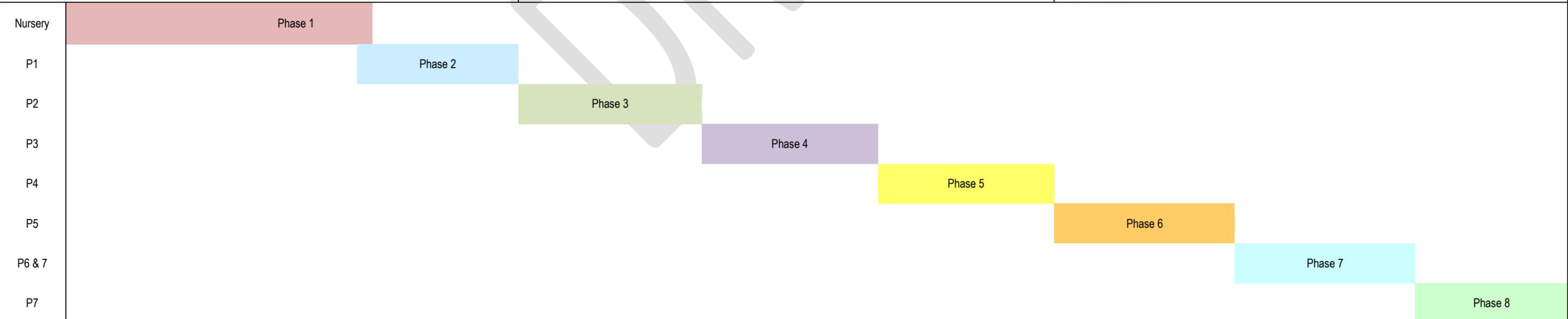


East Lothian's Revised Signposts in Number

The table below identifies (in approximate terms) how these phases develop over the early, first and second continuum of Curriculum for Excellence. Details of each phase can be found in the tables that follow.

<p>I am developing a sense of size and amount by observing, exploring, using and communicating with others about things in the world around me. MNU 0-01a</p> <p>I have explored numbers, understanding that they represent quantities, and I can use them to count, create sequences and describe order. MNU 0-02a</p> <p>I use practical materials and can 'count on and back' to help me to understand addition and subtraction, recording my ideas and solutions in different ways. MNU 0-03a</p> <p>I can share out a group of items by making smaller groups and can split a whole object into smaller parts. MNU 0-07a</p> <p>I have spotted and explored patterns in my own and the wider environment and can copy and continue these and create my own patterns. MTH 0-13a</p>	<p>I can share ideas with others to develop ways of estimating the answer to a calculation or problem, work out the actual answer, then check my solution by comparing it with the estimate. MNU 1-01a</p> <p>I have investigated how whole numbers are constructed, can understand the importance of zero within the system and can use my knowledge to explain the link between a digit, its place and its value. MNU 1-02a</p> <p>I can use addition, subtraction, multiplication and division when solving problems, making best use of the mental strategies and written skills I have developed. MNU 1-03a</p> <p>Having explored fractions by taking part in practical activities, I can show my understanding of: how a single item can be shared equally; the notation and vocabulary associated with fractions; where simple fractions lie on the number line. MNU 1-07a</p> <p>Through exploring how groups of items can be shared equally, I can find a fraction of an amount by applying my knowledge of division. MNU 1-07b</p> <p>Through taking part in practical activities including use of pictorial representations, I can demonstrate my understanding of simple fractions which are equivalent. MTH 1-07c</p> <p>I can continue and devise more involved repeating patterns or designs, using a variety of media. MTH 1-13a</p> <p>Through exploring number patterns, I can recognise and continue simple number sequences and can explain the rule I have applied. MTH 1-13b</p> <p>I can compare, describe and show number relationships, using appropriate vocabulary and the symbol for equals, not equal to, less than and greater than. MTH 1-15a</p> <p>When a picture or symbol is used to replace a number in a number statement, I can find its value using my knowledge of number facts and explain my thinking to others. MTH 1-15b</p>	<p>I can use my knowledge of rounding to routinely estimate the answer to a problem, then, after calculating, decide if my answer is reasonable, sharing my solution with others. MNU 2-01a</p> <p>I have extended the range of whole numbers I can work with, and, having explored how decimal fractions are constructed, can explain the link between a digit, its place and its value. MNU 2-02a</p> <p>Having determined which calculations are needed, I can solve problems involving whole numbers using a range of methods, sharing my approaches and solutions with others. MNU 2-03a</p> <p>I have explored the contexts in which problems involving decimal fractions occur and can solve related problems using a variety of methods. MNU 2-03b</p> <p>Having explored the need for rules for the order of operations in number calculations, I can apply them correctly when solving simple problems. MTH 2-03c</p> <p>I can show my understanding of how the number line extends to include numbers less than zero and have investigated how these numbers occur and are used. MNU 2-04a</p> <p>Having explored the patterns and relationships in multiplication and division, I can investigate and identify the multiples and factors of numbers. MTH 2-05a</p> <p>I have investigated the everyday context in which simple fractions or decimal fractions are used and can carry out the necessary calculations to solve related problems. MNU 2-07a .</p> <p>I can show the equivalent forms of simple fractions, decimal fractions and percentages and can choose my preferred form when solving a problem, explain my choice of method. MNU 2-07b</p> <p>Have investigated how a set of equivalent fractions can be create, understanding the meaning of simplest form, and can apply my knowledge to compare and order the most commonly used fractions.. MNU 2-07c.</p> <p>Having explored more complex number sequences, including well-known named number patterns, I can explain the rule used to generate the sequence, and apply it to extend the pattern. MTH 2-13a</p> <p>I can apply my knowledge of number facts to solve problems where an unknown value is represented by a symbol or letter MTH 2-15a.</p>
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Guiding Principles for Learning and Teaching of Number

Inquiry –based learning	Learning is inquiry based. Children are routinely engaged in thinking hard to solve arithmetical problems
Initial and on-going assessment	Learning is informed by ongoing assessment through teaching.
Zone of Proximal Development	Learning is focused just beyond the cutting edge of children’s current knowledge.
Quality crafted lessons	Learning approaches are carefully selected to meet the needs of this child.
Developing more sophisticated strategies	The teacher understands the children’s numerical strategies and deliberately engenders the development of more sophisticated strategies through mathematisation.
Observing and fine-tuning learning	Observation of learning informs micro-adjustments within lessons
Symbolising and notating	Children talk about their strategies and over time learn to notate their thinking and formalise this.
Sustained thinking and reflection	Wait time is valued and given
Intrinsic Satisfaction	Through distancing settings and self checking their thinking children understand they are making progress .

Mathematisation Theme	Addition and Subtraction	Multiplication and Division	Fractions, Decimals and Percentages
Structuring number	Understanding the underlying connections between numbers (e.g. $16=10+6, 8+8$, etc.)	Understanding the fairness and equality of multiplication and division Linking and applying knowledge of addition and subtraction to multiplication and division Understand composite and unitary aspects of a quantity	Linking and applying knowledge of Multiplication and Division to Fractions, Decimals and Percentages Understand composite and unitary aspects of a quantity
Extending the range of numbers	Progressively introducing a wider range of numbers to calculate with	Introducing multiples and sequences in steps to ensure secure understanding	Building on knowledge of fair share and equal parts, sequentially introduce fractions in steps to ensure secure understanding. This leads to a depth of understanding within fractions and this knowledge enables learners to develop a meaningful understanding of decimals and percentages.
Decimalising towards Base-ten thinking	Developing base ten thinking that exploits using ten as a unit (e.g. conceptual place value and counting in tens)	Applying conceptual place value to multiplication and division	Applying conceptual place value to Fractions, Decimals and Percentages
Unitising and not counting by ones	Regarding a number larger than one as a unit and use this unit to solve a task.	Adopting appropriate settings to explore the composite and unitary aspects of a quantity	Unitising, Partitioning, Disembedding and Iterating
Distancing the setting of materials	Progressively reducing the role of materials	Distancing the Setting (Manipulate it → See it → Flash it → Screen It → Check It → Express It and Explain It)	Distancing the Setting (Manipulate it → See it → Flash it → Screen It → Check It → Express It and Explain It)
Notating	Progressively formalising mathematical thought in a structured way	Notation (Informal Jottings → Semi-Formal Written Strategies → Formal Written Algorithms)	Notation (Informal Jottings → Semi-Formal Written Strategies → Formal Written Algorithms)
Formalising and generalising	Developing arithmetic to involve more formal notation and more formal procedures. Reasoning that involves proceeding from a few cases to many cases	Increasing the range of tasks to which children apply their strategies	Increasing the range of tasks to which children apply their strategies

Phases at a glance

	Addition and Subtraction		Multiplication and Division		Fractions, Decimals and Percentages
	Understanding Numbers and Numerals	Number Structuring for Addition and Subtraction	Understanding of Multiples and Sequences of Multiples	Grouping and Sharing for Multiplication and Division	Fractions, Decimals and Percentages
Phase 1	Develop number word sequence to <i>at least</i> 20	Develop perceptual counting to add two groups together.		Understand fairness in equal groups and shares	Fair sharing
Phase 2	Develop number word sequence to <i>at least</i> 30	Developing number structures for addition and subtraction to 10		Making equal groups and shares	Wholes, halves and quarters
Phase 3	Develop number word sequence to <i>at least</i> 100	Secure knowledge of addition and subtraction to 10	Multiples of 2	Grouping and sharing in 2s	Unit and composite fractions Wholes, halves, thirds, fifths, tenths
Phase 4	Secure knowledge of addition and subtraction <i>at least</i> to 20		Multiples of 2s and 3	Grouping and Sharing in 2s and 3s	Understanding and comparing wholes, unit, proper and improper fractions
Phase 5	Conceptual place value. Adding and subtracting to, from and through decuples to 100		Multiples of 2s, 3s, 5s and 10s	Grouping and Sharing in 2s, 3s, 5s and 10s ↓ Recall of facts	Understanding and comparing wholes, unit fractions, composite fractions and improper fractions
Phase 6	Secure knowledge of addition and subtraction to <i>at least</i> 100		Multiples of 2s, 4s and 8s, 3s, 5s and 6s, 9s and 10s then lucky 7s	Grouping and Sharing 2s, 4s and 8s, 3s, 5s and 6s, 9s and 10s then lucky 7s ↓ Recall of facts	Using fractions to solve number problems
Phase 7	Addition and Subtraction to <i>at least</i> 1000 and beyond Working towards formal algorithms		2 digital Multiplication and Division Working towards formal algorithms		Simplifying fractions Applying fractional knowledge to decimals and percentages
Phase 8	Efficient use of mental strategies and formal algorithms				

Addition and Subtraction		Multiplication and Division		Fractions, Decimals and Percentages
Understanding numbers and numerals	Number Structuring for Addition and Subtraction	Understanding of multiples and sequences of multiples	Grouping and Sharing for Multiplication and Division	
<p>Phase 1</p> <p>Learning Outcomes:</p> <ul style="list-style-type: none"> I can say forward number word sequences to <i>at least</i> 20 I can say backward number word sequences from <i>at least</i> 20 I am beginning to work out the number word after and number word before I can read numeral sequences to <i>at least</i> 10 I can sequence numerals to <i>at least</i> 10 I can identify and recognise numerals to <i>at least</i> 10. I can work out the missing number or numeral in a sequence to <i>at least</i> 10 <p>Language</p> <ul style="list-style-type: none"> Forward, Backward Before, After, In-between First, Second..... <p>Settings:</p> <ul style="list-style-type: none"> Embedded in daily routines Number Line Numeral Track <p>Mathematisation</p> <p>Distancing the Setting ((Manipulate it → See it → Flash it → Screen It → Check It → Express It and Explain It)</p> <p>Notation (Informal Jottings → Semi-Formal Written Strategies → Formal Written Algorithms)</p> <p>Organising → Generalising</p>	<p>Learning Outcomes:</p> <ul style="list-style-type: none"> I can count perceived items presented in different ways I can count items in one collection I can count out a requested number of items I can count items in a row forwards and backwards I can count items in two collections I can estimate within my number range <p>Settings:</p> <ul style="list-style-type: none"> Items that can be counted (strong emphasis on play experiences) Items displayed in different colours, types, arrangements (rows, dominos, random arrays) <p>Mathematisation</p> <p>Distancing the Setting (Manipulate it → See it → Flash it → Screen It → Check It → Express It and Explain It)</p> <p>Notation (Informal Jottings → Semi-Formal Written Strategies → Formal Written Algorithms)</p> <p>Organising → Generalising</p> <p>Additive task, removed item, missing addend, missing subtrahend, missing minuend, most efficient strategy</p>	<p>STEP 1 Learning Outcomes</p> <ul style="list-style-type: none"> I can describe, organise and make equal groups I can describe, organise and partition equal shares I understand that for shares to be equal, a quantity may remain I can break a whole into parts (amounts and items) I can estimate within my number range <p>Settings</p> <ul style="list-style-type: none"> Items that can be counted, grouped and shared (strong emphasis on play experiences) Items displayed in different colours, types, arrangements, random arrays Materials that can be broken up and shared e.g. playdough, cake mixture etc. <p>Language</p> <ul style="list-style-type: none"> Parts, whole, share, group, the same, fair share, left over <p>Mathematisation</p> <p>Distancing the Setting (Manipulate it → See it → Flash it → Screen It → Check It → Express It and Explain It)</p> <p>Notation (Informal Jottings → Semi-Formal Written Strategies → Formal Written Algorithms)</p> <p>Organising → Generalising</p>	<p>Learning Outcomes</p> <ul style="list-style-type: none"> I can break a whole into parts and can describe how I made it fair. <p>Settings</p> <ul style="list-style-type: none"> Materials that can be broken up and shared e.g. playdough, cake mixture etc. <p>Language</p> <ul style="list-style-type: none"> Parts, whole, share, the same, fair <p>Mathematisation</p> <p>Distancing the Setting (Manipulate it → See it → Flash it → Screen It → Check It → Express It and Explain It)</p> <p>Notation (Informal Jottings → Semi-Formal Written Strategies → Formal Written Algorithms)</p> <p>Organising → Generalising</p>	



Addition and Subtraction		Multiplication and Division		Fractions, Decimals and Percentages
Understanding numbers and numerals	Number Structuring for Addition and Subtraction	Understanding of multiples and sequences of multiples	Grouping and Sharing for Multiplication and Division	
<p>Learning Outcomes:</p> <ul style="list-style-type: none"> I can say and read forward number word sequences to <i>at least</i> 30 I can say and read backward number word sequences from <i>at least</i> 30 I can recall the number word after and number word before to <i>at least</i> 30 I can say the next 2,3 or 4 numbers in a forward and backward number sequence to <i>at least</i> 30 I can sequence numerals to at least 30 I can identify, recognise and place numerals to <i>at least</i> 30 I can work out the missing number or numeral in a sequence to <i>at least</i> 30 I can count on or back from a given number to find or locate another number in a sequence to <i>at least</i> 30 <p>Settings:</p> <ul style="list-style-type: none"> Embedded in daily routines Number Line Numerals Track <p>Mathematisation</p> <p>Distancing the Setting (Manipulate it → See it → Flash it → Screen It → Check It → Express It and Explain It)</p> <p>Notation (Informal Jottings → Semi-Formal Written Strategies → Formal Written Algorithms)</p> <p>Organising → Generalising</p>	<p>STEP 1 Learning Outcomes:</p> <ul style="list-style-type: none"> I understand that numbers can be expressed as parts that can make up a whole using numerals and symbols I understand the concept of zero I can add and subtract using small doubles I can add and subtract using partitions of 5 I can add and subtract using "5 plus" facts to 10 I understand the commutative relationship within addition I understand the distributive and inverse relationship within addition and subtraction I can estimate within my number range and explain my thinking <p>Using all of the above ↓</p> <ul style="list-style-type: none"> quickly derive and recall addition and subtraction tasks <p>Settings:</p> <ul style="list-style-type: none"> Counting items Finger Patterns Five Frames Ten Frames (arranged in 5 plus) http://catalog.mathlearningcenter.org/apps/number-frames <p>Mathematisation</p> <p>Distancing the Setting (Manipulate it → See it → Flash it → Screen It → Check It → Express It and Explain It)</p> <p>Notation (Informal Jottings → Semi-Formal Written Strategies → Formal Written Algorithms)</p> <p>Organising → Generalising</p> <p>Additive task, removed item, missing addend, missing subtrahend, missing minuend, most efficient strategy</p>	<p>STEP 2 Learning Outcomes</p> <ul style="list-style-type: none"> I understand the term equal I can combine and count equal groups I can partition a collection into equal shares and establish the number of shares I can partition a collection into equal shares and establish the number in each share I understand that for shares to be equal, a quantity may remain I can estimate within my number range and explain my thinking <p>Settings:</p> <ul style="list-style-type: none"> Items that can be counted, grouped and shared (strong emphasis on play experiences) Items displayed in different colours, types, arrangements Materials that can be broken up and shared e.g. playdough, cake mixture etc <p>Language</p> <ul style="list-style-type: none"> Parts, wholes, share, shares, group, groups, the same, fair share, equal, half way, half of, collection, left over Groups of, equal shares, partition <p>Mathematisation</p> <p>Distancing the Setting (Manipulate it → See it → Flash it → Screen It → Check It → Express It and Explain It)</p> <p>Notation (Informal Jottings → Semi-Formal Written Strategies → Formal Written Algorithms)</p> <p>Organising → Generalising</p>	<p>Learning Outcomes</p> <ul style="list-style-type: none"> I can break a whole into two equal parts (items) I understand the term half way and half of I understand that a quarter can be made halving the half I can iterates a fraction part to reform the whole I understand the notation for a fraction <p>Settings</p> <ul style="list-style-type: none"> Linear materials to be broken up and shared e.g. bars, paper strips, rods <p>Language</p> <ul style="list-style-type: none"> Parts, whole, share, the same, fair Half, Half Way, Half of Equal Comparative language for size and length <p>Mathematisation</p> <p>Distancing the Setting (Manipulate it → See it → Flash it → Screen It → Check It → Express It and Explain It)</p> <p>Notation (Informal Jottings → Semi-Formal Written Strategies → Formal Written Algorithms)</p> <p>Organising → Generalising</p>	

Addition and Subtraction

Multiplication and Division

Fractions, Decimals and Percentages

Understanding numbers and numerals

Number Structuring for Addition and Subtraction

Understanding of multiples and sequences of multiples

Grouping and Sharing for Multiplication and Division

Learning Outcomes:

- I can recite the decuples from 0-100 forwards and backwards
- I can say and read forward number word sequences to *at least* 100
- I can say and read backward number word sequences from *at least* 100
- I can recall the number word after and number word before to *at least* 100
- I can track numerals
- I can say the next 2,3 or 4 numbers in a forward and backward number sequence to *at least* 100
- I can sequence numerals to *at least* 100
- I can work out the missing number or numeral in a sequence to *at least* 100
- **I can identify, recognise and place numerals to at least 100**
- I can count on or back from a given number to find, locate another number in a sequence to *at least* 100
- I can calculate the number of backwards or forward jumps from a to b

Settings:

- Embedded in daily routines
- Number Line
- Numeral Track
- Hundred Square
- Empty Number Line

Mathematisation

Distancing the Setting (Manipulate IT → See it→Flash it→Screen It→Check It→Express It and Explain It)

Notation (Informal Jottings→Semi-Formal Written Strategies→Formal Written Algorithms)

Organising→Generalising

STEP 2 Learning Outcomes:

- I understand that numbers can be expressed as parts that can make up a whole using numerals and symbols
- I can add and subtract using partitions of 10.
- I can add parts in the range 0 to 5
- I understand the commutative relationship within addition
- I understand the distributive and inverse relationship within addition and subtraction
- I can estimate within my number range and use a variety of strategies
- I can check and compare my estimate

STEP 3 Learning Outcomes:

- I can add when the whole is in the range 0 to 10
- I can subtract parts in the range 0 to 5
- understand the commutative relationship within addition
- understand the distributive and inverse relationship within addition and subtraction

Settings:

- Counting items
- Ten Frames
- <http://catalog.mathlearningcenter.org/apps/number-frames>

Mathematisation

Distancing the Setting (Manipulate IT → See it→Flash it→Screen It→Check It→Express It and Explain It)

Notation (Informal Jottings→Semi-Formal Written Strategies→Formal Written Algorithms)

Organising→Generalising

Additive task, removed item, missing addend, missing subtrahend, missing minuend, most efficient strategy

STEP 3A Learning Outcomes

- I can say the forward number word sequences in multiples of 2s and keep track of the counts on my fingers
- I can say the backward number word sequences in multiples of 2s and keep track of the counts on my fingers
- I can say the next number word before and after in a multiple number sequence in 2s
- I can identify the placement of numerals in sequences of 2s

Settings

- Numeral Lines
- Numeral Tracks

Language

- Multiples
- Sequence
- increment, decrement
- Keeping track

Mathematisation

Distancing the Setting (See it→Flash it→Screen It→Check It→Express It and Explain It)

Notation (Informal Jottings→Semi-Formal Written Strategies→Formal Written Algorithms)

Organising→Generalising

STEP 3B Learning Outcomes

I know that 2 can be regarded as a composite group of 1 and use this to:

- describe, build and count simple arrays of 2 within 10
- count and describe items grouped in 2s within 10
- increment and decrement in groups of 2 within 10
- half numbers within 10
- link groups of 2 and 2 equal groups to doubles
- partition a collection into equal shares and establish the number of shares
- partition a collection into equal shares and establish the number in each share
- understand the commutative relationship within multiplication
- I understand that for shares to be equal, a quantity may remain
- I can estimate within my number range and use a variety of strategies
- I can check and compare my estimate

Settings

- n-tiles
- Dot Arrays → Square Arrays (Base 5 and 10 Grids)

Language

- Parts, wholes, share, shares, group, groups, the same, fair share, equal, half way, half of, collection
- Groups of, equal shares, partition
- Half, double
- Rows, columns, arrays
- Increment and decrement
- Multiply and Divide
- Rows and Columns
- Commutative
- Remainder
- Horizontal and Vertical

Mathematisation

Distancing the Setting (Manipulate IT → See it→Flash it→Screen It→Check It→Express It and Explain It)

Notation (Informal Jottings→Semi-Formal Written Strategies→Formal Written Algorithms)

Organising→Generalising

Learning Outcomes

- I can partition a whole into equal parts (halves, thirds, quarters, fifths and beyond)
- Using linear representation, I can verify fractions of a whole
- I can iterate a unit fraction part to reform the whole
- I can iterate a unit fraction part and create a unit beyond the whole and describe it.
- I understand the notation for a fraction
- I understand the difference between a unit fraction and a composite fraction
- When shown a part and a whole I can work out the size of the part

whole											
half					half						
third			third			third			third		
fifth		fifth		fifth		fifth		fifth		fifth	
Tenth											

Settings

- Linear materials to be broken up and shared e.g. bars, paper strips, rods

Language

- Parts, whole, share, the same, fair,
- Half, Half Way, Half of
- Equal
- Iterate, Reform
- Comparative language for size and length
- Partition
- Unit Fraction (1/2, 1/3, 1/4 etc)
- Composite Fraction (2/3, 3/4, 2/5 etc)

Mathematisation

Distancing the Setting (Manipulate it → See it→Flash it→Screen It→Check It→Express It and Explain It)

Notation (Informal Jottings→Semi-Formal Written Strategies→Formal Written Algorithms)

Organising→Generalising

Addition and Subtraction

Multiplication and Division

Fractions, Decimals and Percentages

Understanding numbers and numerals

Number Structuring for Addition and Subtraction

Understanding of multiples and sequences of multiples

Grouping and Sharing for Multiplication and Division

STEP 4 Learning Outcomes:

- I understand that numbers can be expressed as parts that can make up a whole using numerals and symbols
- I can add and subtract using 10 plus facts
- I can add and subtract using doubles when the whole is in the range 10 to 20
- I can add and subtract using near doubles when the whole is in the range 0 to 20
- I can add parts in the range 0 to 10
- I can subtract when the whole is in the range 0 to 10

STEP 5 Learning Outcomes

- I can add and subtract using partitions of 20
- I can add when the whole is in the range 0-20
- I can subtract when the part is in the range 0 to 10
- I understand the commutative relationship within addition
- I understand the distributive and inverse relationship within addition and subtraction

STEP 6 Learning Outcomes

- I can add and subtract when the whole is in the range 0 to 20
- I understand the commutative relationship within addition
- I understand the distributive and inverse relationship within addition and subtraction
- I can estimate within my number range and use a variety of strategies
- I can check and compare my estimate
- I can estimate where to place given numerals

Settings:

- Ten Frames
- <http://catalog.mathlearningcenter.org/apps/number-frames>
- Arithmetic Rack
- <http://catalog.mathlearningcenter.org/apps/number-pieces>
- Empty Number Line
- <http://catalog.mathlearningcenter.org/apps/number-line>

Mathematisation

Distancing the Setting (Manipulate IT → See it→Flash it→Screen It→Check It→Express It and Explain It)
 Notation (Informal Jottings→Semi-Formal Written Strategies→Formal Written Algorithms)

Organising→Generalising

Additive task, removed item, missing addend, missing subtrahend, missing minuend, most efficient strategy

STEP 4A Learning Outcomes

- I can say the forward number word sequences in multiples of 2s and 3s keep track of the counts on my fingers
- I can say the backward number word sequences in multiples of 2s and 3s and keep track of the counts on my fingers
- I can say the next number word before and after in a multiple number sequence in 2s and 3s
- I can identify the placement of numerals in sequences of 2s and 3s

Settings

- Numeral Lines
- Numeral Tracks

Language

- Multiples
- Sequence
- increment, decrement
- Keeping track

Mathematisation

Distancing the Setting Manipulate IT → See it→Flash it→Screen It→Check It→Express It and Explain It

Notation (Informal Jottings→Semi-Formal Written Strategies→Formal Written Algorithms)

Organising→Generalising

Additive task, removed item, missing addend, missing subtrahend, missing minuend, most efficient strategy

STEP 4B Learning Outcomes

- I know that 2 and 3 can be regarded as composite groups of 1 and use this to:
 - describe, build and count simple arrays of 2s and 3s within 30
 - count and describe items grouped in 2s and 3s within 30
 - increment and decrement in groups of 2s and 3s within 30
 - half and third numbers within relevant tables
- partition a collection into equal shares and establish the number of shares
- partition a collection into equal shares and establish the number in each share
- I understand that for shares to be equal, a quantity may remain. This is called the remainder.
- I relate area and perimeter markers to operations of multiplication and division
- I use knowledge of perimeter markers and area to solve multiplication and division facts in different ways
- I understand the commutative, associative and distributive relationship within multiplication

- I can estimate within my number range and use a variety of strategies
- I can check and compare my estimate

Settings

- n-tiles
- Dot Arrays → Square Arrays (Base 5 and 10 Grids)→Perimeter Markers→Empty Arrays
- Word Problems

Language

- Parts, wholes, share, shares, group, groups, the same, fair share, equal, half way, half of, collection, composite groups
- Groups of, equal shares Groups of, equal shares, partition
- Half, double
- Rows, columns, arrays
- Increment and decrement
- Groups of, equal shares
- Half, third, double
- Multiply and Divide
- Rows and Columns
- Perimeter and Area
- Commutative, Associative and Distributive
- Remainder
- Horizontal and Vertical

Mathematisation

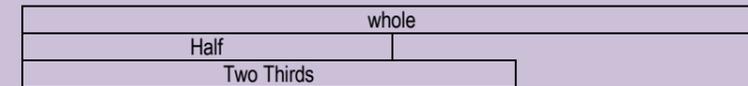
Distancing the Setting Manipulate IT → See it→Flash it→Screen It→Check It→Express It and Explain It

Notation (Informal Jottings→Semi-Formal Written Strategies→Formal Written Algorithms)

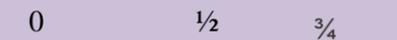
Organising→Generalising

Learning Outcomes

- I can compare a part to its whole and describe the relationship between them (e.g. 1/4 of whole and 2/3 of a whole)



- When shown a part and a whole I can work out the size of the part
- Using an empty number line I can compare fractions



- I know that the bottom number in a fraction is called a denominator and it tells me how many parts there are in a whole
- I know that the top number in a fraction is called a numerator and it tells me how many parts of the whole should be considered

Working with linear bars:

- I can identify what fraction of the whole a given part is
- I can identify and create proper fractions using my knowledge of parts and wholes

Proper fractions

What fraction of the longer bar is the smaller bar?



Working with linear bars:

- I can identify and create improper fractions using my knowledge of parts and wholes
- I can identify the whole within an improper fraction

Improper Fractions

This bar is 5/3 of the whole bar. Find the whole bar.



Settings

- Linear materials that can be broken up and shared e.g. bars, paper strips, rods

Language

- Parts, whole, share, the same, fair,
- Half, Half Way, Half of
- Equal
- Iterate, Reform
- Comparative language for size and length
- Partition
- Unit Fraction (1/2, 1/3, 1/4 etc)
- Composite Fraction (2/3, 3/4, 2/5 etc)
- Unit partition, disembed, iterate
- Denominator, Numerator
- Composite fraction
- Improper fraction

Mathematisation

Distancing the Setting (Manipulate it → See it→Flash it→Screen It→Check It→Express It and Explain It)

Notation (Informal Jottings→Semi-Formal Written Strategies→Formal Written Algorithms)

Organising→Generalising

Addition and Subtraction

Multiplication and Division

Fractions, Decimals and Percentages

Understanding numbers and numerals | Number Structuring for Addition and Subtraction

Understanding of multiples and sequences of multiples | Grouping and Sharing for Multiplication and Division

STEP 7 Learning Outcome

- I can increment and decrement by 10s and by 10s and 1s on and off the decuple
- I can increment and decrement by 10s and by 10s and 1s from a given number to find or locate another number in a sequence to **1000**
- I can calculate the number of backwards or forward increments from a to b
- I can round numbers to the nearest ten within 100 and beyond
- I can name a numeral and describe the value of each digit to *at least 1000, including zero as a place holder*

STEP 8 Learning Outcome

- I can describe how I use my knowledge of number structures to add from a decuple number when the part is within 10
- I can describe how I use my knowledge of number structures to subtract to a decuple number within when the part is within 10
- I can describe how I use my knowledge of number structures to add to a decuple number when the part is within 10
- I can describe how I use my knowledge of number structures to subtract from a decuple number when the part is within 10
- I can describe how I use my knowledge of number structures to add through a decuple number when the part is within 10
- I can describe how I use my knowledge of number structures to subtract through a decuple when the part is within 10
- I understand the commutative relationship within addition
- I understand the distributive and inverse relationship within addition and subtraction

- I can estimate within my number range and use a variety of strategies
- I can check and compare my estimate

Settings:

- Ten Frames
- <http://catalog.mathlearningcenter.org/apps/number-frames>
- Conceptual Place Value Materials
- <http://catalog.mathlearningcenter.org/apps/number-pieces>
- Hundred Square
- Empty Number Line
- <http://catalog.mathlearningcenter.org/apps/number-line>
- Arrow Cards

Mathematisation

Distancing the Setting (Manipulate It → See it → Flash it → Screen It → Check It → Express It and Explain It)

Notation (Informal Jottings → Semi-Formal Written Strategies → Formal Written Algorithms)

Organising → Generalising

Additive task, removed item, missing addend, missing subtrahend, missing minuend, most efficient strategy

STEP 5A Learning Outcome

- I can say the forward number word sequences in multiples of 2s, 3s, 5s and 10s keep track of the counts on my fingers
- I can say the backward number word sequences in multiples of 2s, 3s, 5s and 10s and keep track of the counts on my fingers
- I can say the next number word before and after in a multiple number sequence in 2s, 3s, 5s and 10s
- I can identify hidden numerals and locate their position within sequences of 2s, 3s, 5s and 10s

Settings

- Numeral Lines
- Numeral Tracks

Language

- Multiples
- Sequence
- increment, decrement
- Keeping track

Mathematisation

Distancing the Setting (Manipulate It → See it → Flash it → Screen It → Check It → Express It and Explain It)

Notation (Informal Jottings → Semi-Formal Written Strategies → Formal Written Algorithms)

Organising → Generalising

STEP 5B Learning Outcomes

I know that 2, 3, 5 and 10 can be regarded as composite groups of 1 and use this to:

- describe, build and count simple arrays of 2s, 3s, 5s and 10s within 100
- count and describe items grouped in 2s, 3s, 5s and 10s
- increment and decrement in groups of 2s, 3s, 5s and 10s within 100
- Half, third, fifth and tenth numbers within relevant tables
- partition a collection into equal shares and establish the number of shares
- partition a collection into equal shares and establish the number in each share
- I understand that for shares to be equal, a quantity may remain. This is called the remainder.
- I understand the commutative, associative and distributive relationship within multiplication

Using all of the above

- quickly derive and recall multiplication and division facts
- identify the multiples and factors of numbers from familiar times tables. (e.g. 10 is a multiple of 5 and 2 and 5 and 2 are factors of 10)
- I understand the commutative, associative and distributive relationship within multiplication

- I can estimate within my number range and use a variety of strategies
- I can check and compare my estimate

Settings

- n-tiles
- Dot Arrays → Square Arrays (Base 5 and 10 Grids) → Perimeter Markers → Empty Arrays
- <http://catalog.mathlearningcenter.org/apps/number-pieces>
- Word Problems

Language

- Parts, wholes, share, shares, group, groups, the same, fair share, equal, half way, half of, collection, composite groups
- Groups of, equal shares Groups of, equal shares, partition
- Rows, columns, arrays
- Increment and decrement
- Groups of, equal shares
- Half, third, fifth, tenth, double
- Multiply and Divide
- Rows and Columns
- Perimeter and Area
- Commutative, Associative and Distributive
- Remainder
- Horizontal and Vertical

Mathematisation

Distancing the Setting (Manipulate It → See it → Flash it → Screen It → Check It → Express It and Explain It)

Notation (Informal Jottings → Semi-Formal Written Strategies → Formal Written Algorithms)

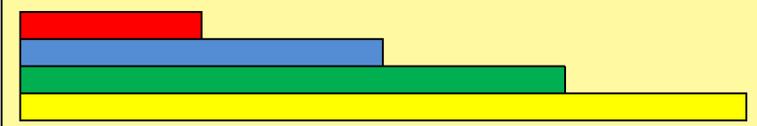
Organising → Generalising

Learning Outcomes

- I can compare a part to different wholes and understand that the part can represent different fractions
- I can produce composite fractions from unit fractions through iteration
- I can produce improper fractions from unit fractions through iteration

Settings

What fraction is the red bar in relation to the blue, green and yellow bars? – Unit Fraction
 What fraction is the green bar in relation to the yellow bar? – Composite Fraction
 What fraction is the green bar in relation to the blue bar? – Improper Fraction



Learning Outcomes

- I can use my knowledge of fractions to explore relationships between two different unit fractions and a whole.

Settings

If the red is a 1/3 of the blue, and the blue is a 1/4 of the yellow, what unit fraction is the red to the yellow? (It is important that the blue is regarded as a whole in its own right but also 1/4 of the yellow bar)



Language

- Parts, whole, share, the same, fair,
- Equal
- Iterate, reform
- Unit partition, disembed, iterate
- Comparative language
- Unit fraction
- Denominator, Numerator
- Composite fraction
- Improper fraction

Mathematisation

Distancing the Setting (Manipulate it → See it → Flash it → Screen It → Check It → Express It and Explain It)

Notation (Informal Jottings → Semi-Formal Written Strategies → Formal Written Algorithms)

Organising → Generalising

Addition and Subtraction

Multiplication and Division

Fractions, Decimals and Percentages

Understanding numbers and numerals

Number Structuring for Addition and Subtraction

Understanding of multiples and sequences of multiples

Grouping and Sharing for Multiplication and Division

STEP 9 Learning Outcomes:

- I can identify, recognise, order and sequence a range of numerals including negative numerals
- I can estimate where to place given numerals to at least 1000
- I can increment and decrement by 100 to at least 1000
- I can describe and compare how I solve a variety of addition and subtraction tasks using my knowledge of tens and ones and number structures; within 100, within 1000
- I can understand the commutative relationship within addition
- I can understand the distributive and inverse relationship within addition and subtraction

Settings:

- Ten Frames
- <http://catalog.mathlearningcenter.org/apps/number-frames>
- Conceptual Place Value Materials
- <http://catalog.mathlearningcenter.org/apps/number-pieces>
- Empty Number Line
- <http://catalog.mathlearningcenter.org/apps/number-line>

Mathematisation

Distancing the Setting (Manipulate It → See it → Flash it → Screen It → Check It → Express It and Explain It)

Notation (Informal Jottings → Semi-Formal Written Strategies → Formal Written Algorithms)

Organising → Generalising

STEP 6A Learning Outcome

- In the following clusters - 2s, 4s and 8s, 3s, 5s and 6s, 9s and 10s then lucky 7s:
- I can say the forward number word sequences in multiples and keep track of the counts on my fingers
 - I can say the backward number word sequences in multiples and keep track of the counts on my fingers
 - I can say the next number word before and after in a multiple number sequence
 - I can identify hidden numerals and locate their position within sequences

Settings

- Numeral Lines
- Numeral Tracks

Language

- Multiples
- Sequence
- Increment, Decrement
- Keeping track

Mathematisation

Distancing the Setting (Manipulate It → See it → Flash it → Screen It → Check It → Express It and Explain It)

Notation (Informal Jottings → Semi-Formal Written Strategies → Formal Written Algorithms)

Organising → Generalising

STEP 6B Learning Outcomes

In the following clusters - 2s, 4s and 8s, 3s, 5s and 6s, 9s and 10s then lucky 7s:

- describe, build and count simple arrays
- count and describe items grouped
- increment and decrement in groups
- partition a collection into equal shares and establish the number of shares
- partition a collection into equal shares and establish the number in each share
- I understand that for shares to be equal, a quantity may remain. This is called the remainder.
- I understand the commutative, associative and distributive relationship within multiplication

Using all of the above



- quickly derive and recall multiplication and division facts
- identify the multiples and factors of numbers from familiar times tables. (e.g. 10 is a multiple of 5 and 2 and 5 and 2 are factors of 10)
- I can use the commutative and inverse relationships between multiplication and division.

Settings

- n-tiles
- Dot Arrays → Square Arrays (Base 5 and 10 Grids) → Perimeter Markers → Empty Arrays
- <http://catalog.mathlearningcenter.org/apps/number-pieces>
- Word Problems
- Jotting → Formal Expressions

Language

- Parts, wholes, share, shares, group, groups, the same, fair share, equal, half way, half of, collection, composite groups
- Groups of, equal shares Groups of, equal shares, partition
- Half, double
- Rows, columns, arrays, build describe
- Increment and decrement
- Groups of, equal shares
- Half, third, fifth, tenth, double
- Commutative and inverse relationships
- Multiples and Factors
- Multiply and Divide
- Perimeter and Area
- Commutative, Associative and Distributive
- Remainder
- Horizontal and Vertical

Mathematisation

Distancing the Setting (Manipulate It → See it → Flash it → Screen It → Check It → Express It and Explain It)

Notation (Informal Jottings → Semi-Formal Written Strategies → Formal Written Algorithms)

Organising → Generalising

Learning Outcomes

- I can identify unit fractions, composite fractions and improper fractions when comparing linear bars

Settings

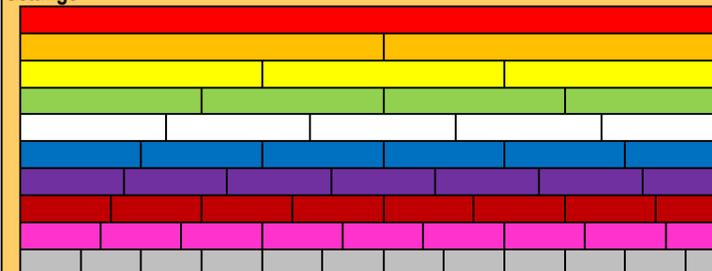
This is a whole bar. Draw me 1/3 of the whole bar. Draw me 2/3 of the whole bar. Draw me 4/3 of the whole bar.



Learning Outcomes

- I can match and give examples of equivalent fractions
- I can use my knowledge of equivalent fractions to simplify fractions

Settings

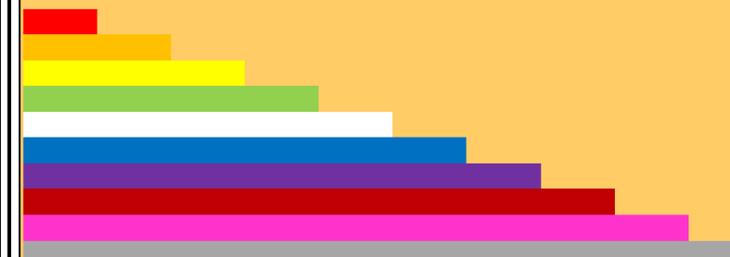


Learning Outcomes

- I can use my knowledge of unit fractions and iterating to help me solve related problems

Settings

If the pink is 81 what value is the red? Can you use this to work out the value of the green? If the white bar is 45 what is the value of the green?



Candy factory

Candybot <http://lrrg.centers.vt.edu/projects/games/apps/candyBot.htm>

Learning Outcomes

- I can use the denominator and the numerator to calculate the fraction of an amount e.g. two thirds of 27 is 27 divided by 3 and multiplied by 2

Settings

- Square arrays

Language

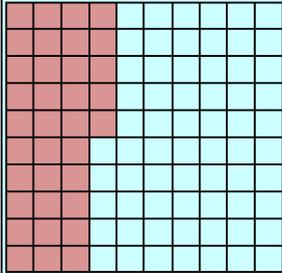
- Parts, whole, share, the same, fair,
- Equal
- Iterate, Reform
- Unit partition, disembed, iterate
- Numerator and Denominator
- Comparative language
- Unit fraction
- Composite fraction
- Improper fraction

Mathematisation

Distancing the Setting (Manipulate it → See it → Flash it → Screen It → Check It → Express It and Explain It)

Notation (Informal Jottings → Semi-Formal Written Strategies → Formal Written Algorithms)

Organising → Generalising

Addition and Subtraction		Multiplication and Division		Fractions, Decimals and Percentages	
Understanding numbers and numerals	Number Structuring for Addition and Subtraction	Understanding of multiples and sequences of multiples	Grouping and Sharing for Multiplication and Division		
<p>STEP10 Learning Outcomes:</p> <ul style="list-style-type: none"> I can read, write and sequence numbers forwards and backwards in the range 0 to 1 000 000 I can describe the value of each digit in a numeral to <i>at least</i> 1000 and up to 1 000 000 I can estimate where to place given numerals I can understand the commutative relationship within addition I can understand the distributive and inverse relationship within addition and subtraction I can use jottings to solve addition and subtraction tasks within one hundred I understand and use formal algorithms to solve addition and subtraction tasks within one hundred I can use both mental strategies and formal algorithms to solve a variety of addition and subtraction tasks beyond 100. I can choose the most efficient method for the problem given. <p>Settings:</p> <ul style="list-style-type: none"> Conceptual Place Value Materials http://catalog.mathlearningcenter.org/apps/number-frames http://catalog.mathlearningcenter.org/apps/number-pieces Empty Number Line http://catalog.mathlearningcenter.org/apps/number-line Jotting→Semi-Formal →Formal Algorithms <p>Mathematisation</p> <p>Distancing the Setting (Manipulate It → See it→Flash it→Screen It→Check It→Express It and Explain It)</p> <p>Notation (Informal Jottings→Semi-Formal Written Strategies→Formal Written Algorithms)</p> <p>Organising→Generalising</p> <p>Additive task, removed item, missing addend, missing subtrahend, missing minuend, most efficient strategy</p>		<p>STEP 7 Learning Outcomes</p> <ul style="list-style-type: none"> I can represent and describe how I use my understanding of number structures and equal groups to multiply and divide tens and ones by a single digit. (e.g. 32×4, $56 \div 4$, $34 \div 7$) I can multiply and divide by 100 up to at least 1000 I can divide whole numbers and identify when there is a remainder. I can use jottings to solve multiplication and division tasks I understand and use formal algorithms to solve multiplication and division tasks I can use both mental strategies and formal algorithms to solve a variety of multiplication and division tasks. I can choose the most efficient method for the problem given. I understand the commutative, associative and distributive relationship within multiplication <p>Settings:</p> <ul style="list-style-type: none"> Dot Arrays → Square Arrays (Base 5 and 10 Grids)→Perimeter Markers→Empty Arrays http://catalog.mathlearningcenter.org/apps/number-pieces Word Problems Empty Number Line http://catalog.mathlearningcenter.org/apps/number-line Jotting→Semi-Formal →Formal Algorithms <p>Language:</p> <ul style="list-style-type: none"> Parts, wholes, share, shares, group, groups, the same, fair share, equal, half way, half of, collection, composite groups Groups of, equal shares, partition Rows, columns, arrays Increment and decrement Groups of, equal shares Half, third, fifth, tenth, double Multiples Sequence Keeping track Commutative and inverse relationships Multiples and Factors Multiply and Divide Algorithm Efficiency Rows and Columns Perimeter and Area Commutative, Associative and Distributive Remainder Horizontal and Vertical <p>Mathematisation</p> <p>Distancing the Setting (Manipulate It → See it→Flash it→Screen It→Check It→Express It and Explain It)</p> <p>Notation (Informal Jottings→Semi-Formal Written Strategies→Formal Written Algorithms)</p> <p>Organising→Generalising</p>		<p>Learning Outcomes</p> <ul style="list-style-type: none"> Using prior knowledge I can demonstrate how to simplify fractions I know that percent means per hundred and can relate this to partitioning a whole into a hundred parts I can use my knowledge of the unit fraction which is 1% and reiterate this a given number of times to create percentages between 1-100% I can use my knowledge of the unit fraction which is 1% and reiterate this a given number of times to create percentages beyond 100% I can partition a unit into 1/10 and understand its significance to conceptual place value. I can partition 1/10 of a unit into ten parts recognising this is 1/100 and understand its significance to conceptual place value. I can explain the link between a digit, its place and its value to at least 3 decimal places I can use my knowledge of 1, 1/10, 1/100 and 1/1000 to construct and order various decimal fractions I can round decimal fractions to at least 3 decimal places I can multiply and divide decimal fractions with at least 3 decimal places mentally by 10, 100 and 1000 I can understand the equivalence of a fraction, a decimal and a percentage (e.g. $7/100$, 0.07 and 7%) I can demonstrate how to convert a percentage into a simplified fraction (e.g. 35% is $7/20$) I can use my knowledge of simplifying and equivalent fractions to put fractions in order I can use my knowledge of simplifying fractions, decimals and percentages to solve numerical tasks (e.g. 35% of £12) <p>Settings</p> <p>Regard the 100 grid as a one. Colour in 35% of the grid. The if the grid represented £12 what does the shaded 35% represent?</p>  <p>http://www.visnos.com/demos/percentage-fraction-decimals-grid</p> <p>Word problems</p> <p>Language</p> <ul style="list-style-type: none"> Parts, whole, share, the same, fair, Equal Iterate, Reform Unit partition, disembed, iterate Numerator and Denominator Comparative language Partition Composite fraction Improper fraction Simplify <p>Mathematisation</p> <p>Distancing the Setting (Manipulate it → See it→Flash it→Screen It→Check It→Express It and Explain It)</p> <p>Notation (Informal Jottings→Semi-Formal Written Strategies→Formal Written Algorithms)</p> <p>Organising→Generalising</p>	

	Addition and Subtraction		Multiplication and Division		Fractions, Decimals and Percentages
	Understanding numbers and numerals	Number Structuring for Addition and Subtraction	Understanding of multiples and sequences of multiples	Grouping and Sharing for Multiplication and Division	
Phase 8	<p>Learning Outcomes</p> <ul style="list-style-type: none"> • I can use both mental strategies and formal algorithms to solve multi-step addition and subtraction tasks beyond 100. • I can apply the correct order of operations in number calculations when solving multi-step tasks • I can represent and describe how I use my understanding of number structures and equal groups to multiply and divide tens and ones by two digit numbers. (e.g. 32×43, $56 \div 14$) • I understand and use formal algorithms to solve multiplication and division tasks • I understand that for shares to be equal, a quantity may remain. This is called the remainder. • I can use both mental strategies and formal algorithms to solve a variety of multiplication and division tasks. I can choose the most efficient method for the problem given. • I understand and can use the order of operations to solve equations • I understand the commutative, associative and distributive relationship within multiplication • I understand the commutative relationship within addition • I understand the distributive and inverse relationship within addition and subtraction <p>Settings:</p> <ul style="list-style-type: none"> • Dot Arrays → Square Arrays (Base 5 and 10 Grids) → Perimeter Markers → Empty Arrays • http://catalog.mathlearningcenter.org/apps/number-pieces • Word Problems • Empty Number Line • http://catalog.mathlearningcenter.org/apps/number-line • Jotting → Semi-Formal → Formal Algorithms • Conceptual Place Value Materials (For addition and subtraction) <p>Mathematisation</p> <p>Distancing the Setting (Manipulate It → See it → Flash it → Screen It → Check It → Express It and Explain It)</p> <p>Notation (Informal Jottings → Semi-Formal Written Strategies → Formal Written Algorithms)</p> <p>Organising → Generalising</p> <p>Additive task, removed item, missing addend, missing subtrahend, missing minuend, most efficient strategy</p> <p>Language:</p> <ul style="list-style-type: none"> • Parts, wholes, share, shares, group, groups, the same, fair share, equal, half way, half of, collection, composite groups • Groups of, equal shares, partition • Rows, columns, arrays • Increment and decrement • Groups of, equal shares • Half, third, fifth, tenth, double • Multiples Sequence • Keeping track • Commutative and inverse relationships • Multiples and Factors • Multiply and Divide • Algorithm • Efficiency • Perimeter and Area • Commutative, Associative and Distributive • Remainder • Horizontal and Vertical • BODMAS – Brackets, Other, Division, Multiplication, Addition, Subtraction 				