



**West Monkton Church of England School**

# **Mathematics Policy**

**February 2022**

Review: February 2024

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## Rationale

At West Monkton, we are dedicated to ensure that all children make the expected progress through the use of a mastery approach to teaching mathematics. A vital component of this is to ensure that teaching practice and pedagogy is consistently effective across the whole school and therefore this policy coupled with the Inspire maths programme aims to provide our practitioners with the resources, guidance and progressive steps required.

## Intent

At West Monkton C.E Primary School we aim:

- To provide children with a mastery maths curriculum
- To provide high quality resources
- To recognise and support the needs of all individuals
- To use positive feedback and encouragement wherever possible to support the self-esteem of children
- Children should develop resilience and self-confidence in applying their learning skills
- To ensure consistency and progression in our approach to calculation

## Implementation

We will achieve our aims by:

- Using the mastery approach for the planning, delivery and engagement with mathematics to ensure that all learners have the relevant support, including those with additional needs as illustrated by Appendix 1
- Adhering to West Monkton's Calculation Policy (See Appendix 2) for Addition, Subtraction, Multiplication and Division. This will reinforce the use of concrete, pictorial and abstract (CPA) teaching methods
- Application of the INSPIRE guidance document where relevant (new starts, refresher training) to ensure consistency of teaching practice
- Application of Times Tables Rockstars, Numbots and Hegarty Maths to develop fluency of key concepts and skills and recall of times tables
- Ensuring that the CPA approach is being used, including the use of heuristic models for problem solving
- Ensuring that all 'teachers' are effectively modelling following the small progression steps provided by the Inspire guidance
- Develop the use of mathematical vocabulary through teacher modelling, use of sentence stems to enable mathematical talk between children (see appendix 4)
- Embed effective questioning into all lessons as a platform for essential in-class formative assessment (anchor questioning)
- Implement daily mathematical interventions resulting from the in-class formative assessment that day
- Monitor teaching and learning of maths, through Learning Review Weeks and the Talk for Teaching model from which we will monitor the progress and effectiveness of the Inspire programme to provide the opportunity to share good practice (IRIS) with colleagues and highlight any areas of weakness that can be addressed and developed
- Using the progression of skills document (Appendix 5) to ensure that national curriculum objectives are covered as well as providing the opportunity for effective AFL with years and across phases
- Encourage the use of NCETM, White Rose and other mastery materials to ensure that there are opportunities for pupils to explore maths at 'greater depth'

- Adhere to the school summative assessment schedule (NFER testing, SATS and teacher assessments)
- Ensure opportunities for teacher CPD through the Boolean Maths Hub, Oak Partnership Trust Research Group and in school PDMs

## Impact

- Children demonstrate a quick recall of facts and procedures including the fast recall of times tables
- Mathematical concepts or skills are mastered when a child can show it in multiple ways, using the mathematical language to explain their ideas, and can independently apply the concept to new problems in unfamiliar situations
- At least 80% of children should master each objective for each unit before progressing to the next
- Children show increased self-confidence and willingness to challenge themselves developing their resilience and ability to work collaboratively with others
- Children will be flexible and fluid to move between different contexts and representations of maths and have the chance to develop the ability to recognise relationships and make connections in maths lessons
- Children show a high level of pride in the presentation and understanding of the work
- The exploration of mathematics should be interactive and engaging using real life contextualisation
- Teaching staff will feel supported by a rigorous programme of monitoring and review as well as CPD to enable them to deliver the Inspire programme effectively

## Roles and Responsibilities

### The Headteacher/Maths Leads will:

- Implement this policy consistently throughout the school by reaffirming the expected standard and supporting staff in the implementation of the policy through Learning Review Weeks
- Communicate to all staff key dates for training days throughout the academic year, giving prior notice each term to enable staff to schedule them accordingly
- Report to Governors, when requested, on the effectiveness of the policy

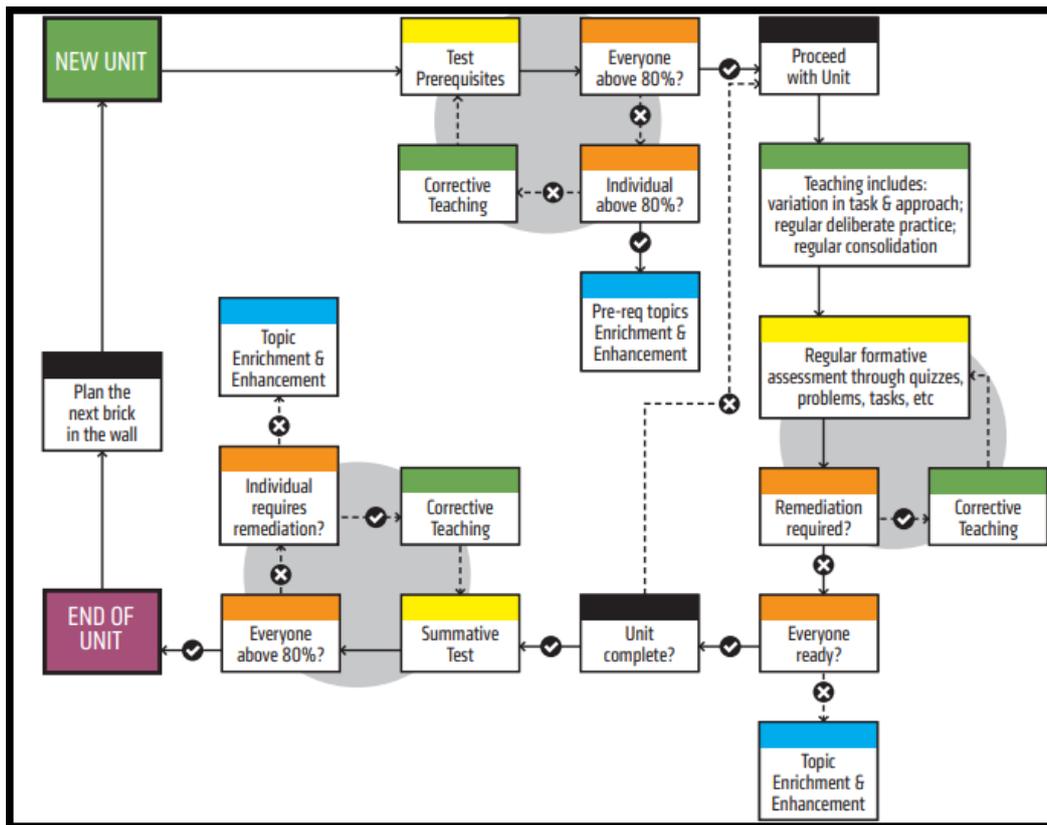
### The Governing Body will:

- Support the school in the implementation of the policy
- Review the effectiveness of the policy as required

### Parents, Carers and Families will be encouraged to:

- Promote positive behaviours at home with regards to completion of any homework set and regular practice on TT Rockstars
- Raise any concerns regarding their child's maths progress at parent consultations
- Support maths based family learning events at the school

# Appendix 1 – Maths Mastery Cycle



## KEY

Assessing	Teaching	Decision	Non-compulsory content	Process
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### New unit

The planning, design and sequencing of units is important to ensure that, as the journey through mathematics progresses, new concepts and learning is being built on top of appropriate foundations.

### Test prerequisites

Test design is critical here. Often, tests used in mathematics education reveal little about whether a child has actually gripped a concept or not – rather, tests tend to reveal whether a child can repeat something they have been shown. Performance is not a good proxy for learning!

### Everyone above 80%?

It is tempting to move on without this benchmark being reached. After all, teachers have internal and external pressures on them, which encourage behaviours of moving through content quickly. A fear can exist that content will not be covered. However, although early units will typically take 40% more teaching time, this time is recouped later in the course, when pupils will be able to travel more quickly through units because the prerequisites are truly secure. The threshold of 80% is only as useful as the design of the questions / tasks / problems. Designed badly, 80% (or any other mark) can be utterly meaningless.

### Corrective Teaching

This 'corrective teaching' must be distinct from prior attempts to teach the concept, which the individual failed to grasp. A different approach is deployed at each cycle.

### Teaching includes...

There are aspects of school level mathematics that pupils must acquire fluency in if they are to be able to access the rest of the subject and move to greater expertise in more demanding situations. The fundamental, non-negotiables are:

1. Numerosity,
2. Place value,
3. Base 10 system,
4. Arithmetic,
5. Proportional reasoning

### Regular formative assessment...

It is the design of these tasks, questions, problems, quizzes that is key to success. Formative assessment design is intellectually demanding and complex. Matching the concepts with intelligent assessment questions is high priority. These questions must reveal whether or not an individual has gripped the concept.

### Topic Enrichment and Enhancement

Pupils should be given real opportunities to be intellectually challenged. They should be able to celebrate their own depth of knowledge and success, by grappling with significantly complex problems. This must include opportunities to conjecture, generalise and reason.

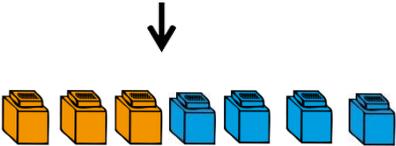
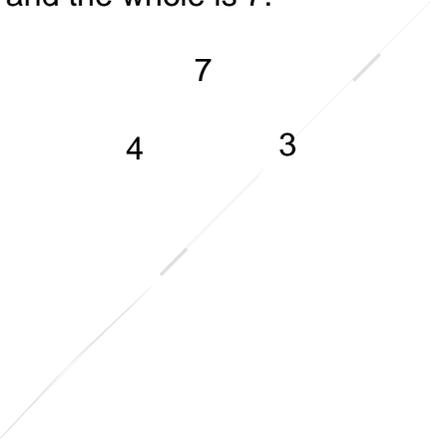
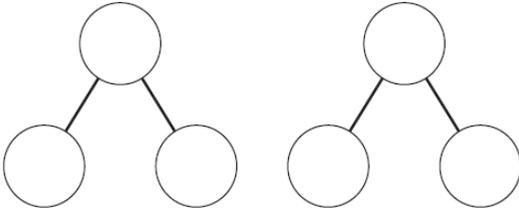
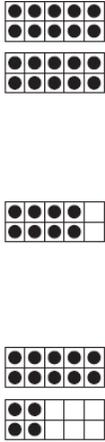
### Summative Test

A successful pass in the summative test should be equally rewarded and celebrated, regardless of when the pupil passes. A good analogy here is a driving test. A driver is not considered less of a driver because they passed on their third test rather than their first.

### Plan the next brick in the wall

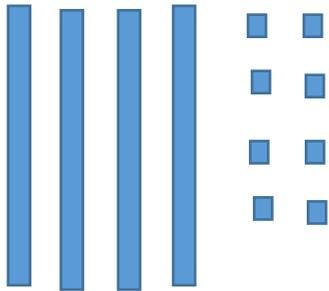
Like a Jenga puzzle, new mathematical learning rests on earlier mathematics. The 'bricks' must be carefully planned - a pathway that makes sense and builds the wall appropriately - if the course (rather than just a unit) is to be successful.

## Appendix 2 -Calculation Policy

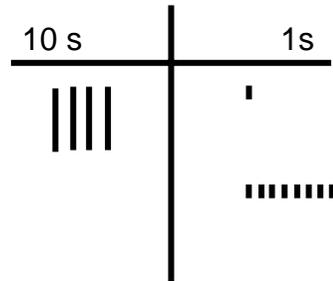
Addition			
Key Language	Sum, total, parts and wholes, plus, add, altogether, more, count on, increase		
Concrete	Pictorial	Abstract	Greater Depth
<p>Combining two parts to make a whole (Use a wide range of resource to ensure children understand objects represent an amount)</p> 	<p>Represent the objects using dots or crosses. They can represent putting the parts together to make a whole in a part part whole diagram.</p>	<p>Write the abstract number sentence.</p> $4 + 3 = 7$ <p>Four is a part, 3 is a part and the whole is 7.</p> 	<p>James wants to partition his number in different ways.</p> <p>Complete the part-whole models to show two ways he could do this.</p> 
<p>Regrouping to make 10; using ten frames and counters/cubes or Numicon.</p>	<p>Draw the ten frames and counters.</p>	<p>Develop an understanding of equality e.g.</p> $6 + \square = 11$ $6 + 5 = 5 + \square$ $6 + 5 = \square + 4$	<p>Sam, Jenny and Tom each make a number. Sam has 6 more than Jenny and 6 less than Tom. Match each number to the correct position.</p>  

TO + O using Dienes. Children need an understanding of partitioning and place value.

$41 + 8$



Represent the Dienes as lines or a number on a place value grid.  
41 + 8



Using part part whole model or partition the numbers mentally

$1 + 8 = 9$

$40 + 9 = 49$

Fill in the missing numbers and explain what you notice.

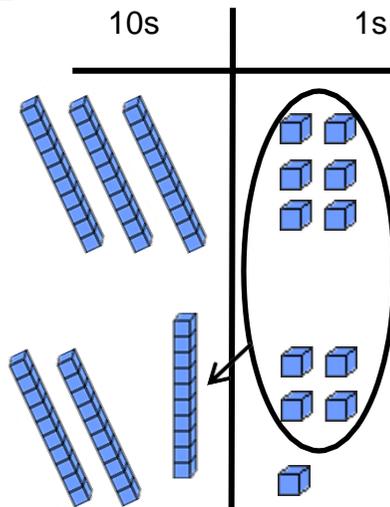
$23 + \square = 30$

$33 - \square = 30$

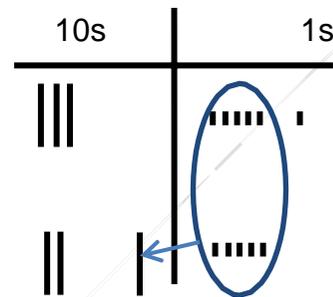
$43 + \square = 50$

$53 - 3 = \square$

TO + TO using Dienes. Children continue to develop understanding of partitioning  
36 + 25



Represent the Dienes as lines of a number on a place value grid.  
36 + 25



Learning the strategy of number bonds to support adding and beginning to use a written method.

$$\begin{array}{r} 36 + 25 \\ \begin{array}{l} \text{red arrow from 6 to 5} \\ \text{red arrow from 5 to 10} \end{array} \\ 10 \\ 1 \end{array} \quad \begin{array}{l} 30 + 20 = 50 \\ 5 + 5 = 10 \\ 50 + 10 + 1 = 61 \end{array}$$

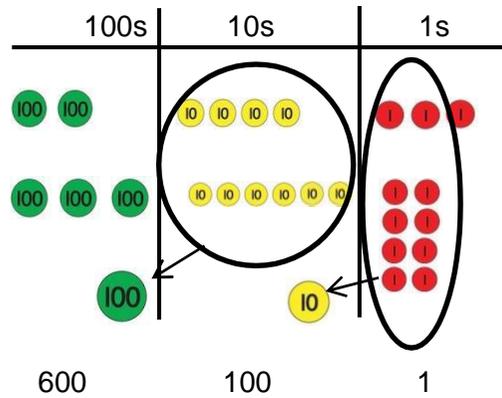
	50	+ 10	+ 1	= 61
+	2	5		
	6	1		
	±			

Anna buys a teddy and a pencil.



The teddy costs 20p more than the pencil. How much does she pay altogether?

Use of counters to add HTO + HTO/HTO + TO. Developing understanding that we can regroup 10 ones for 1 tens etc.



Represent the counters in a place value chart as progressing onto numerical values.

	100s	10s	1s
	200	40	3
+ 300		60	8
500		100	11
	$500 + 100 + 11 = 611$		

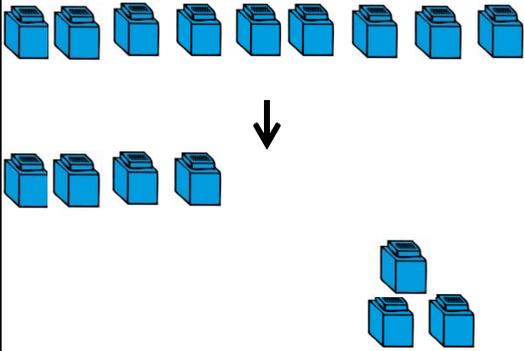
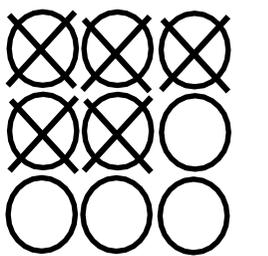
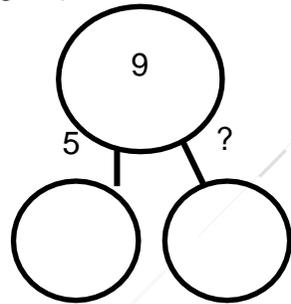
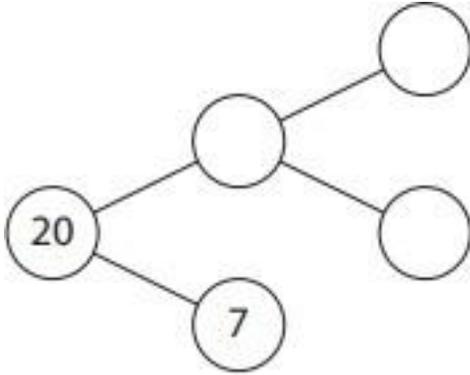
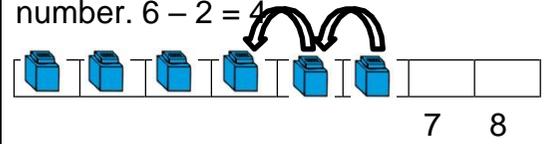
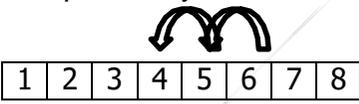
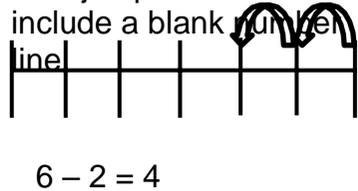
Using a formal written method to add three digit numbers together.

	2	4	3
+	3	6	8
	6	1	1
	±	±	

Here are some addition calculations. Without solving the calculations, decide

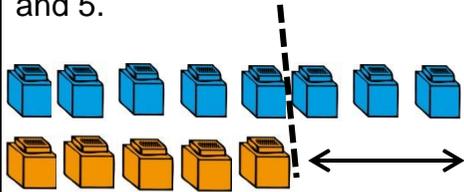
- Carry no digits
- Has the largest answer

791	124	579
+ 100	+ 300	+ 304
_____	_____	_____

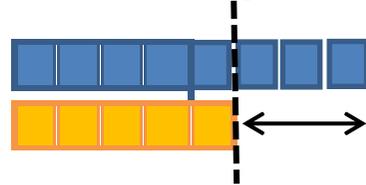
Subtraction			
Key Language	Take away, less than, the difference, minus, fewer, decrease, subtract, count back/on		
Concrete	Pictorial	Abstract	Greater Depth
<p>Physically taking away and removing objects from a whole. (Use a wide range of resource to ensure children understand objects represent an amount)</p> 	<p>Draw the concrete resources they are using and cross out the correct amount.</p> 	<p>Write the abstract number sentence.</p> $9 - 5 = 4$ 	<p>Complete:</p>  <p>Create your own diagram.</p>
<p>Counting back on a number line, starting with the biggest number. <math>6 - 2 = 4</math></p> 	<p>Represent what they see pictorially</p> 	<p>Represent the calculation on a number line to show their jumps. This can include a blank number line</p> 	<p>Miss Froggy can only leap in 2s on a numberline. She started on 20 and leapt back 6 Miss Froggy leaps. Show this on a number line. Finish off the number sentence to show Miss Froggy's journey.</p>

Finding the difference using physical objects.

Calculate the difference between 8 and 5.



Draw the object they have used or a bar model to illustrate what needs calculating.



Find the difference between 8 and 5.

$8 - 5$ , the difference is 3

Children to explore why  $9-6$ ,  $8-5$ ,  $7-4$  have the same difference.

Using ten frames and physical objects,  $14 - 5$

objects,  $14 - 5$

$4 \quad 1$

$-4$

$-1$

Present the tens frame pictorially.

$14 - 5$

Show how to make 10 by partitioning the subtrahend (the part you are taking away)

$$14 - 5 = 9$$

$\swarrow \quad \searrow$   
 $4 \quad 1$

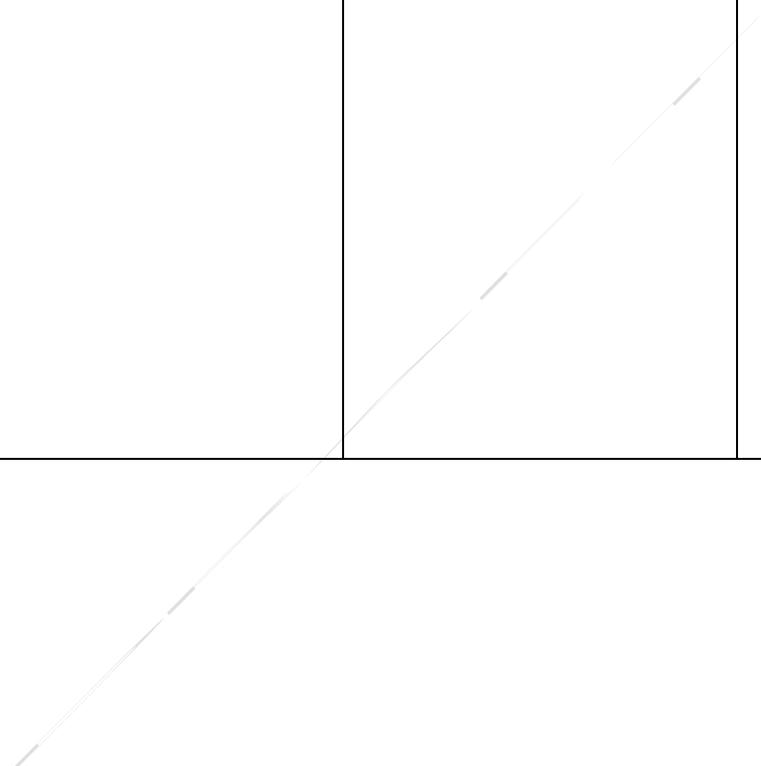
$$14 - 4 = 10$$

$$10 - 1 = 9$$

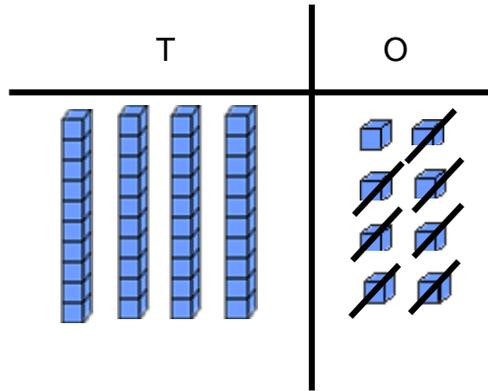
12 children are on a bus. 8 children get off the bus. Then 4 more children get off the bus. How many children were left on the bus?



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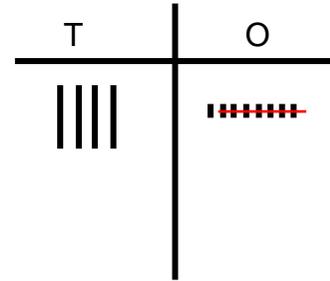


Column method using Dienes without regrouping  
48-7



Represent the Dienes pictorially

$$48 - 7$$



Partition the numbers mentally to subtract.  
May introduce the column method without regrouping here.

	4	8
-		7
	4	1

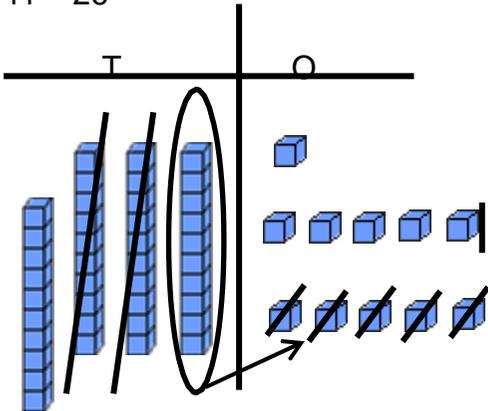
Flo and Jim are answering a problem:

Danny has read 62 pages of the class book, Jack has read 41. How many more pages has Danny read than Jack?  
Flo does the calculation  $62 + 41$ . Jim does the calculation  $62 - 41$ . Who is correct?

Explain how you know.

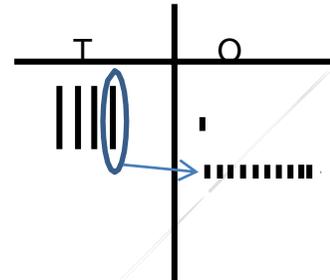
Column method using Dienes to solve TO – TO with regrouping

$$41 - 26$$



Represent the resource, remembering to show the regrouping.

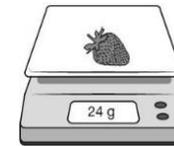
$$41 - 26$$



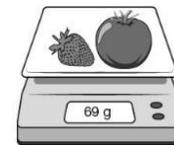
Formal column method. Children must understand what has happened when they have crossed out digits.

	<del>4</del> <sup>3</sup>	11
-	2	6
	1	5

The strawberry weighs 24 grams.



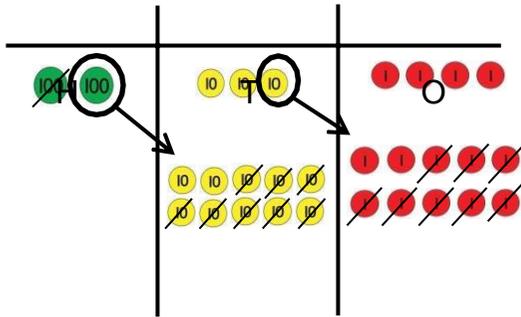
The strawberry and tomato together weigh 69 grams.



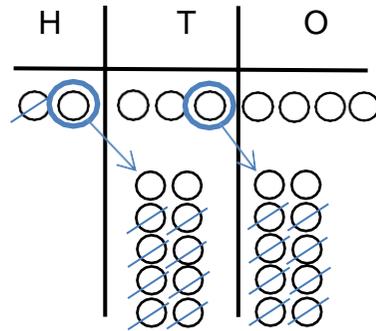
What does the tomato weigh?

Column method using counters to solve HTO-HTO

$$234 - 188$$



Represent the resource, remembering to show the regrouping.



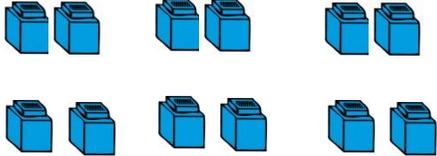
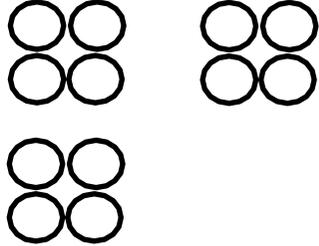
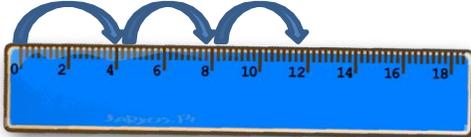
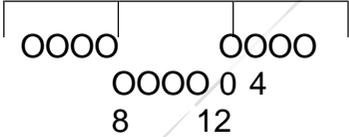
Formal column method. Children must understand what has happened when they have crossed out digits.

	<sup>1</sup> 2	<sup>1</sup> 2 <sup>3</sup>	<sup>1</sup> 4
-	1	8	8
<hr/>			
	0	4	6
<hr/>			

**5003 - 1998**

What are the different ways you could do this calculation?

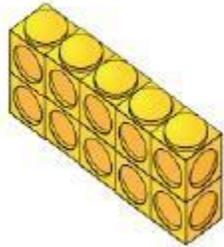
Which is the most efficient and why?

Multiplication			
Key Language	Repeated addition, times, multiplied by, product, groups of, lots of, equal groups.		
Concrete	Pictorial	Abstract	Greater Depth
<p>Repeated addition</p> <p><math>4 + 4 + 4</math></p> <p>There are 3 equal groups with 4 in each group.</p> 	<p>Represent the practical resource with a picture.</p> 	<p><math>4 + 4 + 4 = 12</math></p> <p><math>4 + 4 + 4 = 3 \times 4</math></p> <p><math>3 \times 4 = 12</math></p>	<p>Tara has 4 books. Ravi has 3 times as many books as Tara.</p>  <p>How many books do Tara and Ravi have altogether?</p>
<p>Repeated addition</p> <p>Shown on a number line.</p> 	<p>Pictorially represented on a number line.</p> <p>3 lots of 4 is 12.</p> 	<p>Show on a blank number line. <math>3 \times 4 = 12</math></p> 	<p>Amaan solved a multiplication calculation which had 3 equal jumps. He lands on 21. Show his workings.</p> 

Arrays  
Highlights the commutativity of multiplication.

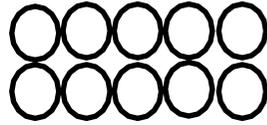


2 lots of 5



5 lots of 2

Represent the arrays in both directions.



Record a range of calculations from the arrays.

$$2 + 2 + 2 + 2 + 2 = 10$$

$$5 + 5 = 10$$

$$2 + 2 + 2 + 2 + 2 = 5 + 5$$

$$2 \times 5 = 10$$

$$5 \times 2 = 10$$

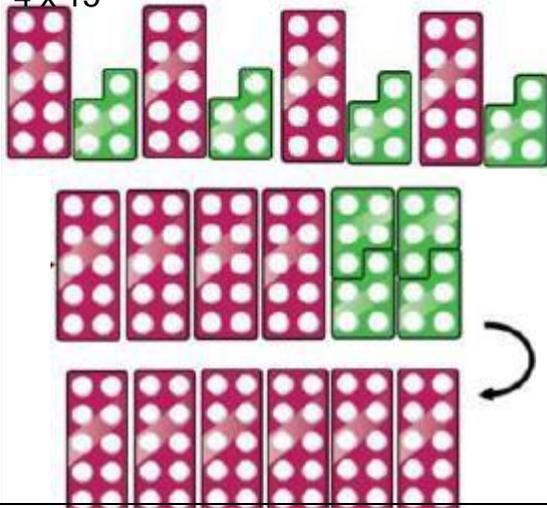
$$2 \times 5 = 5 \times 2$$

Any plants 4 rows of carrots.

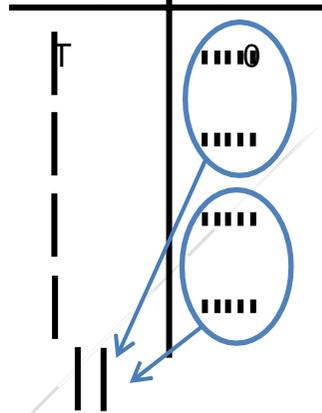
There are 3 carrots in each row. A rabbit eats 2 of the carrots.

How many carrots are left?

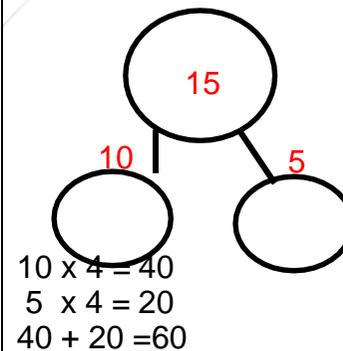
Partitioning  
Use Numicon or Dienes to represent the number and rearrange  
 $4 \times 15$



Represent the Numicon/ Dienes as tens and ones pictorially.



Partition the larger number and multiply the parts.



Jack is making cards.

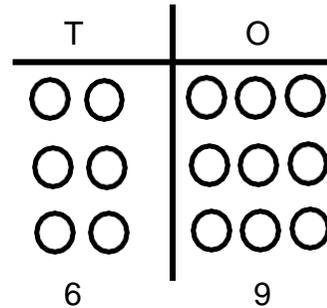
One sheet of paper makes 15 cards. Jack uses 5 sheets of paper.

How many cards does he make?

Formal column method with counters  $23 \times 3 = 69$

T	O
10 10	1 1 1
10 10	1 1 1
10 10	1 1 1
60	9

Represent the counters pictorially.



Record each step of the multiplication.

	2	3	
x		3	
		9	(3 x 3)
	6	0	(20 x 3)
	6	9	

Each toy cost 25p.

Jack buys 6 toys.

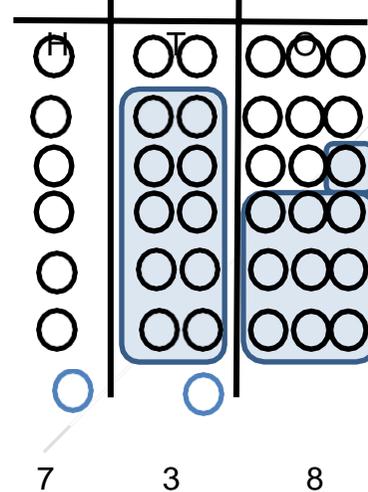


How much change does he get from £2.00

Formal column method with counters  $6 \times 123 = 738$

100 H	10 10	1 1 1
100	10 10	1 1 1
100	10 10	1 1 1
100	10 10	1 1 1
100	10 10	1 1 1
100	10 10	1 1 1
	100	10
700	30	8

Represent the counters pictorially.



Use a formal written method. Children must be confident with the value of each digit when multiplying.

	1	2	3
x		6	
	7	3	8
	±	±	

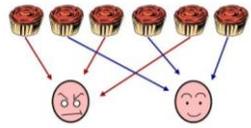
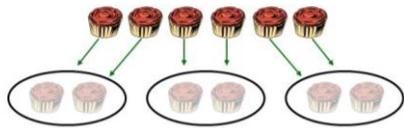
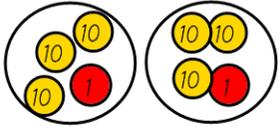
There are 28 pupils in a class.

The teacher has 8 litres of orange juice.

She pours 225 millilitres of orange juice for every pupil

How much orange juice is left over?

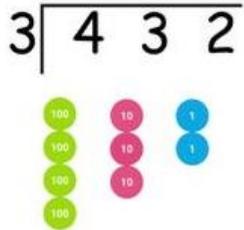


Division			
Key Language	Share, group, divide, dividend, divisor, quotient		
Concrete	Pictorial	Abstract	Greater Depth
<p>Repeated subtraction</p> <p><math>24 \div 6</math></p> <p>4 lots of 6 can be subtracted from 24;</p> <p><math>24 - 6 = 18</math>  <math>18 - 6 = 12</math>  <math>12 - 6 = 6</math>  <math>6 - 6 = 0</math></p>	<p>Represent the subtraction pictorially.</p>	<p>Use an abstract number line to represent equal groups are being subtracted.</p>	<p>Miss Smith needs 30 apples for her class. There are 5 apples in each bag.</p> <p>How many bags of apples does Miss Smith need altogether?</p>
<p>Sharing using a range of objects</p> <p><math>6 \div 2</math> 6 cakes shared between 2</p>  <p>6 cakes put into groups of 2</p> 	<p>Represent the sharing pictorially.</p>	<p>Use times table facts to support.</p> <p>If I know <math>2 \times 3 = 6</math> then I know <math>6 \div 2 = 3</math>.</p>	<p>How many ways could you share 20 sweets between friends so everyone gets an equal amount?</p>
<p>Sharing using place value counters.</p> <p>62</p> 	<p>Represent the counters pictorially.</p>	<p>Partition the number into two parts linked to the divisible number.</p>	<p>A group of friends earn £80 by washing cars. They share the money equally. They get £16 each. How many friends are in the group?</p>

<p>Using resources to represent remainders.  <math>10 \div 3</math></p> 	<p>Represent the sticks pictorially.</p> <p>There are 3 whole squares, with 1 left over.</p>	<p>Use times table facts to support.</p> <p>If I know <math>4 \times 3 = 12</math> then I know 13 is made up of 3 groups of 4, with 1 left over.</p>	<p>Jack wants to buy a bike that cost £107.</p> <p>He saves £10 each Saturday.</p> <p>How many Saturdays will it take him to save enough to buy the bike?</p> 

Short division using place value counters

$$432 \div 3$$

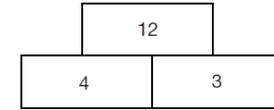


Represent the counters pictorially.

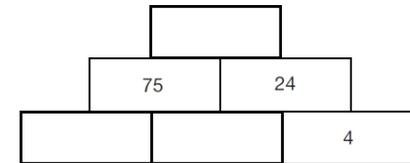
Use the short division written method

	1	2	3
5	6	11	15

In this tower, two numbers are multiplied to give the number above.



Write the missing numbers in the tower below to make it correct.



Long division using place value

counters  $2544 \div 12$

We can't group 2 thousands into groups of 12 so we can regroup them.

			2	1	2
1	2	2	5	4	4
		2	4		
			1	4	
			1	2	
				2	4
				2	4
					0

Year 6 are calculating three thousand, six hundred and thirty-three, divided by twelve.

Whitney says that she knows there will be a remainder without calculating.

Is she correct? Explain your answer.

## Appendix 3 - INSPIRE – Guidance Document 2019-20

### Introduction

As you are all aware, we have invested heavily in an exciting maths programme. There are many reasons as to why it is imperative that we fully embrace this programme. As maths leads we would like to provide you with key information and details of how to deliver the programme successfully.

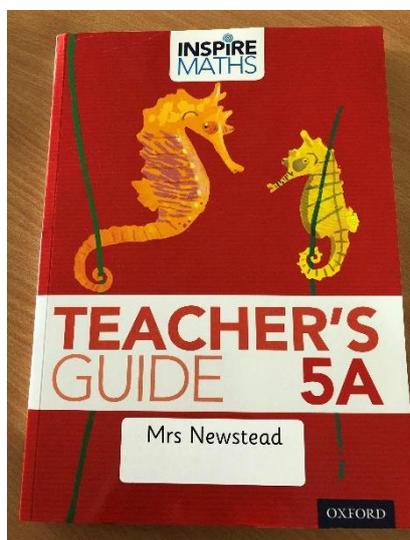
### Benefits of using High Quality Textbooks

The teacher guide, text books and practice books have a proven track record to have a profound impact on teaching and the learning of mathematics when adhered to. They provide teachers with a highly supportive guide which can scaffold your understanding of effect maths pedagogy, thus ensuring that lessons are consistent and of a high standard across the school. The materials are an extremely valuable resource and we want to encourage staff and pupils to take care and therefore have set out the following guidelines.

### Set up

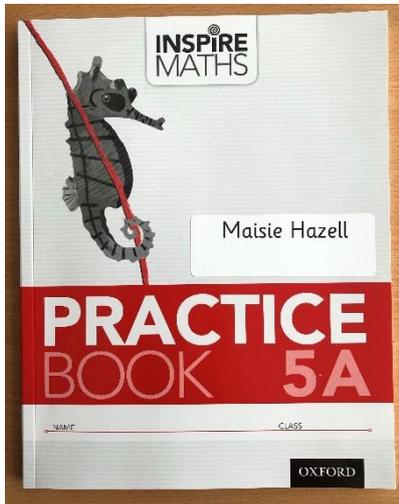
#### Teacher Guides

Teacher Guides are the responsibility of the teaching staff to be maintained in good condition for future use. Please can you ensure that teacher guides are labelled as below in case they are misplaced and can be returned to the appropriate teacher.



## Practice Books

Each child will have up to four practice books that need to be labelled as shown in the picture below. As per the teacher guides can teachers please set high expectations from the outset that pupils respect their books and are kept in good condition.



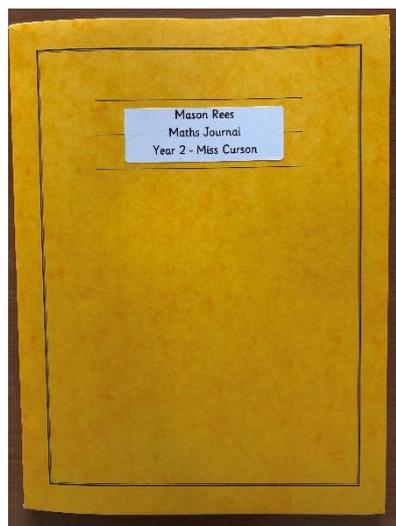
Only pencil is to be used in the practice book. Dates are to be entered when and where appropriate as indicated in the book. If a child requires extra space for workings out or explanation/reasoning, this can be recorded in their maths journals. Please see sub heading 'Maths Journal' for further guidance.

## Pupil Textbooks

Please note that each class has enough text books for one between two children. These are not to be labelled and again are expected to be kept in good condition.

## Maths Journal

Instead of typical maths book, children will be required to have a maths journal which will be yellow squared for KS1 and blue squared for KS2. Each child will need a labelled maths journal to use in conjunction with their practice book.



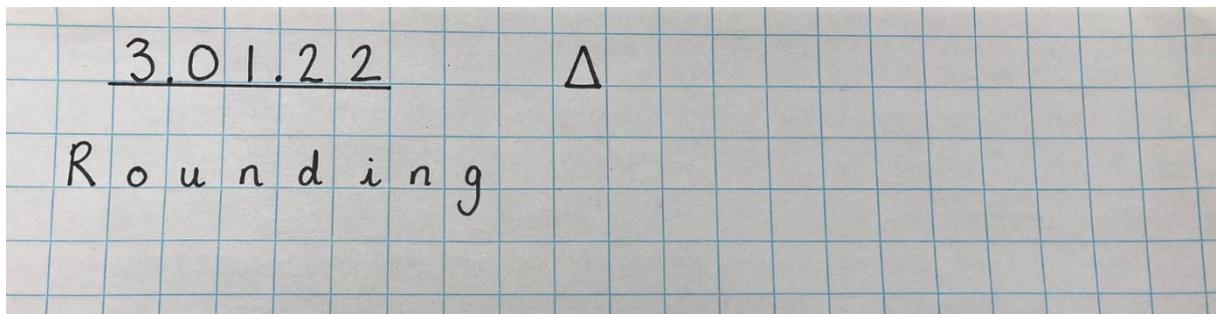
## Learning Objectives & Success Criteria

Learning objectives can be derived from the medium term plans that are within the teacher guides at the front of each unit. Each unit is broken down into sub units which subsequently contains several learning objectives.

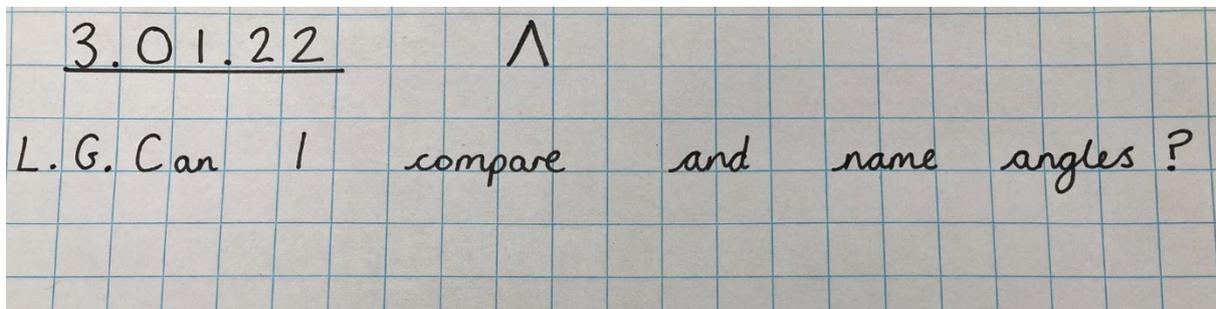
Success criteria statements are then formed out of these objectives, giving a clear idea of the evidence that a teacher will be looking for to identify whether pupils have met the learning objectives. The success criteria should be child-friendly as the pupils themselves should be part of the process of assessing whether they have made progress and been successful in meeting the objectives. Pupils can be involved in deciding upon the success criteria (co-constructing). When providing feedback, comments or verbal comments should refer to the success criteria.

Inspire Maths has been designed such that teachers will no longer need to spend time planning or finding resources. The only requirement that teachers will need to uphold is that learning objectives are present and displayed in maths journals (KS2), alongside success criteria that will also be displayed throughout the lesson.

Template A – KS1 Example of Learning Objective layout in journals:



Template B – KS2 Example of Learning Objective layout in journals:



### How to teach INSPIRE

#### Preparation

When you start a new unit refer to the teacher guide and study the medium term plan, which is located at the beginning of each unit. At this point consider the pre requisite skills that the children will require to access this unit. These clearly state the breakdown of the unit into sub units, which have sub headings in **BOLD**. For each sub unit you need to create a class set of the maths journal objective templates (Template A). Please note that a new learning goal is NOT required for every lesson. A new learning goal is ONLY required for each sub unit.

Prior to teaching each lesson, the teacher is expected to study the sequence of steps for each sub unit and is confident in delivering and modelling where required. The teacher guide clearly states a teaching sequence and this **MUST** be followed to ensure a level of consistency across the school and for the programme to be effective. Teachers are expected to gather any resources that are required for the lesson. If the teacher feels that other resources that are not stated in the teacher guides would be effective then have them at hand.

### ACB Books

As you are aware, Formative Assessment (FA) is an on-going cyclical process. Therefore, prior to every lesson teachers will be expected to use their own FA to inform next steps. For example, identifying children that may require pre teaching, scaffolding through the lesson or afternoon interventions.

### Lesson Design

INSPIRE maths has been devised on the basis that children will often be seated in mixed ability, random pairings. Therefore, there is no grouping of any kind. Differentiation will still take place through the use of scaffolding, resources and support given. Children should not be directed to different tasks and all children will follow the steps within each unit. However, recognising within every year group there are children identified with SEND, these children will be catered for separately through discussions with the SENCO, phase leaders and the class teacher.

A typical INSPIRE lesson will look like this:

1. Hand out LG templates and stick into maths journal (1<sup>st</sup> lesson of sub unit ONLY)
2. Share learning intentions for lesson with class
3. Complete anchor task to assess prior knowledge and next steps
4. Hand out text books/practice books
5. Teacher starts teaching sequence of steps as per the teacher guide (sometimes teacher experience and the use of AFL will result in amending/adding additional steps. In addition children assessed as ready to move on will work independently).
6. At various intervals children will be asked to work in practice books independently (pages that children are working on will be identified on LG). **This is where teachers and TAs will be moving around the classroom continually assessing (hawking and eaves dropping) and addressing misconceptions, scaffolding, questioning and updating ACB books. Where possible, making sure that no child is left over looked. (Steps 4 & 5 are likely to be the main body of the lesson and can be interchangeable)**
7. At the end of the lesson children are reverted to the learning goal template in their journals. Teachers are expected to provide children with the opportunity to self assess for the relevant steps. Please note that learning goals can be run over several lessons. During this time, teachers and TAs can continue to

move around the room to assess the children against the criteria and update the template accordingly.

8. **Marking & Feedback – In line with the feedback policy, the vast majority of feedback will be given within the lesson with the teacher & TA moving around the class and updating the learning goals accordingly as to whether the child has achieved the learning objective – see template A.**

## Self Assessment

To ensure consistency across the school, self assessment symbols for maths have been introduced. The three symbols listed below will be used for the children to self assess against each of the steps to success. Children will also be expected to complete a general self-assessment about the whole sub unit by circling the appropriate symbol in the top right hand corner of the template.



I do not understand and I need some help with this...



I am getting there! I just need some more practice...



I understand it and could teach it to someone else.

## Afternoon Interventions

Any children that are highlighted as not achieving the learning objective for a specific lesson will require some teacher led follow up work as part of the afternoon. This does not need to be more than 20-30 minutes in duration and is simply a way of providing the child with the tools and adult support so that they do not fall behind. The Headteacher and SENDCo will also be running interventions along with pre-teaching. Children will be identified for these through Pupil Progress Meetings and regular teacher formative assessment through the use of the ACB books,

## Pace

INSPIRE maths is based on children's understanding and not coverage of curriculum. The teacher guides provide guidance on pace and progression through concepts. As a school we are committed to closing the attainment gap and want to ensure that no child is left behind. Therefore, our expectation is that the large majority of pupils will progress through the programmes of study at broadly the same pace.

## How can I use Inspire Maths to challenge children?

You can use the *Inspire Maths* Pupil Textbooks and additional resources to challenge quick graspers in a variety of ways. It's essential to the *Inspire Maths* approach that the whole class works on the same topic together. Therefore it's important not to accelerate quick graspers onto a different area of the curriculum from the rest of the class. Instead, you can challenge these children by supporting them to gain a deeper understanding of the current topic. The Practice Books and Assessment Books are a good source of challenging activities that will help children achieve greater depth of understanding. In addition to these books, *Inspire Maths Online* has numerous resources.

## How can I support struggling learners with Inspire Maths?

There are lots of ways to support struggling learners to succeed in maths, such as pre-teaching key concepts and practising same-day intervention. You can also make use of additional materials from *Inspire Maths Online*, such as the whole-class [Simmering Skills activities](#), which practise key number skills, and the [word list](#), which contains all of the mathematical language that is used in *Inspire Maths*.

## Assessment Support

INSPIRE maths offer a range of assessment support including an assessment tracker, termly assessments and guidance on preparing for SATS. These can all be found on the P-drive in your own year group folders. You will not have to report on the INSPIRE assessment results, as we do for the NFERs, however this could be a good tool for teacher assessment.

The Assessment Books are a flexible resource that you can use for both formative and summative assessment and as a bank of questions for challenging practice.

## Simmering Skills

Keep children's essential number skills bubbling away with the front of class activities that INSPIRE maths offer. These can be used as a daily maths challenge or part of a short lesson starter. These can also be found on the P-drive, in the INSPIRE folder and also online.

## Conclusion

Finally to reiterate, in order for us to reap the benefits this programme has to offer, we all need to commit to these guidelines: not just to ensure consistency but to help one another too. Like children, we need to feedback to one another what is working well (or not), what we might need help with, be reflective and share best practice, so together we can strive to deliver a whole-school approach to teaching mastery maths!



## Appendix 4 – Maths Vocabulary/Sentence Stems

 <b>WEST MONKTON MATHEMATICIANS SAY...</b> 	
<p><b>Reasoning sentence starters:</b></p> <ul style="list-style-type: none"> <li>○ I solved the problem by...</li> <li>○ The strategy I used was...</li> <li>○ I discovered that...</li> <li>○ I noticed that...</li> <li>○ Another strategy that you could use is...</li> <li>○ The first thing I did was...</li> </ul>	<p><b>Comparing sentence starters:</b></p> <ul style="list-style-type: none"> <li>○ I agree with _____ because...</li> <li>○ I disagree with _____ because...</li> <li>○ That's a good answer because...</li> <li>○ I got a different answer because...</li> <li>○ My strategy is like yours because...</li> <li>○ I made a connection with what _____ said...</li> </ul>
<p><b>Questions that I can ask my partner:</b></p> <ul style="list-style-type: none"> <li>○ How did you work out your answer?</li> <li>○ Why did you....?</li> <li>○ Could you have....?</li> <li>○ What if...?</li> <li>○ What steps did you take to workout your answer?</li> <li>○ Can you prove that your answer is correct?</li> <li>○ Why did you choose that operation/method?</li> <li>○ Can you explain this to me?</li> </ul>	<p><b>Good talk partners:</b></p> <ul style="list-style-type: none"> <li>○ Disagree respectfully</li> <li>○ Explain or elaborate on their ideas</li> <li>○ Listen carefully</li> <li>○ Share their thinking</li> <li>○ Work together to solve problems</li> <li>○ Ask questions when they don't understand</li> </ul>

## Appendix 5 – Progression of Skills

This document has been created to show the progression of skills at West Monkton when following the INSPIRE programme and aligning to national curriculum objectives (This can be used for teacher assessment to ensure coverage of these NC objectives). As well as providing an opportunity for AFL within and across years. Teachers can use this document as a way of keeping track of what they have covered in each academic year by selecting the tick boxes below. This process will help to identify any pre requisite skills and gaps that may need to be taught.

Please note that for all year groups the following applies:

Some objectives may be covered within key stages (KS1, KS2), rather than solely within year groups following the INSPIRE programme. Teachers need to ensure that children have the pre requisite skills in readiness for the objective to be taught. Please recognise that some objectives may be covered in the following year and therefore may not need to be covered within a set year group.

These objectives are covered within INSPIRE books but are not specified in the NC.

Please note that these objectives **may** have been covered in the proceeding year through INSPIRE. It is the responsibility of the teacher to use AFL and ensure that these key objectives are covered. Where these objectives have not been covered, please use Additional IM Activities or other resources to ensure that these are evidenced in Maths journals.

### Maths Progression of Skills – Year 1

#### Number: Number and place value

- Count to and across 100, forwards and backwards, beginning with 0 or 1, or from any given number
- Count, read and write numbers to 100 in numerals; **count in multiples of twos, fives and tens**
- Given a number, identify one more and one less
- Identify and represent numbers using objects and pictorial representations including the number line, and use the language of: equal to, more than, less than (fewer), most, least
- Read and write numbers from 1 to 20 in numerals and words

#### Measurement

- Compare (using a pan balance and/or non standard units), describe and solve practical problems for:
- lengths and heights (e.g. long/short, longer/shorter, tall/short, double/half)
  - mass or weight (e.g. heavy/light, heavier than, lighter than)
  - capacity/volume (full/empty, more than, less than, half, half full, quarter)**
  - time (quicker, slower, earlier, later)
- Measure and begin to record the following (including using objects as non-standard units – paperclips, lollipop sticks):
- lengths and heights
  - mass/weight
  - capacity and volume**
  - time (hours, minutes, seconds)

	<ul style="list-style-type: none"> <li><input type="checkbox"/> Recognise and know the value of different denominations of coins and notes</li> <li><input type="checkbox"/> Understand that £1 is equivalent to 100p and that pounds can be counted up to £100.</li> <li><input type="checkbox"/> Applying addition/subtraction concepts to money including solving problems.</li> <li><input type="checkbox"/> Sequence events in chronological order using language such as: before and after, next, first, today, yesterday, tomorrow, morning, afternoon and evening</li> <li><input type="checkbox"/> Recognise and use language relating to dates, including days of the week, weeks, months and years</li> <li><input type="checkbox"/> Tell the time to the hour and half past the hour and draw the hands on a clock face to show these times</li> </ul>
<p><u>Number: Addition and Subtraction</u></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Read, write and interpret mathematical statements involving addition (+), subtraction (-) and equals (=) signs</li> <li><input type="checkbox"/> Represent and use number bonds and related subtraction facts within 20</li> <li><input type="checkbox"/> Add and subtract one-digit and two-digit numbers to 20 including zero (including using make-10 strategy and regrouping into tens/ones)</li> <li><input type="checkbox"/> Solve simple one-step problems that involve addition and subtraction, using concrete objects and pictorial representations and missing number problems such as <math>7 = ? - 9</math></li> <li><input type="checkbox"/> Applying the 'part whole' and 'adding on' concepts in addition, including solving word problems</li> <li><input type="checkbox"/> Applying the 'part whole' and 'taking away' concepts in subtraction, including solving word problems</li> <li><input type="checkbox"/> Composing a family of number sentences from a set of three related numbers.</li> <li><input type="checkbox"/> Counting, comparing and ordering numbers to 100.</li> <li><input type="checkbox"/> Adding three numbers – add on, making 10 and regrouping concepts being applied</li> <li><input type="checkbox"/> Mental addition and subtraction.</li> </ul> <p>Conceptualising a two-digit number as tens and ones. Recognising that when adding, you are putting two parts together. When subtracting you are taking away from a whole.</p>	<p><u>Geometry: Properties of shapes</u></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Recognise and name common 2-D and 3-D shapes, including:</li> <li><input type="checkbox"/> 2-D shapes (e.g. rectangles (including squares), circles and triangles)</li> <li><input type="checkbox"/> Recognise when an object is viewed from different angles/sides we can identify different shapes.</li> <li><input type="checkbox"/> Identifying and making patterns, understanding that these are formed by repeating an arrangement of shape, size and/or colour next to each other.</li> <li><input type="checkbox"/> 3-D shapes (e.g. cuboids (including cubes), pyramids and spheres)</li> </ul>
<p><u>Number: Multiplication and Division</u></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Understanding that multiplication can be shown as repeated addition</li> <li><input type="checkbox"/> Solve simple one-step problems involving multiplication and division, calculating the answer</li> </ul>	<p><u>Geometry: Position and direction</u></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Describe position, directions and movements, including half, quarter and three-quarter turns</li> </ul>

<p>using concrete objects, pictorial representations and arrays with the support of the teacher</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Understanding that division is conceptualised that division is dividing a set of objects into equal groups.</li> </ul>	
<p><u>Number: Fractions</u></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Recognise, find and name a half as one of two equal parts of an object, shape or quantity</li> <li><input type="checkbox"/> Recognise, find and name a quarter as one of four equal parts of an object, shape or quantity</li> </ul>	<p><u>Statistics:</u></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Collecting and organising data in horizontal or vertical picture graphs for interpretation (including using symbols)</li> </ul>

## Maths Progression of skills – Year 2

### Number: Number and place value:

- Count in steps of 2,3 and 5 from 0, and in tens from any number, forward and backward
- Recognise the place value of each digit in two-digit numbers (tens and ones)
- Identify, represent and estimate numbers using different representations, including the number line
- Compare and order numbers from 0 up to 100: use  $\leq$ ,  $\geq$  and  $=$  signs
- Read and write numbers to at least 100 in numerals and in words
- Use place value and number facts to solve problems
- Work with numbers to 1000

### Measurement

- Choose and use appropriate standard units to estimate and measure length/height in any direction (m/cm); mass (kg/g); temperature ( $^{\circ}\text{C}$ ); capacity (litres/ml) to the nearest appropriate unit, using rulers, scales, thermometers and measuring vessels
- Use concepts of addition and subtraction, multiplication and division of number to solve one step and two step measure related problems
- Recognising volume as the amount of space/mass/liquid a container holds.
- Compare and order lengths, mass, volume/capacity and record the results using  $\leq$ ,  $\geq$  and  $=$
- Recognise and use symbols for pounds (£) and pence (p); combine amounts to make a particular value
- Find different combinations of coins to equal the same amounts of money
- Solve simple problems in a practical context involving addition and subtraction of money of the same unit, including giving change
- Compare and sequence intervals of time
- Tell and write the time to five minutes, including quarter past/to the hour and draw the hands on a clock face to show these times.
- Know the number of minutes in an hour and the number of hours in a day
- Learning that time is told in AM & PM and what these represent.
- Understanding that hour is written as H and minutes are written as mins.

### Number: Addition and Subtraction:

- Solve problems with addition and subtraction:
- Using concrete objects and pictorial representations, including those involving numbers, quantities and measures
- Applying their increasing knowledge of mental and written method

- Recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100

Add and subtract numbers using concrete objects, pictorial representations, and mentally, including:

- A two-digit number and ones
- A two-digit number and tens
- Two two-digit numbers
- Adding three one-digit numbers

- Show that addition of two numbers can be done in any order (commutative) and subtraction of one number from another cannot

### Geometry: Properties of shapes

- Identify and describe the properties of 2-D shapes, including the number of sides and symmetry in a vertical line
- Identify and describe the properties of 3-D shapes, including the number of edges, vertices and faces
- To identify 2-D shapes on the surface of 3-D shapes, for example a circle on a cylinder and a triangle on a pyramid
- Compare and sort common 2-D and 3-D shapes and everyday objects
- Identifying semi circles and quarter circles

### Geometry: Position and direction:

- Order and arrange combinations of mathematical objects in patterns and sequences
- Use mathematical vocabulary to describe position, direction and movement, including movement in a straight line and distinguishing between rotation as a turn and in terms of right

Recognise and use the inverse relationship between addition and subtraction and use this to check calculations and solve missing number problems.

Work with numbers to 1000 using heuristic models such as bar modelling and 'part-part-whole'.

Solving two-step word problems to represent various concepts in addition and subtraction.

Number: Multiplication and Division

Recall and use multiplication and division facts for the 2,5 and 10 (3 & 4) multiplication tables, including recognising odd and even numbers.

Calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (x), division ( $\div$ ) and equals (=) signs

Show that multiplication of two numbers can be done in any order (commutative) and division of one number by another cannot

Solve one-step problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts

angles for quarter, half and three- quarter turns (clockwise and anti-clockwise)

Lines & Surfaces:

Representing lengths with straight lines.

Interpret straight lines with given lengths.

Identifying flat and curved surfaces.

Fractions

Recognise, find, name and write fractions  $\frac{1}{3}$ ,  $\frac{1}{4}$ ,  $\frac{2}{4}$  and  $\frac{3}{4}$  of a length, shape, set of objects or quantity

Write simple fractions e.g.  $\frac{1}{2}$  of 6 = 3 and recognise the equivalence of two quarters and one half

Quantifying and comparing fractions including adding and subtracting fractions.

Apply the adding on, taking away, part whole and comparing concepts to solve word problems involving fractions.

Statistics

Interpret and construct simple pictograms, tally charts, block diagrams and simple tables

Ask and answer simple questions by counting the number of objects in each category and sorting the categories by quantity

Ask and answer questions about totalling and comparing categorical data.

## Maths Progression of skills – Year 3

### Number: Number and place value:

- Count from 0 in multiples of 4, 8, 50 and 100; finding 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
- Identify, represent and estimate numbers using different representations
- Read and write numbers to at least 1000 in numerals and in words
- Solve number problems and practical problems involving these ideas
- Working with numbers to 10000

### Measurement:

- Measure, compare, add and subtract: lengths (m/cm/mm); mass (kg/g); volume/capacity (l/ml)
- Concepts in the four operations are applied to solve two step word problems in the context of length, mass, volume and time.
- Measure the perimeter of simple 2-D shapes
- Add and subtract amounts of money to give change, using both £ and p in practical contexts
- 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, hours and o'clock; use vocabulary such as 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
- Conversion of hours and minutes, recognising that one hour = 60 minutes.
- Compare durations of events, for example to calculate the time taken by particular events or tasks.

### Number: Addition and Subtraction:

- Recognise that the meaning of sum is to add

Add and subtract numbers mentally (applying number bonds to assist), 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 the efficient written methods of columnar addition and subtraction (regrouping)
- Estimate the answer to a calculation and use inverse operations to check answer
- Solve problems, including missing number problems, using number facts, place value, and more complex addition and subtraction

### Number: Multiplication and Division:

- Recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables (6, 7, 9)
- Write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to efficient written methods
- Multiplication by a two digit or a three digit number using regrouping in ones, tens, hundreds and thousands

### Geometry: Properties of shapes:

- Draw 2-D shapes and make 3-D shapes using modelling materials; recognise 3-D shapes in different orientations and describe them
- 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, vertical, perpendicular and parallel lines

### Area & Perimeter:

- Area is the amount of space that covers the surface of a shape
- The amount of space is measured by the number of standard units
- A square centimetre is a standard unit of measuring area
- A square metre is a standard unit for measuring bigger areas
- Perimeter is the area around a shape
- The area of the rectangle is the amount of space that covers the surface, which can be calculated as length x width

- Solve two step problems, including missing number problems, involving multiplication and division, including integer scaling problems and correspondence problems in which n objects are connected to m objects
- Recognise that division is the inverse of multiplication.
- Division involves distribution of a set of items equally into groups by related multiplication facts.
- Division of a 2 digit number by a 1 digit number with remainders
- Recognising patterns to identify odd and even numbers
- Expressing a number as a sum of values of different places
- Dividing equally with no remainder
- Regrouping from values of a higher place (hundreds/tens) to a lower place (tens/ones) in division

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, find and write fractions of a discrete set of objects: unit fractions and non-unit fractions with small denominators
- Recognise and use fractions as numbers: unit fractions and non-unit fractions with small denominators
- Recognise and show, using diagrams, equivalent fractions with small denominators
- Finding equivalent fractions using multiplying and dividing factors
- Add and subtract fractions (where the denominator is a multiple of the other) with the same denominator within one whole (e.g.  $5/7 + 1/7 = 6/7$ )
- Compare and order unit fractions with the same denominator
- Solve problems involving all of the above

Statistics:

- Interpret and present data using bar charts, pictograms and tables
- Solve one-step and two-step questions such as 'How many more?' and 'How many fewer?' using information presented in scaled bar charts and pictograms and tables

## Maths Progression of skills – Year 4

### Number: Number and place value:

- Count in multiples of 6, 7, 9, 25 and 1000
  - Find 1000 more or less than a given number
  - Count backwards through zero to include negative numbers
  - 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
- Working with numbers up to 100000
- Read Roman numerals to 100 (I to C) and understand how, over time, the numeral system changed to include the concept of zero and place value.

### Number: Multiplication and Division

- Recall multiplication and division facts for multiplication tables up to  $12 \times 12$
  - 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 (when a given number is divided by its factor it doesn't leave any remainder) and commutativity in mental calculations
  - Multiples of a one digit whole number are found by multiplying the whole number by any other whole number
  - Understanding the concept that factors and multiples are related; 2 is a factor of 8 and 8 is a multiple of 2
  - Multiply two-digit, three-digit numbers and four digits by a one-digit number using formal written layout and regrouping
  - Multiply two-digit by a three-digit number using formal written layout and regrouping
  - Using formal written methods, including regrouping to divide a 4 digit number by a 1 digit whole number
- Solve problems (up to 3 steps) involving multiplying and adding, including using the distributive law to multiply two digit numbers by one digit, integer scaling problems and harder multiplication problems such as which n objects are connected to m objects

### Measurement

- Convert between different units of measure (e.g. kilometre to metre; hour to minute)
  - Measure and calculate the perimeter of a rectilinear figure (including squares) in centimetres and metres
  - Find the area of rectilinear shapes by counting/using formula ( $l \times w$ )
  - Calculating the perimeter and area of a composite shape
  - Applying the concepts of area and perimeter to solve word problems
  - Estimate, compare and calculate different measures, including money in pounds and pence
  - 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.
- Identify that a second is a unit of time and  $60 \text{ seconds} = 1 \text{ minute}$

### Geometry: Properties of shapes

- To compare and classify geometric shapes, including quadrilaterals and triangles, based on their properties and sizes
- To identify acute and obtuse angles and compare and order angles up to two right angles by size
- Angles are named as  $\angle ABC$  or  $\angle a$
- Drawing angles up to  $180^\circ$
- Angles are named as  $\angle ABC$  or  $\angle a$
- Recognising the relationship between angles and turns – a right angle = quarter turn = 90 degrees, 2 right angles = half turn = 180 degrees, 3 right angles = three quarter turn = 270 degrees, 4 right angles = full turn = 360 degrees.
- To identify lines of symmetry in 2-D shapes presented in different orientations
- Making symmetrical shapes and patterns
- Identifying tessellations
- To complete a simple symmetric figure with respect to a specific line of symmetry

### Geometry: Position, direction, motion

- To describe positions on a 2-D grid as coordinates in the first quadrant
- To describe movements between positions as translations of a given unit to the left/right and up/down

	<ul style="list-style-type: none"> <li><input type="checkbox"/> To plot specified points and draw sides to complete a given polygon</li> <li><input type="checkbox"/> Know the directions of an eight point compass – N, E, S, W/ NE, NW, SE, SW.</li> <li><input type="checkbox"/> Draw perpendicular and parallel lines</li> </ul>
<p><u>Number: Fractions (including decimals)</u></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Understanding tenths, hundredths and thousandths including recognising that decimals up to three places are fractions with denominators, 10, 100, 1000 respectively</li> <li><input type="checkbox"/> Recognise and show, using diagrams, families of common equivalent fractions</li> <li><input type="checkbox"/> Count up and down in hundredths; recognise that hundredths arise when dividing an object by a hundred and dividing tenths by ten</li> <li><input type="checkbox"/> 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</li> <li><input type="checkbox"/> Add and subtract fractions with the same denominator/different</li> <li><input type="checkbox"/> Recognise a mixed number is made up of a whole number and a proper fraction.</li> <li><input type="checkbox"/> Recognise that an improper fractions, the numerator is equal to or greater than the denominator</li> <li><input type="checkbox"/> Convert mixed number and improper fractions and vice versa.</li> <li><input type="checkbox"/> Recognise and write decimal equivalents of any number of tenths or hundredths</li> <li><input type="checkbox"/> Recognise and write decimal equivalents to 1/4; 1/2; 3/4</li> <li><input type="checkbox"/> Find the effect of dividing a one- or two-digit number by 10 and 100, identifying the value of the digits in the answer as units, tenths and hundredths</li> <li><input type="checkbox"/> Round decimals with one decimal place to the nearest whole number</li> <li><input type="checkbox"/> Compare numbers with the same number of decimal places up to two/three decimal places</li> <li><input type="checkbox"/> Addition &amp; subtraction of decimals</li> <li><input type="checkbox"/> Multiplication and division of decimals by a whole number</li> <li><input type="checkbox"/> Estimation of decimals, applying mental and rounding concepts</li> <li><input type="checkbox"/> Solve simple measure and money problems involving fractions and decimals to two decimal places.</li> </ul>	<p><u>Statistics</u></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> To interpret and present discrete data using bar charts and continuous data using line graphs</li> <li><input type="checkbox"/> To solve comparison, sum and difference problems using information presented in bar charts, pictograms, tables and simple line graphs.</li> </ul>

## Maths Progression of skills – Year 5

### Number: Number and place value

- Working with numbers up to 10 million
- Read, write, order and compare numbers to at least 1 000 000 and determine the value of each digit
- Count forwards or backwards in steps of powers of 10 for any given number up to 1 000 000
- Interpret negative numbers in context, count forwards and backwards with positive and negative whole numbers through zero
- Round any number up to 1 000 000 to the nearest 10, 100, 1000, 10 000 and 100 000
- 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
- Understanding the order of operations in number sentences (BODMAS)

### Number: Addition and Subtraction

- Add and subtract whole numbers with more than 4 digits, including using efficient written methods (columnar addition and subtraction)
- Add/subtract numbers mentally with increasingly large numbers
- 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

### Number: Multiplication and Division

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

### Measurement

- Convert between different units of measure (e.g. kilometre and metre; metre and centimetre; centimetre and millimetre; kilogram and gram; litre and millilitre) (using concepts of powers of ten)
- Understand and use approximate equivalences between metric and common imperial units such as inches, pounds and pints
- Measure and calculate the perimeter of composite rectilinear shapes in centimetres and metres
- Calculate and compare the area of squares and rectangles (including squares), and including using standard units, square centimetres (cm<sup>2</sup>) and square metres (m<sup>2</sup>) and estimate the area of irregular shapes
- Identifying the base and height of a triangle and finding the area of a triangle
- Estimate volume (e.g. using 1 cm<sup>3</sup> blocks to build cubes and cuboids) and capacity (e.g. using water)
- Understanding and measuring volume
- Drawing cubes and cuboids
- Solve problems involving converting between units of time
- To solve problems involving addition and subtraction of units of measure (e.g. length, mass, volume, money) using decimal notation.
- Use all 4 operations to solve problems involving measure (e.g. Length, mass, volume, money) using decimal notation including scaling

### Geometry: Properties of shapes

- Identify 3-D shapes, including cubes and cuboids, from 2-D representations
- Know angles are measured in degrees; estimate and compare acute, obtuse and reflex angles
- Draw given angles, and measure them in degrees (o)
- Drawing triangles and four sided shapes when provided with certain properties
- Recognising that vertically opposite angles created by two intersecting straight lines are equal

#### To Identify:

- multiples of 90o
- angles at a point and one whole turn (total 360o)
- angles at a point on a straight line and 1/2 a turn (total 180o)
- other multiples of 90o
- Angles of a triangle = 180 degrees
- In parallelograms, rhombuses and trapeziums, opposite sides are parallel and equal and each pair of angles between parallel sides adds up to 180 degrees.

- Multiply numbers up to 4 digits by a one or two-digit number using a formal written method, including long multiplication for two-digit numbers
- Multiply and divide numbers mentally drawing upon known facts
- Divide numbers up to 4 digits by a one-digit number using the efficient written method of short division and interpret remainders appropriately for the context
- Multiply and divide whole numbers and those involving decimals by 10, 100 and 1000
- 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
- To solve problems involving addition, subtraction, multiplication and division and a combination of these, including understanding the meaning of the equals sign
- To solve problems involving multiplication and division, including scaling by simple fractions and problems involving simple rates

- A rhombus is a parallelogram with four equal sides where opposite angles are equal
- A trapezium is a four sided shape where only 1 pair of opposite sides is parallel and each pair of angles between parallel sides adds up to 180 degrees.
- 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

Geometry: Position, direction, motion

- 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

Ratio:

- Recognising ratio is a way of comparing relative sizes of two quantities or sets of items (comparing part to part as opposed part to whole)
- Finding ratio and equivalent ratios using common factors and expressing them in their simplest form.
- Comparing three quantities in the form of ratios
- Solve word related problems involving ratios.

Mean (average):

- Understanding mean
- Calculating the mean and applying this to solve word problems

Number: Fractions (including decimals)

- Compare and order fractions whose denominators are all multiples of the same number
- Identify, name and write equivalent fractions of a given fraction, represented visually, including tenths and hundredths
- Add and subtract fractions with the same denominator and denominators that are multiples of the same number
- Recognise mixed numbers and improper fractions and convert from one form to the other and write mathematical statements  $>1$  as a mixed number (e.g.  $2/5 + 4/5 = 6/5 = 1 \frac{1}{5}$ )
- Recognising the relationship between fractions and division (when a whole number is divided by another whole number it can result in;
  - a) A whole number with or without remainder
  - b) A proper fraction
  - c) A mixed number

Statistics

- Solve comparison, sum and difference problems using information presented in a line graph
- Complete, read and interpret information in tables, including timetables

- Adding and subtracting mixed numbers
- Multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams
- Multiplying an improper fraction to a proper fraction
- Multiplying a mixed number to a whole number
- Dividing a fraction by a whole number
- Read and write decimal numbers as fractions (e.g.  $0.71 = 71/100$ )
- 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
- Read, write, order and compare numbers with up to three decimal places
- 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 hundred, and as a decimal fraction
- Converting fractions to percentages
- Calculating percentages of a quantity
- Solving word problems involving percentages
- Solve problems which require knowing percentage and decimal equivalents of  $1/2$ ,  $1/4$ ,  $1/5$ ,  $2/5$ ,  $4/5$  and those with a denominator of a multiple of 10 or 25

## Maths Progression of skills – Year 6

<p><u>Number: Number and place value</u></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Read, write, order and compare numbers up to 10 000 000 and determine the value of each digit</li> <li><input type="checkbox"/> Round any whole number to a required degree of accuracy</li> <li><input type="checkbox"/> Use negative numbers in context, and calculate intervals across zero</li> <li><input type="checkbox"/> Solve number problems and practical problems that involve all of the above.</li> </ul>	<p><u>Algebra</u></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Use simple formulae</li> <li><input type="checkbox"/> Generate and describe linear number sequences</li> <li><input type="checkbox"/> Express missing number problems algebraically</li> <li><input type="checkbox"/> Find pairs of numbers that satisfy number sentences involving two unknowns</li> <li><input type="checkbox"/> Enumerate possibilities of combinations of two variable</li> </ul>
<p><u>Number: Addition, Subtraction, Multiplication and Division</u></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Multiply multi-digit numbers up to 4 digits by a two-digit whole number using the efficient written method of long multiplication</li> <li><input type="checkbox"/> Divide numbers up to 4 digits by a two-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</li> <li><input type="checkbox"/> Divide numbers up to 4 digits by a two-digit number using the formal written method of short division where appropriate, interpreting remainders according to the context</li> <li><input type="checkbox"/> Perform mental calculations, including with mixed operations and large numbers</li> <li><input type="checkbox"/> Identify common factors, common multiples and prime numbers</li> <li><input type="checkbox"/> Use their knowledge of the order of operations to carry out calculations involving the four operations</li> <li><input type="checkbox"/> Solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why</li> <li><input type="checkbox"/> Solve problems involving addition, subtraction, multiplication and division</li> <li><input type="checkbox"/> Use estimation to check answers to calculations and determine, in the context of a problem, levels of accuracy.</li> </ul>	<p><u>Measurement</u></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Solve problems involving the calculation and conversion of units of measure, using decimal notation to three decimal places where appropriate</li> <li><input type="checkbox"/> 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 three decimal places</li> <li><input type="checkbox"/> Convert between miles and kilometres</li> <li><input type="checkbox"/> Recognise that shapes with the same areas can have different perimeters and vice versa</li> <li><input type="checkbox"/> Recognise when it is necessary to use the formulae for area and volume of shapes</li> <li><input type="checkbox"/> Calculate the area of parallelograms and triangles</li> <li><input type="checkbox"/> Calculate, estimate and compare volume of cubes and cuboids using standard units, including centimetre cubed (cm<sup>3</sup>) and cubic metres (m<sup>3</sup>) and extending to other units, such as mm<sup>3</sup> and km<sup>3</sup></li> <li><input type="checkbox"/> Calculate the volume of a cuboid and calculate the volume of liquids</li> </ul>
<p><u>Number: Fractions (including decimals and percentages)</u></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Use common factors to simplify fractions; use common multiples to express fractions in the same denomination</li> <li><input type="checkbox"/> Compare and order fractions, including fractions &gt;1</li> <li><input type="checkbox"/> Add and subtract fractions with different denominators and mixed numbers, using the concept of equivalent fractions</li> <li><input type="checkbox"/> Multiply simple pairs of proper fractions, writing the answer in its simplest form (e.g. <math>1/4 \times 1/2 = 1/8</math>)</li> <li><input type="checkbox"/> Divide proper fractions by whole numbers (e.g. <math>1/3 \div 2 = 1/6</math>)</li> </ul>	<p><u>Geometry: Properties of shapes</u></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Draw 2D shapes using given dimensions and angles</li> <li><input type="checkbox"/> Recognise, describe and build simple 3-D shapes, including making net</li> <li><input type="checkbox"/> Compare and classify geometric shapes based on their properties and sizes and find unknown angles in any triangles, quadrilaterals, and regular polygons</li> <li><input type="checkbox"/> Illustrate and name parts of circles, including radius, diameter and circumference and know that the diameter is twice the radius</li> <li><input type="checkbox"/> Recognise the ratio of the circumference of a circle to its diameter is the constant <math>\pi</math></li> </ul>

<ul style="list-style-type: none"> <li><input type="checkbox"/> Dividing a proper fraction by another proper fraction</li> <li><input type="checkbox"/> Associate a fraction with division to calculate decimal fraction equivalents (e.g. 0.375) for a simple fraction (e.g. 3/8)</li> <li><input type="checkbox"/> Identify the value of each digit to three decimal places and multiply and divide numbers by 10, 100 and 1000 where the answers are up to three decimal places.</li> <li><input type="checkbox"/> Multiply one-digit numbers with up to two decimal places by whole numbers</li> <li><input type="checkbox"/> Use written division methods in cases where the answer has up to two decimal places</li> <li><input type="checkbox"/> Solve problems which require answers to be rounded to specified degrees of accuracy.</li> <li><input type="checkbox"/> Recall and use equivalences between simple fractions, decimals and percentages, including in different contexts</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Calculate the area of a circle using <math>\pi \times \text{radius} \times \text{radius}</math></li> <li><input type="checkbox"/> Recognise angles where they meet at a point, are on a straight line, and are vertically opposite.</li> <li><input type="checkbox"/> Finding unknown angles, understanding and applying the properties of angles, triangles, squares, rectangles, parallelograms, rhombuses and trapeziums</li> </ul> <p><u>Nets</u></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Identifying cubes and cuboids from a given net</li> </ul> <p><u>Geometry: Position, direction, motion</u></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Describe positions on the full coordinate grid (all four quadrants)</li> <li><input type="checkbox"/> Draw and translate simple shapes on the coordinate plane, and reflect them in the axes</li> </ul>
<p><u>Ratio and Proportion</u></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Solve problems involving the relative sizes of two quantities where missing values can be found by using integer multiplication and division facts</li> <li><input type="checkbox"/> Solve problems involving the calculation of percentages (e.g. of measures, and such as 15% of 360) and the use of percentages for comparison</li> <li><input type="checkbox"/> To solve problems involving similar shapes where the scale factor is known or can be found</li> <li><input type="checkbox"/> Solve problems involving unequal sharing and grouping using the knowledge of fractions and multiples</li> </ul> <p><u>Speed</u></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Recognising what speed is in relation to distance</li> <li><input type="checkbox"/> Calculating average speeds</li> <li><input type="checkbox"/> Applying combinations of concepts such as mean, speed and rate to solve high order word problems</li> </ul>	<p><u>Statistics</u></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Interpret and construct pie charts and line graphs and use these to solve problem</li> <li><input type="checkbox"/> Calculate and interpret the mean as an average</li> </ul>