (M) and recognise years written in Roman numerals.

Number: Addition and Subtraction

Add and subtract numbers mentally with increasingly large numbers.

Add and subtract whole numbers with more than 4 digits, including using formal written methods (columnar addition and subtraction)

Use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy.

Solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why.

Statistics

Solve comparison, sum and difference problems using information presented in a line graph.

Complete, read and interpret information in tables including timetables.

Number: Multiplication and division

Multiply and divide numbers mentally drawing upon known facts.

Multiply numbers up to 4 digits by a one or two digit number using a formal written method, including long multiplication for 2-digit numbers.

Divide numbers up to 4 digits by a one digit number using the formal written method of short division and interpret remainders appropriately for the context.

Solve problems involving addition and subtraction, multiplication and division and a combination of these, including understanding the use of the equals sign.

Number: Multiplication and division

Multiply and divide numbers mentally drawing upon known facts.

Multiply and divide whole numbers by 10, 100 and 1000.

Identify multiples and factors, including finding all factor pairs of a number, and common factors of two numbers.

Recognise and use square numbers and cube numbers and the notation for squared (^{2}) and cubed (^{3})

Solve problems involving multiplication and division including using their knowledge of factors and multiples, squares and cubes.

Know and use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers.

Establish whether a number up to 100 is prime and recall prime numbers up to 19

Number: Fractions

Compare and order fractions whose denominators are multiples of the same number.

Identify, name and write equivalent fractions of a given fraction, represented visually including tenths and hundredths.

Recognise mixed numbers and improper fractions and convert from one form to the other and write mathematical statements >1 as a mixed number [for example $\frac{2}{5} + \frac{4}{5} = \frac{6}{5} = 1\frac{1}{5}$]

Add and subtract fractions with the same denominator and denominators that are multiples of the same number.

Multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams.

Read and write decimal numbers as fractions [for example $0.71 = \frac{71}{100}$]

Solve problems involving multiplication and division, including scaling by simple fractions and problems involving simple rates.

Measurement: Perimeter and area

Measure and calculate the perimeter of composite rectilinear shapes in cm and m.

Calculate and compare the area of rectangles (including squares), and including using standard units, cm^2, m^2 estimate the area of irregular shapes.

Number: Decimals and percentages

Read, write, order and compare numbers with up to three decimal places.

Recognise and use thousandths and relate them to tenths, hundredths and decimal equivalents.

Round decimals with two decimal places to the nearest whole number and to one decimal place.

Solve problems involving number up to three decimal places.

Recognise the per cent symbol (%) and understand that per cent relates to 'number of parts per hundred', and write percentages as a fraction with denominator 100, and as a decimal.

Solve problems which require knowing percentage and decimal equivalents of $\frac{1}{2}, \frac{1}{4}, \frac{2}{4}, \frac{3}{4}, \frac{1}{5}, \frac{2}{5}, \frac{4}{5}$ and those fractions with a denominator of a multiple of 10 or 25.

Number: Decimals

Solve problems involving number up to three decimal places.

Multiply and divide whole numbers and those involving decimals by 10, 100 and 1000.

Use all four operations to solve problems involving measure [for example, length, mass, volume, money] using decimal notation, including scaling.

Geometry: Properties of shape

Identify 3D shapes, including cubes and other cuboids, from 2D representations.

Use the properties of rectangles to deduce related facts and find missing lengths and angles.

Distinguish between regular and irregular polygons based on reasoning about equal sides and angles.

Know angles are measured in degrees: estimate and compare acute, obtuse and reflex angles.

Draw given angles, and measure them in degrees (°)

Identify: angles at a point and one whole turn (total 360°), angles at a point on a straight line and ½ a turn (total 180°) other multiples of 90°

Geometry: Position and direction

Identify, describe and represent the position of a shape following a reflection or translation, using the appropriate language, and know that the shape has not changed.

Measuring: Converting units

Convert between different units of metric measure [for example, km and m; cm and m; cm and mm; g and kg; l and ml]

Understand and use approximate equivalences between metric units and common imperial units such as inches, pounds and pints.

Solve problems involving converting between units of time.

Measurement: Volume

Estimate volume [for example using 1cm^3 blocks to build cuboids (including cubes)] and capacity [for example, using water]

Use all four operations to solve problems involving measure.

New vocabulary

- Powers of 10
- Factor pairs
- Composite numbers, prime number, prime factors, square number, cubed number
- Formal written method
- Volume
- Imperial units, metric units
- Reflex angle
- Dimensions
- Proper fractions, improper fractions, mixed numbers
- Percentage
- Half, quarter, fifth, two fifths, four fifths
- Ratio, proportion

GD
EXS
VTS

Year 6 Maths' Pathway (WRM)

Place value

Read, write, order and compare numbers up to 10,000,000 and determine the value of each digit.

Round any whole number to a required degree of accuracy.

Use negative numbers in context, and calculate intervals across zero.

Solve number and practical problems that involve all of the above.

Number: Addition, Subtraction, multiplication and division

Solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why.

Multiply multi-digit number up to 4 digits by a 2-digit number using the formal written method of long multiplication.

Divide numbers up to 4 digits by a 2-digit whole number using the formal written method of long division, and interpret remainders as whole number remainders, fractions, or by rounding as appropriate for the context.

Divide numbers up to 4 digits by a 2-digit number using the formal written method of short division, interpreting remainders according to the context.

Perform mental calculations, including with mixed operations and large numbers.

Identify common factors, common multiples and prime numbers.

Use their knowledge of the order of operations to carry out calculations involving the four operations.

Solve problems involving addition, subtraction, multiplication and division.

Use estimation to check answers to calculations and determine in the context of a problem, an appropriate degree of accuracy.

Number: Fractions

Use common factors to simplify fractions; use common multiples to express fractions in the same denomination.

Compare and order fractions, including fractions > 1

Generate and describe linear number sequences (with fractions)

Add and subtract fractions with different denominations and mixed numbers, using the concept of equivalent fractions.

Multiply simple pairs of proper fractions, writing the answer in its simplest form [for example $\frac{1}{4} \times \frac{1}{2} = \frac{1}{8}$]

Divide proper fractions by whole numbers [for example $\frac{1}{3} \div 2 = \frac{1}{6}$]

Associate a fraction with division and calculate decimal fraction equivalents [for example, 0.375] for a simple fraction [for example $\frac{3}{8}$]

Recall and use equivalences between simple fractions, decimals and percentages, including in different contexts.

Geometry: Position and direction

Describe positions on the full coordinate grid (all four quadrants).

Draw and translate simple shapes on the coordinate plane, and reflect them in the axes.

Number: Decimals

Identify the value of each digit in numbers given to 3 decimal places and multiply numbers by 10, 100 and 1,000 giving answers up to 3 decimal places.

Multiply one-digit numbers with up to 2 decimal places by whole numbers.

Use written division methods in cases where the answer has up to 2 decimal places.

Solve problems which require answers to be rounded to specified degrees of accuracy.

Number: Percentages

Solve problems involving the calculation of percentages [for example, of measures and such as 15% of 360] and the use of percentages for comparison.

Recall and use equivalences between simple fractions, decimals and percentages including in different contexts.

Number: Algebra

Use simple formulae

Generate and describe linear number sequences.

Express missing number problems algebraically.

Find pairs of numbers that satisfy an equation with two unknowns.

Enumerate possibilities of combinations of two variables.

Measurement: Converting units

Solve problems involving the calculation and conversion of units of measure, using decimal notation up to three decimal places where appropriate.

Use, read, write and convert between standard units, converting measurements of length, mass, volume and time from a smaller unit of measure to a larger unit, and vice versa, using decimal notation to up to 3dp.

Convert between miles and kilometres.

Measurement: Perimeter, Area and Volume

Recognise that shapes with the same areas can have different perimeters and vice versa.

Recognise when it is possible to use formulae for area and volume of shapes.

Calculate the area of parallelograms and triangles.

Calculate, estimate and compare volume of cubes and cuboids using standard units, including cm^3, m^3 and extending to other units (mm^3, km^3)

Number: Ratio

Solve problems involving the relative sizes of two quantities where missing values can be found by using integer multiplication and division facts.

Solve problems involving similar shapes where the scale factor is known or can be found.

Solve problems involving unequal sharing and grouping using knowledge of fractions and multiples.

Geometry: Properties of shape

Draw 2-D shapes using given dimensions and angles.

Compare and classify geometric shapes based on their properties and sizes and find unknown angles in any triangles, quadrilaterals and regular polygons.

Recognise angles where they meet at a point, are on a straight line, or are vertically opposite, and find missing angles.

Statistics

Illustrate and name parts of circles, including radius, diameter and circumference and know that the diameter is twice the radius.

Interpret and construct pie charts and line graphs and use these to solve problems.

Calculate the mean as an average.

Projects, investigation and transition units

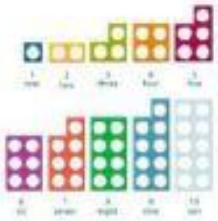
New vocabulary

- Numbers to ten million
- Order of operations
- Common factors, common multiples
- Four quadrants (for coordinates)
- Vertically opposite (angles)
- Circumference, radius, diameter
- Degree of accuracy
- Simplify
- Linear number sequence
- Substitute
- Variables
- Symbol
- Known values
- Mean
- Pie chart
- Construct

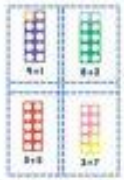
Addition

Concrete: objects and pictures

Students are encouraged to develop a mental picture of the number system in their heads to use for calculation. They develop ways of recording calculations using pictures, Numicon, etc.

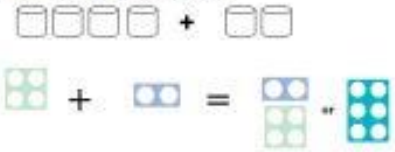


Students are able to use Numicon to see number bonds to 10 effectively and are able to add with Numicon pieces.



Bead strings or bead bars can be used to illustrate addition including bridging through ten by counting on 2 then counting on 3.

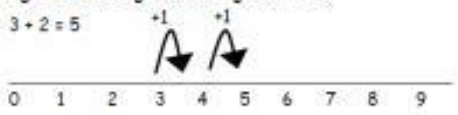
Students are able to combine two or more sets of objects, Numicon can be used as a support.



Using the number line

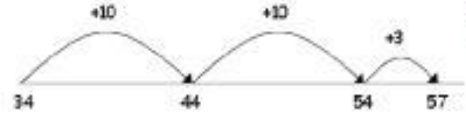
Students use given number lines to count on in ones to begin with starting with the larger number.

3 + 2 = 5



Students will begin to use 'empty number lines' themselves starting with the larger number and counting on.
First by counting on in tens and ones. Then helping children to become more efficient by adding the units the tens in one jump (by using the known facts e.g. 4 + 6 = 10).

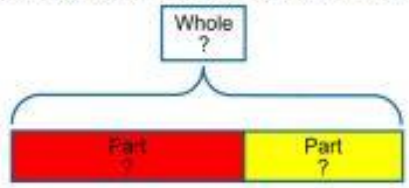
34 + 23 = 57



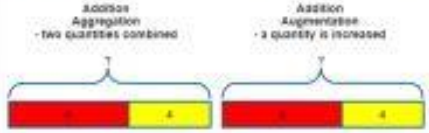
165 + 56 = 221

Pictorial representation (bar models)

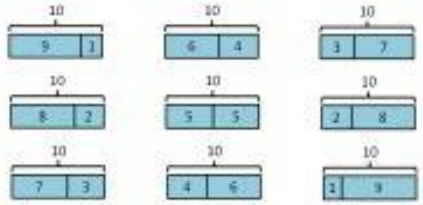
In problems involving addition (and subtraction) there are three possible unknowns as illustrated below and given the value of two of them the third can be found.



The examples below illustrate a variety of ways that the bar might be used for addition (and subtraction) problems. A question mark is used to indicate the part that is unknown.

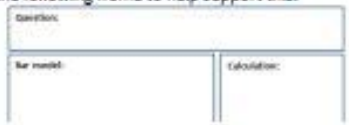


Number Bonds



NOTE: Bar models should not be used to replace the abstract calculation but along-side the calculation as a transitional phase to help support the visualisation of the calculation.

Use the following frame to help support this:

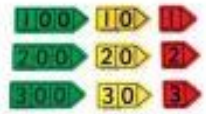


Abstract calculation

Students may use the partioning method to start to solve addition problems (you can use the place value partioning cards to support with this)

48 + 36 = 40 + 8 + 30 + 6

40 + 30 = 70
8 + 6 = 14
70 + 14 = 84



48 + 36 = 84

NOTE: In a line of working, an "equals" sign should appear only once. Working should develop down the page, with equals signs in line
(The following is poor practice: 40 + (3 + 4) = 7 = 40 + 7 = 47, as students are equating unequal things.)

63 + 32 = 95

60 + 3
+ 30 + 2
90 + 5 = 95

Then

63
+ 32
5 (3 + 2)
+ 90 (60 + 30)
95

Partition the numbers into hundreds, tens and ones. Add the least significant digits (ones) first then the tens etc. in preparation for the formal written method.

Adding the least significant digits first in preparation for 'carrying'. Make sure they are carrying the line below.

1845 + 526 = 2371

1845
+ 526
2371
1 1

£154.75 + £233.82 = £388.57

154.75
+ 233.82
388.57
1

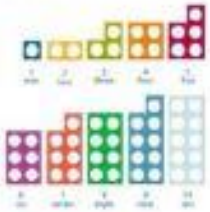
Continue to use the language of place value to ensure understanding.

Ensure students line up the digits correctly.

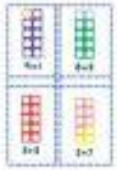
Subtraction

Concrete: objects and pictures

Students are encouraged to develop a mental picture of the number system in their heads to use for calculation. They develop ways of recording calculations using pictures, Numicon, etc.



Students are able to use Numicon to see number bonds to 10 effectively and are able to subtract with Numicon pieces.

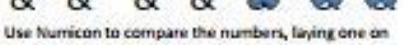


Bead strings bead bars can be used to illustrate subtraction.

6–2=4

Children given 7 objects asked to move (not remove) 3 objects- how many are left. How can they check?

There were 7 butterflies in the garden 3 flew away. How many left?



Use Numicon to compare the numbers, laying one on another.

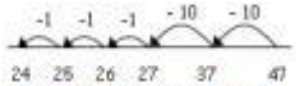
Using the number line

Students use given number lines to count backwards in ones to begin with.

6 – 3 = 3

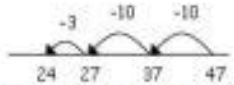
Students should then count back in tens and ones.

47 – 23 = 24



Then to help the students become more efficient by subtracting by the ones in one jump, using known facts.

47 – 23 = 24

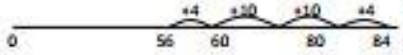


Bridging through ten helps students become more efficient.

42 – 25 = 17

Complementary addition:

84 – 56 = 28



4 + 10 + 10 + 4 = 28

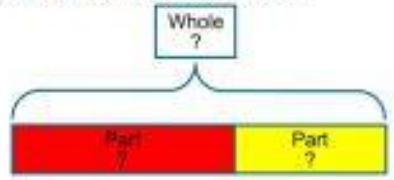
Finding the difference between decimals on a number line

243.43-123.29 =

Students must use their addition method using accurate place value to add jumps. Where there is a large amount of jumps some may be mentally added first. Students may use any method to add the differences together, column method is advised.

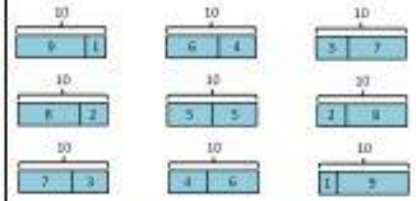
Pictorial representation (bar models)

In problems involving subtraction (and addition) there are three possible unknowns as illustrated below and given the value of two of them the third can be found.



The examples below illustrate a variety of ways that the bar might be used for subtraction (and addition) problems. A question mark is used to indicate the part that is unknown.

Number Bonds



NOTE: Bar models should not be used to replace the abstract calculation but along-side the calculation as a transitional phase to help support the visualisation of the calculation.

Use the following frame to help support this:

Abstract calculation

Partioning and Decomposition:

Step 1 764 = 700 + 60 + 4
- 286 - 200 + 80 + 6

Step 2 700 + 40 + 14
- 200 + 80 + 6

Step 3 600 + 140 + 14
- 200 + 80 + 6
400 + 60 + 8 = 468

This would be recorded by the children as

600 140
~~700~~ + ~~60~~ + 4
- 200 + 80 + 6
400 + 60 + 8 = 468

When students are confident they can shorten their working using the column method.

235 – 127 = 108

Use the language of place value to ensure understanding
In this example it has only been necessary to exchange from the tens column
Use base ten materials to support understanding

Using decimals:

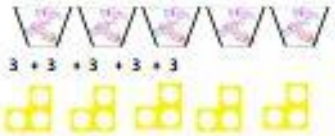
£166.25 – £83.72 = £82.53

Ensure the decimal points line up.

Multiplication

Concrete: objects and pictures

Grouping:
There are 3 sweets in one bag.
How many sweets are there in 5 bags?



Display Numicon like this- then how can we fit it together? Will it fit into a ten shape? How many left?

Arrays:
Use arrays to support early multiplication.

An array

3 x 5 =

Commutative multiplication sums will be able to be seen though the array.

3 x 5 = 15
5 x 3 = 15

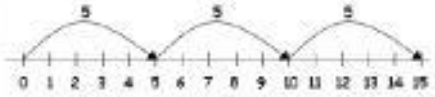
Repeated addition:
3 times 5 is 5 + 5 + 5 = 15 or 3 lots of 5 or 5 x 3
Repeated addition can be shown easily on a bead bar:

5 x 3 = 5 + 5 + 5

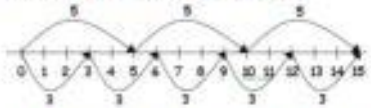
Using the number line

Repeated addition:
3 times 5 is 5 + 5 + 5 = 15 or 3 lots of 5 or 5 x 3
Repeated addition can be shown easily on a number line:

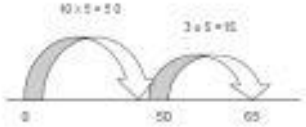
5 x 3 = 5 + 5 + 5



Commutativity:
Children should know that 3 x 5 has the same answer as 5 x 3. This can also be shown on the number line.



Demonstrate the partitioning method using a number line:
13 x 5 = 65

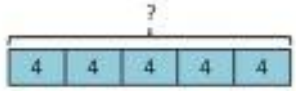


Pictorial representation (bar models)

Bar models:
Bar models when multiplying is particularly valuable for representing these types of problems and for making the connections between these concepts visible and accessible.

Notice how each section of the bars in the problem below has a value of 4 and not 1. This many-to-one correspondence or unitising is important and occurs early, for example in the context of money, where one coin has a value of 2p for example. It is also a useful principle in the modelling of ratio problems.

4 x 5 = ?



Using arrays to help with bar models:
Students should be able to model a multiplication calculation using an array. This knowledge will support with the development of the grid method.
Stage 1:

Stage 2:

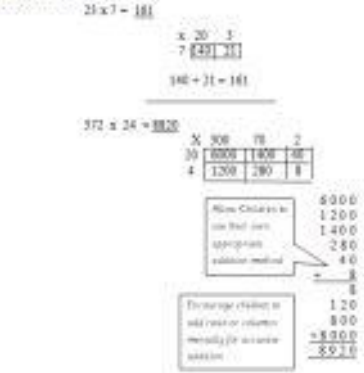
NOTE: Bar models should not be used to replace the abstract calculation but along-side the calculation as a transitional phase to help support the visualisation of the calculation.

Use the following frame to help support this:

Abstract calculation

Partioning:
38 x 5 = (30 x 5) + (8 x 5)
= 150 + 40
= 190

Grid Method:



Column Method:

```
  12
x 34
  48
+360
 408
```

Using decimals:
Using similar methods, they will be able to multiply decimals with up to two decimal places by a single digit number and then two digit numbers, approximating first. They should know that the decimal points line up under each other.
For example:
4.92 x 3
Children will approximate first
4.92 x 3 is approximately 5 x 3 = 15
Grid:

x	4	0.9	0.02
3	12	2.7	0.06

```
  12
+ 0.7
+ 0.06
 12.76
```

Column:

```
  53·2
x  2·4
 212·8   (53·2 x 4)
1064·0   (53·2 x 20)
1276·8
```

It is an option to include 0 in this example, but not essential

The prompts on brackets) can be omitted if children no longer need them

Division

Concrete: objects and pictures

Grouping or repeated subtraction:

There are 6 sweets, how many people can have 2 sweets each?

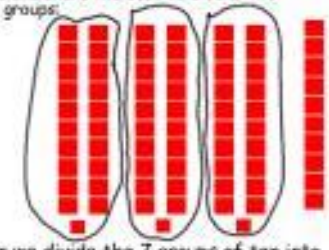
18 ÷ 3=

Repeated addition using bead bar:

Note: Avoid the language of sharing, instead talk about grouping

3)73 or 73÷3

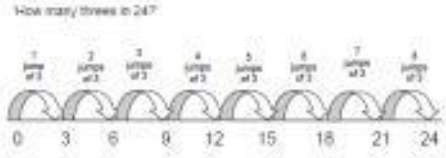
Once the number is represented in base 10 blocks. Begin dividing the base 10 blocks into groups of three. Draw 3 boxes or circles and share the base 10 blocks into three groups.



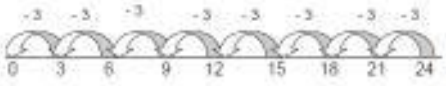
When we divide the 7 groups of ten into groups there is 1 group of ten left over. We put the 3 1's into groups and there are no 1's left over.
To finish sharing the last group of 10, it needs to be traded for 10 1's.

Using the number line

24 ÷ 3 = 8

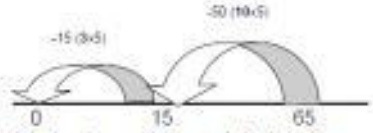


...also jump back from 24 to make the link with repeated subtraction.



"How many groups of three in 24?

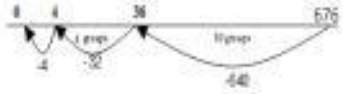
65 ÷ 5 = 13



Think about key times table facts to help chunk the problem. (Coin facts:1x, 2x, 5x, 10x, 20x, 50x, 100x, 200x)

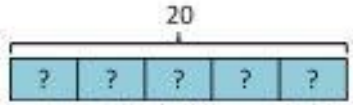
676 ÷ 8 = 84.5

OR



Pictorial representation (bar models)

20 ÷ 5 = ?



When modelling problems involving proportion it is useful to divide the bar into equal parts so that the proportional relationship and multiplicative structure are exposed.

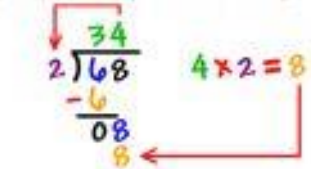
NOTE: Bar models should not be used to replace the abstract calculation but along-side the calculation as a transitional phase to help support the visualisation of the calculation.

Use the following frame to help support this:

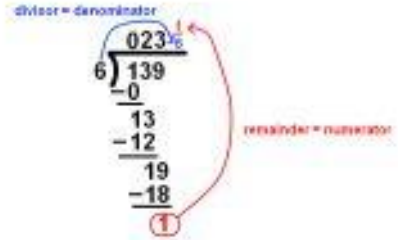
Abstract calculation

Children will develop their use of repeated addition to be able to add multiples of the divisor. Initially, these should be multiples of 10s, 5s, 2s and 1s = numbers with which the children are more familiar.

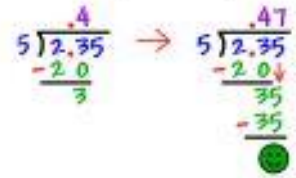
Only when fully confident with chunking on a number line should chunking come in. Children should already be able to express quotients as fractions or decimal fractions.



Any remainders should be shown as fractions, i.e. if the children were dividing 32 by 10, the answer should be shown as 3 2/10 which could then be written as 3 1/5 in its lowest terms.



Extend to decimals with up to two decimal places. Children should know that decimal points line up under each other.



So, 2.35 ÷ 5 = .47