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# MATHEMATICS PROCEDURE AT FROME VALE ACADEMY

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Pupils at Frome Vale Academy (FVA) are entitled to a balanced curriculum which develops all students' mathematical proficiency. Teachers develop happy and successful mathematicians who understand the curriculum content and are not only fluent in mathematical skills and procedures but can also solve problems, explain their thinking and have a positive attitude about themselves as learners of mathematics.

Teachers encourage self-reflection so that all learners develop their understanding of what it means to be a mathematician and can articulate how they are developing these skills. We want learners to know that there are many ways to demonstrate their mathematical abilities and to appreciate the ways that they behave mathematically. We want learners to feel positive about themselves as mathematical learners: we know that building resilience is key to successful mathematics and we help learners recognise their achievement and progress in mathematics.

Teachers provide students with opportunities to develop their mathematical capabilities in multiple strands:

### *Natural Curiosity*

- All of us are naturally curious about mathematics.
- It is intrinsically satisfying to gain mathematical understanding.
- There are many ways of working mathematically.

### *Thinking Mathematically*

- Mathematics is a worthwhile and interesting activity in its own right.
- You can find out whether something is true in mathematics by deductive reasoning rather than empirical evidence or opinion.
- Mathematics has order and structure and can be beautiful.



*Working Collaboratively*

- Exchanging questions and ideas is an important part of working mathematically.
- We also learn by reflecting on our mistakes and misconceptions.

*Growth Mindset and Determination*

- Mathematical ability is not fixed: everyone can make progress in mathematics.
- Everyone should have the opportunity to grapple with problems that they do not yet know how to solve.
- Everyone should have the opportunity to succeed mathematically.

**This leads us to believe that all learners are entitled to:**

- a rich mathematical learning experience
- assessment criteria that offer them opportunities to succeed
- a challenging mathematical curriculum which offers them opportunities to struggle



# Implementation

## **Long-term lesson sequences**

Our long-term teaching sequences are designed around two key principles:

1. Areas of mathematics are given different time weightings according to priority. This helps teachers to confidently use the time they have available to have maximum impact, prioritising core areas of the mathematics curriculum over others. *This is of particular importance as we respond to learning loss in the wake of COVID-related learning disruption over the previous two academic years.*
2. Units of learning are sequenced with intent. This ensures that skills are learned progressively, helping students to be ready for each new concept and skill as it is taught.


Individual teachers have the right to adapt their own plans according to ongoing formative assessment. In the event that a teacher feels that a class would benefit from additional time on a particular focus, they can move away from the original long-term structure. This allows meaningful changes to be made in teaching and learning based on assessment for learning undertaken by staff.

The long-term plan for Years 1-6 can be seen in the appendix. The long-term plan for EYFS can be seen in the relevant chapter of this procedure.



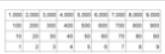
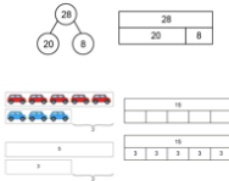
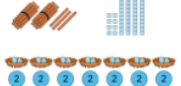
## Models and representations

In order to develop fluency and understanding of concepts, teachers employ a range of physical and pictorial representations across the curriculum in each year group. These are introduced as early as possible in each child's educational journey to maximise exposure and understanding of core representations. In this way, learners become more confident and familiar with each representation, allowing for greater generalisation and reasoning fluency.

The table below outlines the five core representations which sit at the heart of our mathematics teaching at FVA. The codes in each cell of the table refer to the specific, related strands of the *Ready to Progress* document.



### Core representations used in the guidance

Representation	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
	1NPV-1 1AS-1 1NF-1	2AS-1 2AS-3	3NPV-1 3NF-1 3NF-3	4NPV-1 4NF-3	5NPV-1 5NF-2 5MD-1	6NPV-1
	1NPV-1 1NPV-2 1NF-2	2NPV-2 2AS-2	3NPV-3 3F-3 3F-4	4NPV-3 4F-1 4F-2 4F-3	5NPV-3 5F-2 5F-3	6NPV-3 6F-1
	1NPV-1 1NF-2			4MD-1	5NPV-2 5MD-1	6NPV-1
	1AS-1 1AS-2 1NF-1	2NPV-1 2AS-1 2AS-3 2AS-4	3NPV-2 3NPV4 3AS-1 3AS-2 3AS-3 3F-2 3F-4	4NPV-2 4NPV-4 4MD-2 4F-3	5NPV-2 5NPV-4 5F-1	6NPV-4 6AS/MD-4 6F-3
		2NPV-1 2AS-3 2AS-4 2MD-1 2MD-2	3AS-2 3MD-1	4MD-2 4F-2	5 NPV-1 5MD-3 5MD-4	6NPV-2



## **Language and mathematical vocabulary**

Teachers understand that it is important for pupils to understand mathematical vocabulary if they are to gain the most out of mathematics lessons. Such understanding allows learners to:

- Understand questions
- Ask their own questions
- Understand explanations clearly
- Explain their own thinking clearly
- Form the generalisations needed to think deeply and make mathematical connections
- Solve problems – you need language to think with

With this in mind, Frome Vale Academy has a list of mathematical terms which are taught between Reception and Year 6. This mathematical vocabulary list can be found in the appendix.

When planning a new mathematics topic, teachers first identify any mathematical vocabulary which the pupils need to be successful. This vocabulary is explicitly taught: each lesson features a vocabulary focus slot where the words are explored in a variety of ways to establish and develop understanding.

Pupils are encouraged to record new mathematical vocabulary in their **Vocabulary Vaults** alongside definitions or representations that assist understanding. Furthermore, key mathematical vocabulary for the current unit is displayed in each classroom, along with definitions (created by teachers or pupils) to assist pupil understanding.

Ideas for games which can be played in the classroom to support the teaching of mathematical vocabulary are included in the appendix.



## **Lesson design**

Teachers are not expected to produce written plans for individual lessons. Rather, staff should create lesson designs – using either Notebook or Powerpoint – which contain all of the resources required for the lesson. This has several advantages:

- Staff workload is reduced by avoiding duplication of ideas
- The similar structure of each lesson allows teachers to devote time to the content rather than the structure of each lesson
- Lessons contain similar, important elements across all year groups, ensuring consistency for pupils in mathematics lessons

The lesson designs should be simple and contain only important information so as to avoid cognitive overload in learners and maximise pupil focus on mathematically important information.

Template lesson designs are available to assist teachers in creating their own lessons efficiently. Each lesson design should contain the following elements:

- Learning objective
- Active Learner mat
- Vocabulary
- Starter
- Elicitation activity
- Main teaching slides, including:
  - Core model and representations (where applicable)
  - Worked examples
  - Example-problem pairs
  - Opportunities for class discussion
- Reflection, including a final question to demonstrate progress to pupils and as AFL



## **Feedback**

Teachers understand that feedback is a crucial element of the learning journey in mathematics. We believe the following about feedback:

- All work should receive timely feedback
- Children should be assessment capable, understanding where they are successful and what their next steps are to improve
- Feedback is not designed to elicit an emotional response
- Feedback is designed to make pupils think and provides something to be acted on
- Feedback requires pupils to do more work than the adult giving it

Assessment for learning (AFL) is at the heart of our approach to feedback. Teachers use questioning to assess pupil understanding between and within lessons. Through discussion, teachers are able to provide pupils with feedback during the learning.

Since we are developing assessment capable mathematicians, pupils in KS1 and KS2 are encouraged to assess their own learning using answers prepared by the teacher. As well as reducing dependence on the adult, it gives pupils great ownership over their own learning. When marking their own work, children use a simple code:

Tick - 'My answer is correct.'

Dot - 'My answer is incorrect but I understand why. I have made an error and will explain this in green pen.'

Circle - 'My answer is incorrect and I do not understand why. I need adult support.'

Teachers are expected to provide feedback on every piece of learning. Where possible, teachers give feedback within the lesson itself; verbal feedback does not need to be recorded. After a lesson, teachers should acknowledge work: this is particularly important until pupils develop intrinsic motivation. Teachers should use the same code to mark thinking using a red pen:

Tick – 'Your answer is correct.'

Dot - 'Your answer is incorrect but I think you can correct and explain your error. Do this in green pen.'

Circle - 'Your answer is incorrect and I think you have a misconception.' Effective AFL should minimise the number of misconceptions found in independent work. Where they are found after a lesson, teachers will need to decide whether a written comment is enough to fix the



misconception. Teachers might deem it more effective to make a note of the child and speak to them before the next lesson instead.

When providing next steps, teachers are not encouraged to write individual comments on each book. Rather, teachers should firstly decide if some children need verbal feedback and provide this before the next lesson. For the children who have been successful in their learning and do not require a detailed explanation from the teacher, their learning can be moved forward through the use of marking codes. Tiered next steps can be provided at the same time to the whole class using numbered questions on the board. This saves teachers the time involved in writing the same few questions repeatedly in books. Teachers write the question number that they would like each pupil to think about and solve in their book; students should be given time to respond in green pen before the next lesson.





## **Differentiation**

As assessment capable learners, pupils at FVA are supported to understand how successful they are within a lesson. This enables pupils to make an active choice in the selection of independent tasks. However, this is a guided choice: teachers use their expert knowledge of pupils' current understanding – drawn from AFL both before and during the lesson – to steer learners towards the most appropriate learning task.

Independent learning tasks are organised into three tiers:

1. Show it
2. Solve it
3. Prove it

The names have been chosen to reflect a broad progression of understanding as learners move from novice to expert in that domain. 'Show it' tasks will support learners in becoming familiar with the structures, models and processes of a mathematical idea. 'Solve it' tasks provide an opportunity for learners to engage in intelligent practice through independent application of the new skill to solve novel problems. 'Prove it' tasks are more open-ended and develop deeper thinking around mathematical concepts through reasoning and justification tasks.



## **Calculation Procedure**

It is important that all learners are given the tools to explore and understand mathematics. To this end, teachers at FVA ensure that concepts are taught and experienced, wherever possible, in three modes: concrete, pictorial and abstract. All learners, regardless of age and current mathematical ability (against Age-Related Expectations) benefit from experiencing mathematics in different modes: it is not the case that learners begin with concrete before moving onto pictorial models and finally working only with abstract, formal written methods. Rather, the use of all three modes as widely as possible allows pupils to conceptualise and generalise their mathematical thinking as deeply as possible.

Pupils at FVA are exposed to a range of different models and methods for thinking about mathematical problems as they move through the school. As learners progress through school, these models and methods develop and deepen their understanding. Where learners are judged as not yet having requisite foundational knowledge and skills, teachers meet learners 'where they are', adapting teaching and providing intervention activities which enable learners to secure foundational knowledge before being introduced to more sophisticated methods.

In order to ensure consistency and progress in mathematical modelling throughout the school, teachers refer to the two calculation policies in the appendices. These documents outline the key concrete, pictorial and abstract methods which pupils experience in each year group as their mathematical abilities grow.

Pupils are expected to write numerals as laid out in the FVA handwriting expectation document. This document is displayed in each classroom and is consistent throughout all year groups.



## **Ready to Progress**

We want pupils at FVA to be confident in core areas of mathematics and ready to begin each new school year with the necessary fundamental knowledge to be successful. The *Ready to Progress* (RtP) criteria are useful in identifying core areas of the curriculum and the skills which pupils need by the end of the year.

Assessments are used throughout the year to check that pupils have acquired the expected level of understanding: the timetable for these assessments can be found in the appendix. Scores for these assessments are recorded on a tracker, allowing class teachers to see which students have successfully reached the expected standard and which students require further support during the year.

These assessments are designed to check for deep conceptual understanding using varied models and representations. This is in line with our aim for all learners to develop a deep understanding of mathematics. By being familiar with the content of these assessments, teachers can ensure that they are providing sufficient opportunities in class for pupils to become familiar with these models and representations.



## **Mathematics in EYFS**

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
Autumn	Getting to know you (Take this time to play and get to know the children!)			Just like me!			It's me 1, 2, 3!			Light and Dark		
Spring	Alive in 5!			Growing 6, 7, 8			Building 9 and 10			Consolidation		
Summer	To 20 and Beyond			First, then, now			Find My Pattern			On the Move		

### Long-term plan

The LTP for mathematics in EYFS can be seen above.

Mathematics is taught through whole class sessions each day, with adult-led group learning and adult-initiated learning opportunities alongside. Mathematics is available and encouraged throughout our daily provision through sorting, counting and number patterns and is accessible during child-led learning. Our maths area is carefully designed to encourage the development of maths concepts taught and encourage children to explore a range of maths concepts and skills independently. Take a look at some pictures of our maths provision.

### Recording in Mathematics

In Term 1, all evidence against the Numeracy statements will be recorded on tapestry with children using whiteboards in adult-led sessions.

In Term 2, plain paper jotters will be introduced for recording. In Term 3, plain paper jotters will be used by the children. In Term 4, 5 & 6, Mathematics books with big squares will be introduced and used alongside child-led, adult-initiated and adult-led learning in order to encourage mathematical recording and independence. Tapestry will continue to be the primary method for recording of our children's Mathematics learning and mathematical understanding.



Here are some of the resources we use in Reception to support the teaching of maths

lolly sticks



counting sticks



multi-link



cubes

counters



dominoes



bottle tops



magnetic  
numbers



sand timers



pebbles



Dice



maths games

sticks



shells





### **Assessment Capable Learners**

At FVA, we are developing learners to be assessment capable. By this, we mean that students should know the learning objective for the lesson, describe their current progress against the objective and use that information to select strategies to improve their work. Many of these strategies are not exclusive to mathematics and will be found across the whole curriculum.

Learners are reminded daily of what it means to be an active learner using the three-tier system: they are able to talk about this in relation to mathematics and do so at the start of each lesson. Pupils are also able to describe strategies for when they are 'stuck' or in the red zone: in specific relation to mathematics, learners can identify particular resources which will support them in their learning.

Through each mathematics lesson, pupils are provided with information to help them gauge their own progress and understanding. Where possible, answers are provided so that pupils can self-assess. A range of AFL techniques are used by teachers to provide feedback to pupils so that they have a clear idea of their current progress against objectives and what they need to do to improve further.

Resilience is an important factor in developing assessment capable learners and teachers use mathematics lessons as an opportunity to develop resilience by creating an atmosphere where mistakes are celebrated and viewed by learners as an integral part of the learning process.

Each lesson ends with a reflection whereby students can consider both their progress against the learning objective and their own active engagement in learning. In this way, pupils leave the lesson aware of the progress that they have made, building mathematical confidence, enjoyment and motivation for the next lesson. Pupils are also supported to develop their sense of themselves as learners, having the opportunity to identify the connection between their progress, feelings and actions.



### **Supplementary Mathematics lesson: Mathsmagicians and Number Sense Maths**

Daily lessons in Y1-Y6. Focus on building core fluency and number skills. Cover all skills, not just those covered to date in the current year. This session provides an additional opportunity for pupils to build a shared understanding of mathematics through mathematical talk. Pupils use agreed hand gestures to demonstrate their own thoughts on what has been said by somebody else in the room. These gestures are consistent throughout the school and are displayed in each classroom. Additionally, learners are equipped with opinion fans which enables all learners to show their thinking instantly and silently, maximizing active pupil participation and offering rapid formative assessment opportunities during whole-class teaching. The hand gestures and fans can be seen in the appendix.

In KS1, teachers follow the Number Sense Maths programme during these daily mathsmagicians sessions. KS1 teachers are provided with NSM training in order to support their delivery of the programme.

In KS2, each session follows a tripartite model: Show it, Solve it, Prove it. By using this framework, teachers at FVA provide the opportunity for learners to develop and demonstrate their thinking in both pictorial and abstract terms. Students are given the opportunity to practise key skills each day to develop recall fluency. Learners are also given the opportunity to further deepen their understanding and discussion is promoted through the use of deeper reasoning questions.





## Assessment

Both formative and summative assessment are integral to the teaching and learning of mathematics at FVA. Assessment data supports teachers and leaders in making judgements about pupil attainment and progress throughout the school. Data is also used to inform next steps in teaching and learning, both within lessons and between lessons.

The table below details the various assessments which are undertaken by each class throughout the year.

	<b>Term 1</b>	<b>Term 2</b>	<b>Term 3</b>	<b>Term 4</b>	<b>Term 5</b>	<b>Term 6</b>
<b>R</b>		DOYA	Formative assessment	DOYA	Formative assessment	ELG end point reporting
<b>Y1</b>	NSM assessment DOYA	NSM assessment DOYA	NSM assessment RtP assessment	NSM assessment RtP assessment DOYA	NSM assessment RtP assessment	NSM assessment DOYA
<b>Y2</b>	NSM assessment RtP assessment DOYA	NSM assessment RtP assessment DOYA	NSM assessment RtP assessment	NSM assessment RtP assessment DOYA KS1 mock SATS	NSM assessment RtP assessment KS1 SATS	NSM assessment DOYA
<b>Y3</b>	RtP assessment DOYA	RtP assessment DOYA	RtP assessment	RtP assessment DOYA	RtP assessment	RtP assessment DOYA
<b>Y4</b>	RtP assessment DOYA	RtP assessment DOYA	RtP assessment	RtP assessment DOYA	RtP assessment	DOYA Multiplication Tables Check
<b>Y5</b>	RtP assessment DOYA	DOYA	RtP assessment	RtP assessment DOYA	RtP assessment	DOYA CLF mock assessments
<b>Y6</b>	RtP assessment DOYA Mock SATS	RtP assessment DOYA Mock SATS	RtP assessment Mock SATS	RtP assessment DOYA Mock SATS	RtP assessment KS2 SATS	DOYA



## **References**

<https://nrich.maths.org/14682>

<https://nrich.maths.org/12160>

<https://nrich.maths.org/13491>

<https://nrich.maths.org/14718/note>

[https://nrich.maths.org/content/id/12160/boosting\\_achievement\\_dweck.pdf](https://nrich.maths.org/content/id/12160/boosting_achievement_dweck.pdf)

[https://nrich.maths.org/content/id/12160/Cuoco\\_etal-1996.pdf](https://nrich.maths.org/content/id/12160/Cuoco_etal-1996.pdf)

<https://nrich.maths.org/content/id/12160/ExploratoryTeachingKRuthven.pdf>

<http://mikeaskew.net/page3/page4/files/EffectiveTeachersofNumeracy.pdf>

<https://nrich.maths.org/content/id/12160/Deep%20Progress.pdf>

<https://www.challenginglearning.com/learning-pit/>

<http://www.mathematicalresilience.org/>

<http://wrap.warwick.ac.uk/51559/7/WRAP-measuring-mathematical-resilience-study-Johnston-Wilder-2013.pdf>

<https://www.youtube.com/watch?v=gm9CIJ74Oxw>

<https://www.moedu-sail.org/lessons/assessment-capable-learner/>

<https://asdn.org/wp-content/uploads/EL-ACVL.pdf>

*Walkthrus*, Tom Sherrington and Oliver Caviglioli



## Appendices

### Contents:

1. Long-term plans for Years 1-6
2. List of mathematical vocabulary
3. Suggested activities for the teaching of mathematical vocabulary
4. Ready to Progress Assessment Timetable
5. Hand gestures used to facilitate class discussion
6. Calculation procedure: addition and subtraction
7. Calculation procedure: multiplication and division

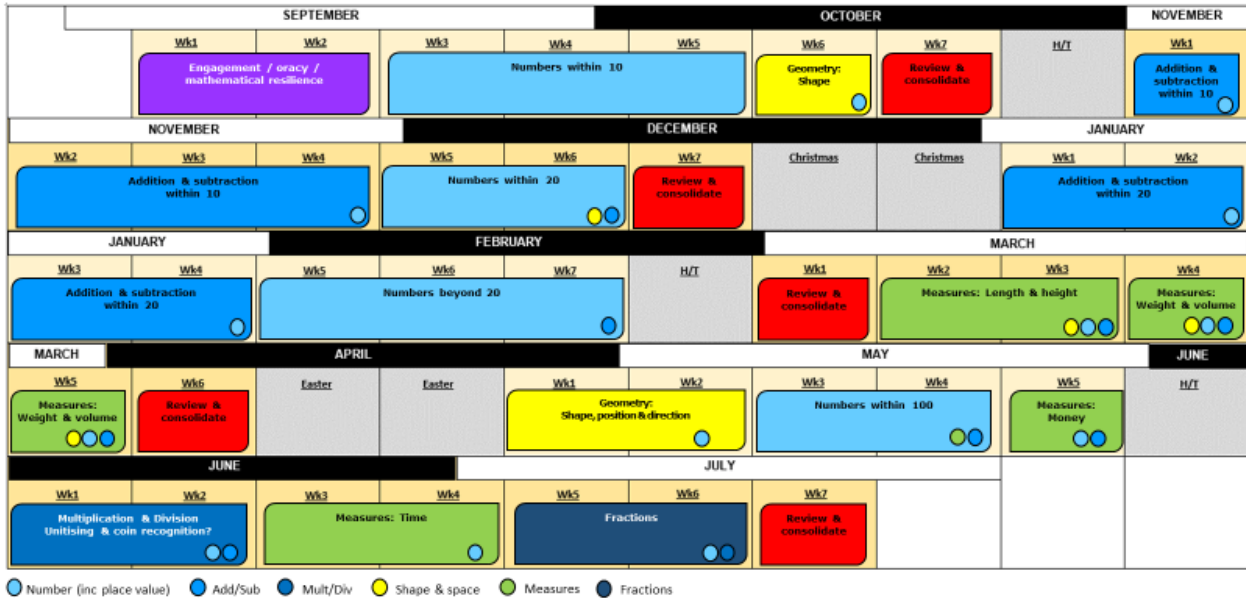


# Long-term Plans Years 1-6



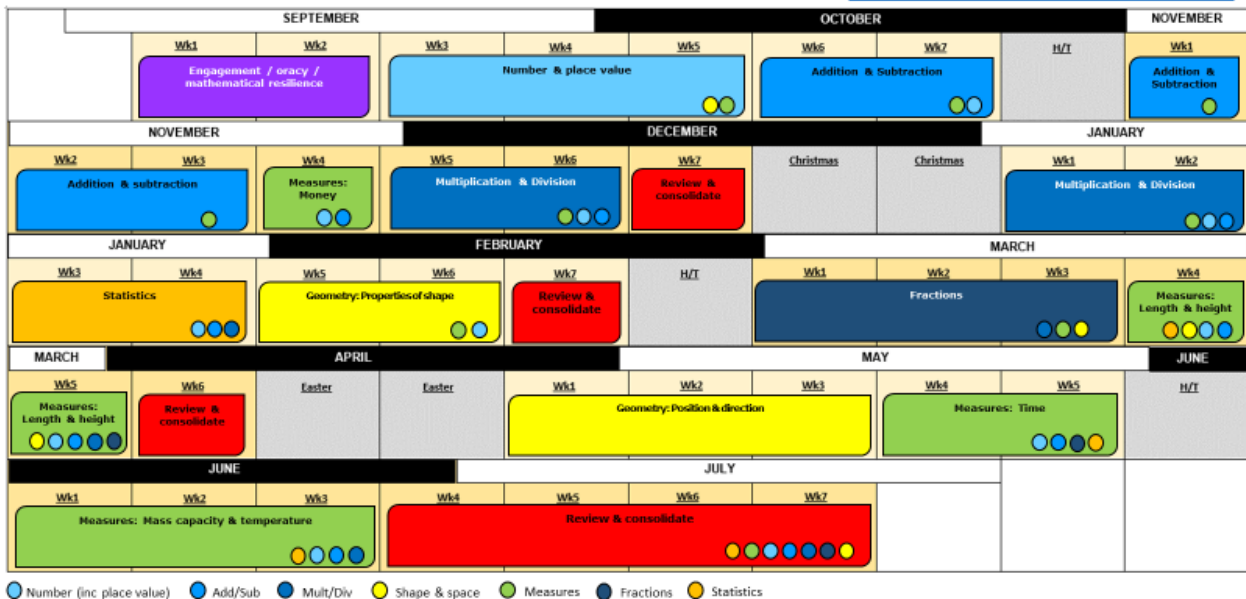
## CLF Primary Mathematics Year 1 2021/22

[Links to RtP and national curriculum](#)



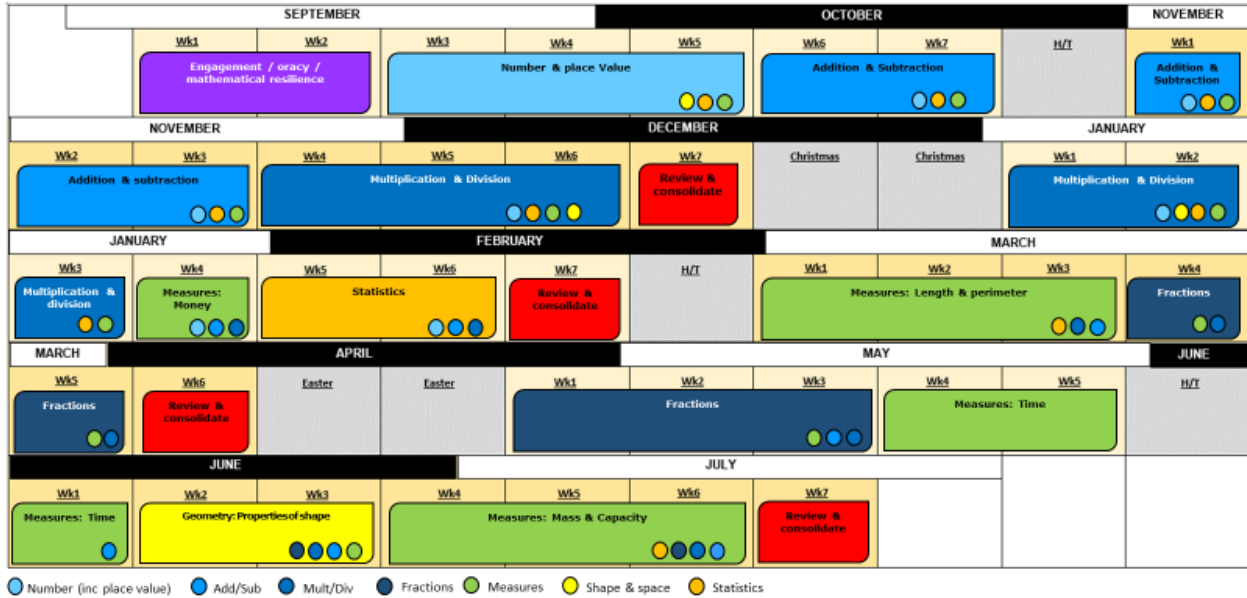
## CLF Primary Mathematics Year 2 2021/22

[Links to RtP, TAF and national curriculum](#)



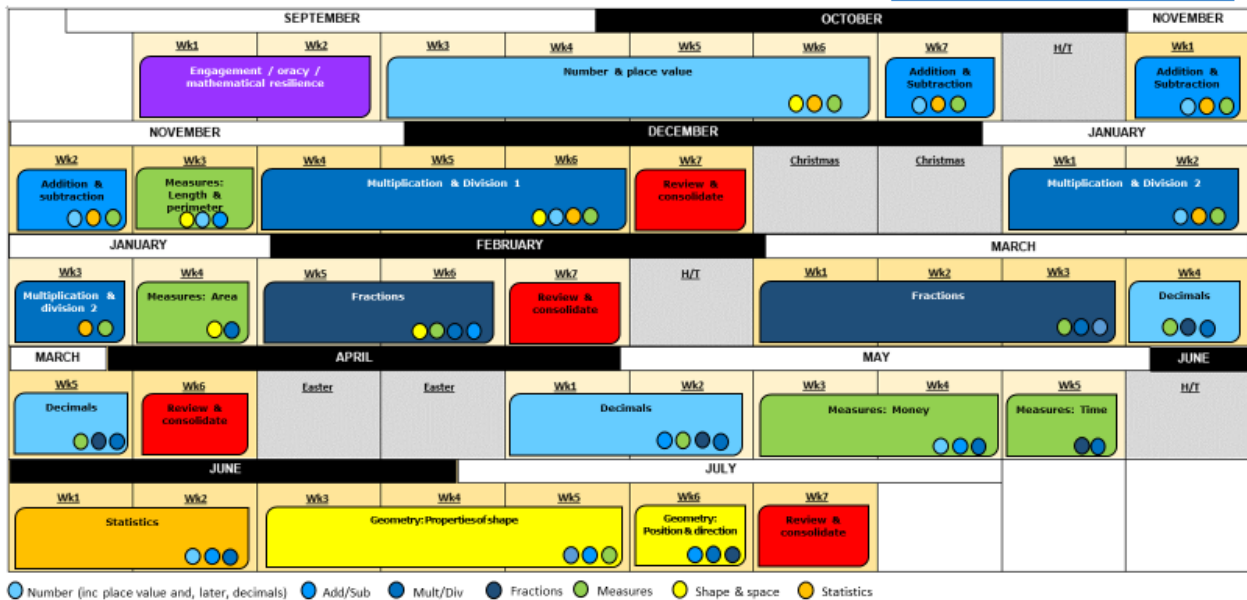
### CLF Primary Mathematics Year 3 2021/22

[Links to RtP and national curriculum](#)



### CLF Primary Mathematics Year 4 2021/22

[Links to RtP and national curriculum](#)





## CLF Primary Mathematics Year 5 2021/22

[Links to RtP and national curriculum](#)

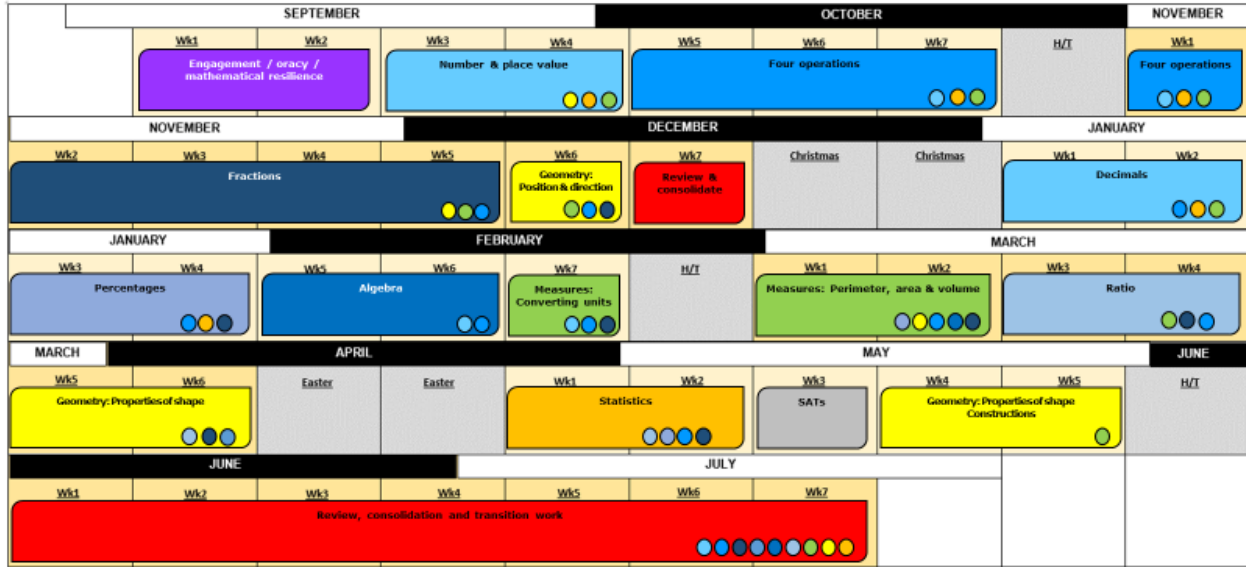
SEPTEMBER				OCTOBER				NOVEMBER	
Wk1	Wk2	Wk3	Wk4	Wk5	Wk6	Wk7	H/T	Wk1	
Engagement / oracy / mathematical resilience		Number & place value			Addition & Subtraction			Statistics	
NOVEMBER			DECEMBER				JANUARY		
Wk2	Wk3	Wk4	Wk5	Wk6	Wk7	Christmas	Christmas	Wk1	
Statistics	Multiplication & Division		Measures: Perimeter & area		Review & consolidate			Multiplication & Division	
JANUARY		FEBRUARY				MARCH			
Wk3	Wk4	Wk5	Wk6	Wk7	H/T	Wk1	Wk2	Wk3	
Multiplication & division	Fractions			Review & consolidate		Fractions		Decimals & percentages	
MARCH		APRIL			MAY				
Wk5	Wk6	Easter	Easter	Wk1	Wk2	Wk3	Wk4	Wk5	
Decimals & percentages	Review & consolidate			Decimals				Geometry: Properties of shape	
JUNE			JULY						
Wk1	Wk2	Wk3	Wk4	Wk5	Wk6	Wk7			
Geometry: Properties of shape		Geometry: Position & direction	Measures: Converting units		Measures: Volume	Review & consolidate			

● Number (inc place value and decimals) 
 ● Add/Sub 
 ● Mult/Div 
 ● Fractions 
 ● Decimals & Percent 
 ● Measures 
 ● Shape & space 
 ● Statistics



## CLF Primary Mathematics Year 6 2021/22

[Links to RtP and national curriculum](#)



● Number (inc place value and decimals) 
 ● + - × ÷ 
 ● Fractions 
 ● Percentages 
 ● Algebra 
 ● Ratio 
 ● Measures 
 ● Shape & space 
 ● Statistics



## Mathematical vocabulary

Acute, Adjacent, Alternate, Angle, Area, Ascending order, Average, Axis of symmetry, Baker's dozen, Base, Base angles, Bisect, Breadth, Capacity, Cardinal number, Carroll Diagram, Circumference, Composite number, Congruent, Consecutive, Coordinates, Denominator, Descending order, Diagonal, Difference, Digit, Digital root, Dimensions, Dodecagon, Edge, Equation, Equilateral triangle, Even number, Exterior, Face, Face value, Factor, Greater than, Gross, Hendecagon, Heptagon, Hexagon, Horizontal, Improper fraction, Integer, Interior, Intersection, Irregular shapes, Isosceles triangle, Kite, Less than, Line of symmetry, Lozenge, Mean, Median, Mode, Multiple, Numerator, Oblique, Oblong, Obtuse angle, Octagon, Odd number, Ordinal number, Parallel lines, Parallelogram, Perimeter, Perpendicular line, Place value, Polyhedron, Prime number, Product, Quadrant, Quindecagon, Quotient, Rectangle, Reflex angle, Rhombus, Roman numerals, Rotational symmetry, Rounding, Scalene triangle, Score, Square number, Squared, Sum, Symmetrical, Tally, Tessellation, Tetragon, Translation, Trapezium, Triangular number, Trigon, Vertex, Vertical line.





## Activities to develop mathematical vocabulary



Call my bluff (three definitions; find the real one)



Give us a clue (guess the word from its definition)



Speechless (define a word without speaking or writing)



Crosswords (design and make)



Countdown (give anagrams and definitions)



Maths Attack (create a poster with as many examples of the term as they can)



Hangman



Yes/No (aka 20 questions or Animal, Mineral, Vegetable)

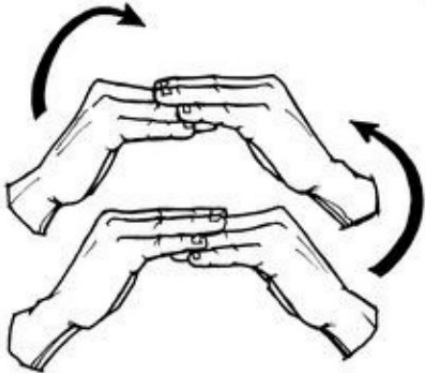


## Ready to Progress Assessment Timetable

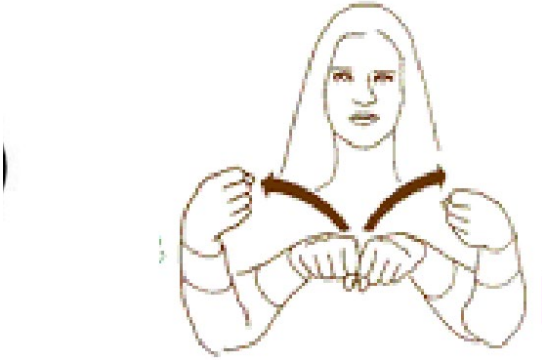
	Term 1	Term 2	Term 3	Term 4	Term 5	Term 6
Year 1			NPV	AS	G	
Year 2	NPV	NF	AS	MD	G	
Year 3	NPV	NF	AS	MD	F	G
Year 4	NPV	NF	MD	F	G	
Year 5	NPV		MD	F	G	
Year 6	NPV	AS	MD	F	G	

Hand gestures used as part of classroom discussion

**BUILD** |



**CHALLENGE**



AGREE

