



*Durweston CE Primary School*  
*including pre-school*

# ***Maths Policy***

**Intent**

At Durweston we want our children to be confident and effective mathematicians. In line with the National Curriculum, we want them to:

- become fluent in the fundamentals of mathematics, through varied and fluent practice with increasingly complex problems over time, so that pupils develop conceptual understanding and the ability to recall knowledge rapidly and accurately
- reason mathematically by following a line of enquiry, conjecturing relationships and generalisations, and developing an argument, justification or proof using mathematical language
- solve problems by applying their mathematics to a variety of routine and non-routine problems with increasing sophistication, including breaking down problems into a series of smaller steps and persevering in seeking solutions

**In EYFS**, pupils learn to verbally count beyond 20, recognising the pattern of the counting system; they compare quantities up to 10 in different contexts, recognising when one quantity is greater than, less than or the same as the other quantity; they explore and represent patterns within numbers up to 10, including evens and odds, double facts and how quantities can be distributed equally.

**In years 1 and 2**, pupils develop confidence and mental fluency with whole numbers, counting and place value. This should involve working with numerals, words and the four operations, including with practical resources eg concrete objects and measuring tools. Pupils should develop their ability to recognise, describe, draw and compare and sort different shapes and use the related vocabulary. Teaching should involve using a range of measure to describe and compare different quantities such as length, mass, capacity/volume, time and money.

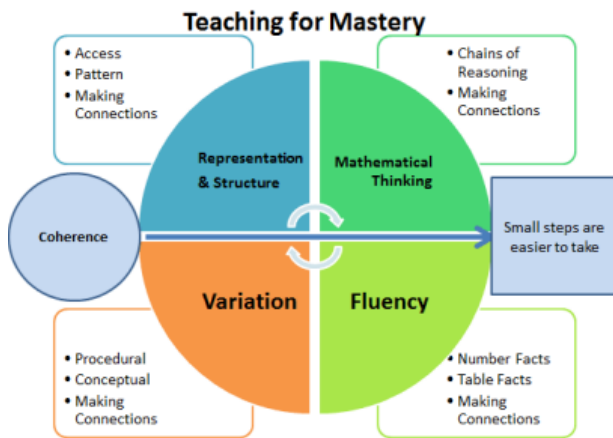
**By the end of year 2**, pupils should know their number bonds to 20 and be precise in using and understanding place value. An emphasis on practice at this early stage will aid fluency.

**In years 3 and 4**, pupils should become increasingly fluent with whole numbers and four operations including number facts and the concept of place value. Pupils develop efficient written and mental methods and perform calculations with increasingly large numbers. Pupils develop their ability to solve a range of problems, including simple fractions and decimal place value. Teaching should also ensure that pupils draw with increasing accuracy and develop mathematical reasoning, so they can analyse shapes and their properties and confidently describe the relationships between them. It should ensure that they can use measuring instruments with accuracy and make connections between measure and number. **By the end of year 4**, pupils should have memorized their multiplication tables up to and including the 12 times table and show precision and fluency in their work.

**In years 5 and 6**, pupils extend their understanding of the number system and place value to include larger integers. This should develop the connections that pupils make between multiplication and division with fractions, decimals, percentages, and ratio. Pupils develop their ability to solve a wider range of problems with increasingly complex properties of number and arithmetic, and problems demanding efficient written and mental methods of calculation. Pupils are introduced to the language of algebra as a means for solving a variety of problems. Teaching in geometry and measure should consolidate and extend knowledge developed in number. **By the end of year 6**, pupils should be fluent in written methods for all four operations, including long multiplication and division and in working with fractions, decimals and percentages. Pupils should read, spell and pronounce mathematical vocabulary correctly.

(Taken from The 2014 Primary National Curriculum Framework)

## Implementation



We teach Maths every day using the White Rose maths scheme from Year R to Year 6. White Rose uses the [Teaching for Mastery model](#) developed by the NCETM. To see how we apply this at Durweston, see [Teaching for Mastery at Durweston](#).

White Rose is based on a small steps approach that keeps all learners together. It is designed to support mathematicians who require more time and visual representation to grasp fundamental concepts as well as those who require challenging further to achieve Greater Depth.

White Rose Resources help us to provide:

- CPA (Concrete / Pictorial / Abstract) representations
- Variation (Procedural / Conceptual)
- Logical and effective small steps
- Vocabulary
- Manipulative (apparatus) usage

White Rose resources support:

- All learners through a whole class learning approach
- EYFS stage learning
- Visual representation designed to show concepts clearly
- Re-visiting of concepts
- Bar models and PPW models for problem solving
- Clear progression of calculation
- Fluency of calculation and concept

Manipulatives are:

- Used purposefully and appropriately
- Available for appropriate lesson to build a mental picture of a mathematical concept
- Manipulative use develops through concepts as the learner moves from EYFS to Y6

For more information, see our website <https://www.durweston.dorset.sch.uk/whiterose-maths>

Developing children's language and vocabulary is essential to teaching and learning. In all lessons:

- attention is given to whether key vocabulary has been learnt
- key vocabulary is drawn out and displayed during lessons and instantly added to as new words arise
- sentence-stems that embed key-concepts are planned into lessons where appropriate. These are modelled and repeated by adults and children
- paired talk activities are used to encourage children to talk about their mathematics- use of key vocabulary and sentence stems is highlighted and praised
- adults encourage more sophisticated and appropriate vocabulary from the children. For example, the child says, 'you have to times the numbers', adult says, 'do you mean you have to multiply the numbers?'
- children are encouraged to answer in full sentences.
- adults mirror alternative words for the same meaning to enrich children's range of vocabulary. For example, the child says '3 times 5 is 15', teacher says, 'yes, the product of 3 and 5 is 15' or '3 multiplied by 5 equals 15'.
- children are required to provide justification and reasoning for their answers. For example, 'I know the shape is a square because....'

### Pupils' Record of Work

Most work is completed in the White Rose workbook. However, children are encouraged to annotate their work to show how they are extending their thinking. Additional math work is done in exercise books with 1cm squares (2cm squares in year 1). Children are expected to use '1 digit to 1 box.' They work in pencil, but mistakes are crossed through with a single line, **not rubbed out**.

### Working Wall

Each class has a maths working wall which displays helpful reminders about previous learning and provides a record of current learning.

### Resources

All classes should have a range of maths resources that are readily available to the children. Equipment should be used by most of the children in the majority of lessons. Additional resources are kept in the Pod. Please ask the Maths coordinator if there is anything you need but can't find.

### Marking and Assessment

All work in maths should be assessed either by the teacher or TA. Any misconceptions should be addressed. Peer marking should be checked. Marking can be done alongside the child during the lesson or after the lesson.

Marking:

- Must identify what the child has done well, though the way this is done is up to individual teachers: eg, pink pen, smiley faces, ticks etc.
- Should correct or direct the children to correct all errors; exceptions might be made in the case of children with SEND.
- Could identify something the child needs to improve.

Some children may have individual maths targets written on the front of their maths books. These should be dated when set and when evidence is gathered to show the target has been met.

Maths is assessed three times a year using PUMA, CGP, past SATS paper or teacher assessment.

These assessments provide evidence to show the progress of each child through the year. The standardised scores are recorded on INSIGHT and used to inform teacher assessment.

### Monitoring

Maths is monitored regularly throughout the year by the Maths lead and the Maths governor who will undertake lesson observations, lesson drop-ins, learning walks, book scrutinies and pupil interviews. Results from monitoring will be shared with staff and governors.

JLS/NB November 2023

### Appendices

1. Whole school fluency map
2. Mastery Lesson Design at Durweston
3. Jurassic Maths Hub Mastery understanding - RAG

**Appendix 1 - Whole School Fluency Map**

**EYFS - Addition facts**

**Dolphins Year 1 and 2 - Addition facts including doubles, near doubles, bridging and compensating.**

Adding 1	Bonds to 10	Adding 10	Bridging/ compensating
Adding 2	Adding 0	Doubles	Near doubles

Y1 facts

Y2 facts

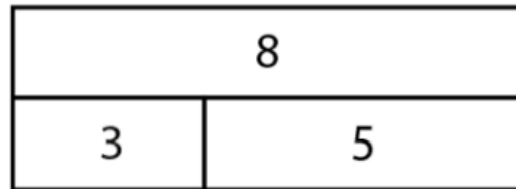
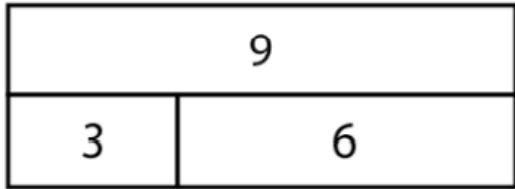
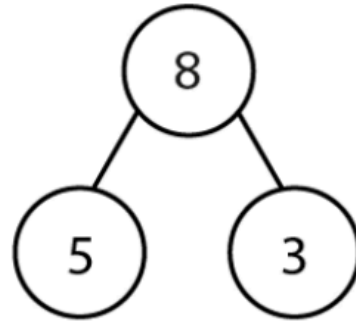
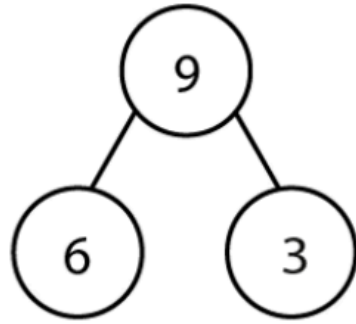
facts

+	0	1	2	3	4	5	6	7	8	9	10
0	0 + 0	0 + 1	0 + 2	0 + 3	0 + 4	0 + 5	0 + 6	0 + 7	0 + 8	0 + 9	0 + 10
1	1 + 0	1 + 1	1 + 2	1 + 3	1 + 4	1 + 5	1 + 6	1 + 7	1 + 8	1 + 9	1 + 10
2	2 + 0	2 + 1	2 + 2	2 + 3	2 + 4	2 + 5	2 + 6	2 + 7	2 + 8	2 + 9	2 + 10
3	3 + 0	3 + 1	3 + 2	3 + 3	3 + 4	3 + 5	3 + 6	3 + 7	3 + 8	3 + 9	3 + 10
4	4 + 0	4 + 1	4 + 2	4 + 3	4 + 4	4 + 5	4 + 6	4 + 7	4 + 8	4 + 9	4 + 10
5	5 + 0	5 + 1	5 + 2	5 + 3	5 + 4	5 + 5	5 + 6	5 + 7	5 + 8	5 + 9	5 + 10
6	6 + 0	6 + 1	6 + 2	6 + 3	6 + 4	6 + 5	6 + 6	6 + 7	6 + 8	6 + 9	6 + 10
7	7 + 0	7 + 1	7 + 2	7 + 3	7 + 4	7 + 5	7 + 6	7 + 7	7 + 8	7 + 9	7 + 10
8	8 + 0	8 + 1	8 + 2	8 + 3	8 + 4	8 + 5	8 + 6	8 + 7	8 + 8	8 + 9	8 + 10
9	9 + 0	9 + 1	9 + 2	9 + 3	9 + 4	9 + 5	9 + 6	9 + 7	9 + 8	9 + 9	9 + 10
10	10 + 0	10 + 1	10 + 2	10 + 3	10 + 4	10 + 5	10 + 6	10 + 7	10 + 8	10 + 9	10 + 10

Starfish	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10
Autumn	0 + 1 1 + 0	0 + 2 2 + 0	0 + 3 3 + 0	0 + 4 4 + 0	0 + 5 5 + 0	0 + 6 6 + 0	0 + 7 7 + 0	0 + 8 8 + 0	0 + 9 9 + 0	1 + 2 2 + 1  1 + 3 3 + 1
Spring	1 + 4 4 + 1  1 + 5 5 + 1	1 + 6 6 + 1  1 + 7 7 + 1	1 + 8 8 + 1	2 + 4 4 + 2  2 + 5 5 + 2	2 + 6 6 + 2  2 + 7 7 + 2	2 + 9 9 + 2  3 + 5 5 + 3	3 + 6 6 + 3  2 + 3 3 + 2	0 + 10 10 + 0 1 + 9 9 + 1	2 + 8 8 + 2 3 + 7 7 + 3	4 + 6 6 + 4
Summer	1 + 1 2 + 2 3 + 3 4 + 4	5 + 5 6 + 6 7 + 7 8 + 8	9 + 9 10 + 10 Recap doubles	Recap 2 + 4 4 + 2  2 + 5 5 + 2	Recap 2 + 6 6 + 2  2 + 7 7 + 2	Recap 2 + 9 9 + 2  3 + 5 5 + 3	Recap 3 + 6 6 + 3  2 + 3 3 + 2	Recap 0 + 10 10 + 0 1 + 9 9 + 1	Recap 2 + 8 8 + 2 3 + 7 7 + 3	Recap 4 + 6 6 + 4

Dolphins	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10
Autumn	Recap + 0 1 + 2 2 + 1	1 + 3 3 + 1 1 + 4 4 + 1	1 + 5 5 + 1 1 + 6 6 + 1	1 + 7 7 + 1 1 + 8 8 + 1	2 + 3 3 + 2 2 + 4 4 + 2	2 + 5 5 + 2 2 + 6 6 + 2	2 + 7 7 + 2 2 + 9 9 + 2	3 + 5 5 + 3 3 + 6 6 + 3	0 + 10 10 + 0 1 + 9 9 + 1	2 + 8 8 + 2 3 + 7 7 + 3
Spring	4 + 6 6 + 4 Recap bonds to 10	1 + 10 10 + 1 2 + 10 10 + 2	3 + 10 10 + 3 4 + 10 10 + 4	5 + 10 10 + 5 6 + 10 10 + 6	7 + 10 10 + 7 8 + 10 10 + 8	9 + 10 10 + 9 Recap add on 10	1 + 1 2 + 2 3 + 3 4 + 4	5 + 5 6 + 6 7 + 7 8 + 8	9 + 9 10 + 10 Recap doubles	3 + 4 4 + 3 4 + 5 5 + 4
Summer	5 + 6 6 + 5 6 + 7 7 + 6	7 + 8 8 + 7 8 + 9 9 + 8	3 + 8 8 + 3 3 + 9 9 + 3	4 + 7 7 + 4 4 + 8 8 + 4	4 + 9 9 + 4 5 + 7 7 + 5	5 + 8 8 + 5 5 + 9 9 + 5	6 + 8 8 + 6 6 + 9 9 + 6	7 + 9 9 + 7 Recap	Recap all y1/y2 facts	Recap all y1/y2 facts

<p>Dolphin concepts</p>	<ul style="list-style-type: none"> <li>• given a number, identify one more and one less</li> <li>• identify and represent numbers using objects and pictorial representations including the number line</li> <li>• use addition (+), subtraction (-) and equals (=) signs</li> <li>• represent and use number bonds and related subtraction facts within 20</li> <li>• add and subtract one-digit and two-digit numbers to 20, including zero</li> <li>• solve one-step problems that involve addition and subtraction, using concrete objects and pictorial representations, and missing number problems</li> <li>• memorise and reason with number bonds to 10 and 20 in several forms (for example, <math>9 + 7 = 16</math>; <math>16 - 7 = 9</math>)</li> <li>• realise the effect of adding or subtracting zero.</li> <li>• solve practical problems for: lengths and heights, mass/weight, time</li> <li>• recognise and know the value of different denominations of coins and notes</li> <li>• recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100</li> <li>• add and subtract numbers using concrete objects, pictorial representations, and mentally</li> <li>• show that addition of two numbers can be done in any order (commutative)</li> <li>• recognise and use the inverse relationship between addition and subtraction</li> </ul>
<p>Worked example</p>	<ul style="list-style-type: none"> <li>• as addition using commutativity (<math>7+1 = 1+7</math>, <math>4+5 = 5+4</math>)</li> <li>• as subtraction facts using inverse (<math>4+5=9</math>, <math>9-4=5</math>, <math>9-5=4</math>, <math>5=9-4</math>, <math>4=9-5</math>)</li> <li>• as related facts (<math>14+5=19</math>, <math>24+5=29</math>, <math>29-4=25</math>, <math>19-5=14</math>)</li> </ul> <div data-bbox="1003 746 1451 1110" data-label="Image"> </div> <div data-bbox="1473 746 1975 1110" data-label="Text"> <p>Teach a strategy at a time and encourage children to build the calculation using the two colours, recording their answers as part-whole models and equations.</p> </div>



$9 = 6 + 3$     $6 + 3 = 9$     $9 = 3 + 6$     $3 + 6 = 9$   
 $9 - 3 = 6$     $6 = 9 - 3$     $9 - 6 = 3$     $3 = 9 - 6$

$8 = 3 + 5$     $3 + 5 = 8$     $8 = 5 + 3$     $5 + 3 = 8$   
 $8 - 3 = 5$     $5 = 8 - 3$     $8 - 5 = 3$     $3 = 8 - 5$

Ensure children hear and use the 'part-part-whole' vocabulary and the range of addition & subtraction vocabulary, for example:

- 8 is the whole; 3 is a part and 5 is a part.
- One of the parts added to the other part equals the whole.
- The whole take away one of the parts equals the other part.
- One of the parts is equal to the whole minus the other part.
- 5 add 3 equals 8.
- 3 plus 5 equals 8.
- The sum of 5 and 3 is 8.
- 3 added to 5 is 8.
- 3 more than 5 is 8.
- 5 and 3 equals 8.
- The total of 3 and 5 is 8.
- 8 subtract 3 equals 5
- 8 minus 5 is 3
- 5 is 8 minus 3

The **colour-coded addition cards** can be used for rehearsal of the different strategies.

$1 + 7 =$	$2 + 4 =$	$3 + 7 =$	$6 + 6 =$	$6 + 5 =$
$8 + 5 =$	$6 + 8 =$	$7 + 10 =$	$4 + 9 =$	

**Using the ten-frame trays to help children visualise the additive root facts:**

**Step 1.**

Although in other maths sessions children may look at random arrangements of numbers on a ten-frame in order to practise subitising and using their part-part-whole skills, ensure children are able to create and recognise **without counting** the numbers 1-10 on the ten-frame using this 'rule' when they are learning strategies for the additive root facts:

**Always fill the top row first starting from the left (the same way you read). When the top row is full start filling the bottom row from the left.**

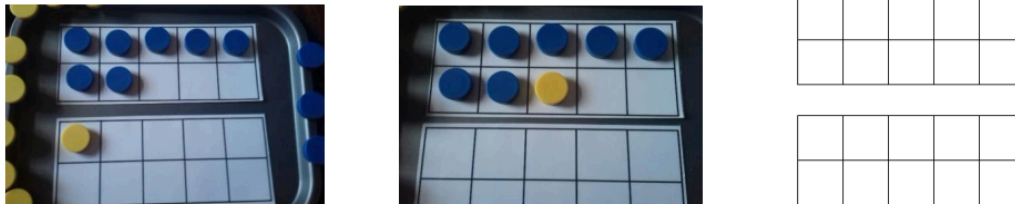
Allow children opportunities to practise building and recognising the numbers 1-10 by calling out the number and using numeral cards and ten-frame flash cards.



**Step 2.**

When the children can confidently recognise the numbers 1-10 **without counting** start teaching the strategies in the given order.

**E.g. 'Adding one':** For  $1 + 7$  or  $7 + 1$  children build both amounts (addends) and move the smallest amount of counters to create the total.



**Step 3.**

When children are gaining confidence with a particular strategy encourage them to visualise moving the counters (of the smallest addend) rather than actually moving them. Eventually the children should be able to picture the numbers on empty ten-frames, visualising the entire addition fact in order to picture the total.

**Seahorses, Sharks, Porpoises Years 2, 3, 4, 5 and 6 - Multiplication facts**

Seahorses = 30 Sharks = 26 Porpoises = 10

1. $2 \times 2$	12. $3 \times 5$	23. $4 \times 10$	34. $7 \times 3$	45. $4 \times 4$	56. $12 \times 8$
2. $3 \times 2$	13. $4 \times 5$	24. $6 \times 10$	35. $8 \times 3$	46. $6 \times 4$	57. $7 \times 7$
3. $4 \times 2$	14. $5 \times 5$	25. $7 \times 10$	36. $9 \times 3$	47. $7 \times 4$	58. $9 \times 7$
4. $5 \times 2$	15. $6 \times 5$	26. $8 \times 10$	37. $11 \times 3$	48. $8 \times 4$	59. $11 \times 7$
5. $6 \times 2$	16. $7 \times 5$	27. $9 \times 10$	38. $12 \times 3$	49. $9 \times 4$	60. $12 \times 7$
6. $7 \times 2$	17. $8 \times 5$	28. $10 \times 10$	39. $6 \times 6$	50. $11 \times 4$	61. $9 \times 9$
7. $8 \times 2$	18. $9 \times 5$	29. $11 \times 10$	40. $7 \times 6$	51. $12 \times 4$	62. $11 \times 9$
8. $9 \times 2$	19. $10 \times 5$	30. $12 \times 10$	41. $8 \times 6$	52. $7 \times 8$	63. $12 \times 9$
9. $10 \times 2$	20. $11 \times 5$	31. $3 \times 3$	42. $9 \times 6$	53. $8 \times 8$	64. $11 \times 11$
10. $11 \times 2$	21. $12 \times 5$	32. $4 \times 3$	43. $11 \times 6$	54. $9 \times 8$	65. $12 \times 11$
11. $12 \times 2$	22. $3 \times 10$	33. $6 \times 3$	44. $12 \times 6$	55. $11 \times 8$	66. $12 \times 12$

	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10
Seahorse Facts - Aut	2 x 2	3 x 2 2 x 3	4 x 2 2 x 4	5 x 2 2 x 5	6 x 2 2 x 6	7 x 2 2 x 7	8 x 2 2 x 8	9 x 2 2 x 9	10 x 2 2 x 10	11 x 2 2 x 11
Seahorse Facts - Spr	12 x 2 2 x 12	3 x 5 5 x 3	4 x 5 5 x 4	5 x 5	6 x 5 5 x 6	7 x 5 5 x 7	8 x 5 5 x 8	9 x 5 5 x 9	10 x 5 5 x 10	11 x 5 5 x 11
Seahorse Facts - Sum	12 x 5 5 x 12	3 x 10 10 x 3	4 x 10 10 x 4	6 x 10 10 x 6	7 x 10 10 x 7	8 x 10 10 x 8	9 x 10 10 x 9	10 x 10	11 x 10 10 x 11	12 x 10 10 x 12

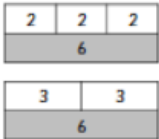

Seahorse concepts

- Calculate mathematical statements e.g.  $3 \times 2 = 6$ ,  $6 \div 2 = 3$
- Recognise odd and even numbers e.g.  $3 \times 2 = 6$ . 6 is an even number.
- Show that multiplication of 2 numbers can be done in any order e.g.  $3 \times 2 = 6$  and so  $2 \times 3 = 6$  (commutative)
- Use repeated addition, arrays and mental methods
- Problems in context e.g. If 3 children each have 2 sweets, how many sweets are there in total?
- Use language of double and half if applicable
- Link the 5 times table to divisions on a clockface
- Find fractions of a quantity e.g.  $\frac{1}{2}$  of 6,  $\frac{1}{3}$  of 10,  $\frac{1}{10}$  of 60

Worked example

$3 \times 2 = 6$        $6 \div 2 = 3$        $2 + 2 + 2 = 6$   
 $2 \times 3 = 6$        $6 \div 3 = 2$        $3 + 3 = 6$

Double 3 is equal to 6  
Half of 6 is equal to 3



$\frac{1}{2}$  of 6 = 3


If 3 children each have 2 sweets, how many sweets are there in total?  
If 2 children share 6 sweets equally between themselves, how many will they get each?

@SarahFarnellKS2

$3 \times 2 = 6$        $6 \div 2 = 3$        $30 \times 2 = 60$   
 $2 \times 3 = 6$        $6 \div 3 = 2$        $60 \div 3 = 20$

If I know that 3 lots of 2 is equal to 6, then I know that 3 lots of 20 is equal to 60.

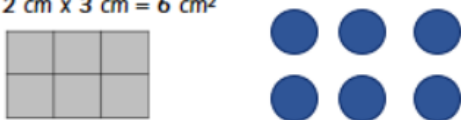


6 is three times as big as 2             $\frac{1}{2}$  of 6 = 3  
 6 is twice as big as 3             $\frac{1}{3}$  of 6 = 2



If 3 children each have 20 sweets, how many sweets are there in total?  
If 2 children share 60 sweets equally between themselves, how many will they get each?

	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10
Shark facts Aut	3 x 3	4 x 3 3 x 4	6 x 3 3 x 6	7 x 3 3 x 7	8 x 3 3 x 8	9 x 3 3 x 9	11 x 3 3 x 11	12 x 3 3 x 12	6 x 6	7 x 6 6 x 7
Shark facts Spr	8 x 6 6 x 8	9 x 6 6 x 9	11 x 6 6 x 11	12 x 6 6 x 12	4 x 4	6 x 4 4 x 6	7 x 4 4 x 7	8 x 4 4 x 8	9 x 4 4 x 9	11 x 4 4 x 11
Shark facts Sum	12 x 4 4 x 12	7 x 8 8 x 7	8 x 8	9 x 8 8 x 9	11 x 8 8 x 11	12 x 8 8 x 12	Recap Aut	Recap Spr	Recap Sum	Recap all

Shark concepts	<ul style="list-style-type: none"> <li>• Derive related facts e.g. <math>30 \times 2 = 60</math>, <math>60 \div 2 = 30</math> up to 1,000,000</li> <li>• Derive related facts in decimal numbers</li> <li>• As appropriate link to measure e.g. 60 minutes in an hour, 10mm = 1cm</li> <li>• Relate area to arrays and multiplication</li> <li>• Find unit fraction of number e.g. if <math>66 \div 6 = 11</math> then <math>\frac{1}{6}</math> of 66 = 11. Potentially extend to non-unit fractions</li> <li>• Use the language of factors and multiples</li> <li>• Use language of composite and prime</li> <li>• Use square numbers</li> </ul>
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Worked example	<p> <math>3 \times 2 = 6</math>      <math>6 \div 2 = 3</math>      <math>300 \times 2 = 600</math>  <math>2 \times 3 = 6</math>      <math>6 \div 3 = 2</math>      <math>6,000 \div 3 = 200</math> </p> <p>If I know that 3 lots of 2 is equal to 6, then I know that 3 lots of 200 is equal to 600.</p> <p> <math>2 \text{ cm} \times 3 \text{ cm} = 6 \text{ cm}^2</math> </p>  <p> <math>\frac{1}{2}</math> of 6 = 3  <math>\frac{1}{3}</math> of 6 = 2  <math>\frac{1}{2}</math> of 60 = 30  <math>\frac{1}{3}</math> of 60 = 20                 </p> <p>If 3 children each have 200 sweets, how many sweets are there in total?                      If 2 children share 600 sweets equally between themselves, how many will they get each?</p> <p style="text-align: right; font-size: small;">@SarahFarrBES2</p>	<p> <math>300 \times 2 = 600</math>      <math>60,000 \div 2 = 30,000</math>  <math>0.2 \times 3 = 0.6</math>      <math>0.6 \div 3 = 0.2</math> </p> <p>If I know that 3 lots of 2 is equal to 6, then I know that 3 lots of 20,000 is equal to 60,000.</p> <p>                     6 is a multiple of 3 and 2       </p> <p>2 and 3 are factors of 6      </p> <p>6 is a composite number because it has factors other than one and itself.      6 is not a square number</p> <p> <math>\frac{1}{2}</math> of 6 = 3  <math>\frac{1}{3}</math> of 6 = 2  <math>\frac{1}{2}</math> of 600 = 300  <math>\frac{1}{3}</math> of 600 = 200  <math>\frac{2}{3}</math> of 600 = 400                 </p> <p>If one chocolate bar costs £0.20, how much will three cost?                      A man had £600,000 in his bank account. He spends half of it. How much does he now have?</p> <p style="text-align: right; font-size: small;">@SarahFarrBES2</p>
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Recap Sharks	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10
Porpoise facts Aut	6 x 6	7 x 6 6 x 7	8 x 6 6 x 8	9 x 6 6 x 9	11 x 6 6 x 11	12 x 6 6 x 12	7 x 8 8 x 7	8 x 8	9 x 8 8 x 9	11 x 8 8 x 11
Porpoise facts Spr	12 x 8 8 x 12	7 x 7	9 x 7 7 x 9	11 x 7 7 x 11	12 x 7 7 x 12	9 x 9	11 x 9 9 x 11	12 x 9 9 x 12	12 x 11 11 x 12	11 x 11 12 x 12
Porpoise facts Sum	Recap and deepen									


**Porpoise Concept**


- Derive related facts e.g.  $30 \times 2 = 60$ ,  $60 \div 2 = 30$  up to 10,000,000
- Derive related facts in decimal numbers up to 3dp e.g.  $0.3 \times 2 = 0.6$
- Use the language of factors and multiples
- Use the language of common multiples
- Use language of composite and prime
- Use square numbers
- Find unit fraction of number e.g. if  $66 \div 6 = 11$  then  $\frac{1}{6}$  of 66 = 11. Extend to non-unit fractions

**Worked example**

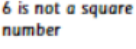
**300**  $\times 2 = 600$      $60,000 \div 2 = 30,000$   
 $0.2 \times 3 = 0.6$      $0.6 \div 3 = 0.2$

If I know that 3 lots of 2 is equal to 6, then I know that 3 lots of 20,000 is equal to 60,000.

6 is a multiple of 3 and 2 

2 and 3 are factors of 6 

6 is a **composite number** because it has factors other than one and itself.

6 is not a square number 


$\frac{1}{3}$  of 6 = 2  
 $\frac{1}{2}$  of 6 = 3  
 $\frac{1}{2}$  of 600 = 300  
 $\frac{1}{3}$  of 600 = 200  
 $\frac{2}{3}$  of 600 = 400


If one chocolate bar costs £0.20, how much will three cost?  
 A man had £600,000 in his bank account. He spends half of it. How much does he now have?

@SarahFarrellKS2

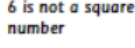
**3,000,000**  $\times 2 = 6,000,000$      $600,000 \div 20 = 30,000$   
 $0.02 \times 3 = 0.06$      $0.6 \div 3 = 0.2$

If I know that 3 lots of 2 is equal to 6, then I know that 3 lots of 2,000,000 is equal to 6,000,000.

6 is a multiple of 3 and 2 

2 and 3 are factors of 6 

6 is a common multiple of 3 and 2

6 is not a square number 

$\frac{1}{3}$  of 6 = 2  
 $\frac{1}{2}$  of 6 = 3  
 $\frac{1}{20}$  of 600,000 = 30,000  
 $\frac{1}{3}$  of 600,000 = 200,000  
 $\frac{2}{3}$  of 600,000 = 400,000

If one chocolate bar costs £0.20, how much will three cost?  
 A man had £6,000,000 in his bank account. He spends half of it. How much does he now have?

@SarahFarrellKS2

**Mastery Lesson Design at Durweston**

### Representation & Structure

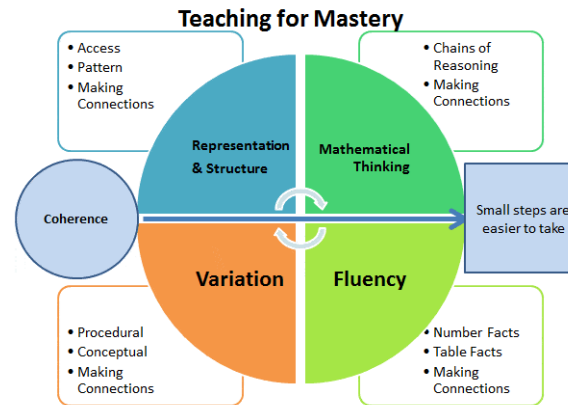
- CPA used meaningfully across school
- Representations expose the structure of the problem or calculation
- Linguistic representations (emphasis on vocabulary and using stem sentences)
- Representations must be carefully selected and used in a meaningful order

### Coherence

- Microscopic steps (within a lesson, unit, year, scheme)
- Focused, key learning objectives
- Careful sequencing of steps within a lesson, building to generalisation
- Pre-empting misconceptions
- Opportunities for fluency, reasoning and problem solving with each objective

What does this mean?  **$8 + 3 = 11$**  In which order should concepts be introduced?

What understanding is required to access this? How might it be misunderstood?



### Mathematical Thinking

- The answer is just the beginning
- Reasoning as a regular part of each lesson
- Questioning to deepen understanding and give access to all students

Is this sometimes, always or never true?

How is this the same? How is it different?

Can you prove this?

### Variation

- Activating the thinking process and avoiding mechanical repetition
- Ensure the steps taken within a lesson are small, logically ordered and connected
- Prepare learners to recognise Maths in unfamiliar contexts

#### conceptual variation

#### procedural variation

$7 \times 4$   
 $70 \times 4$   
 $70 \times 8$   
 $14 \times 4$   
 $140 \times 40$

### Fluency

- Teaching procedural and factual knowledge develops students' automaticity
- Automaticity frees the mind to focus on the concept

$999 \times 8$

$999$	$1000 \times 8 - 8$
$\times 8$	$8000 - 8$
$7992$	$7992$

Which method demonstrates fluency?

We use WRM as our vehicle in Mathematics. It offers us a firm, secure, research-based foundation on which to build sequences of lessons that ultimately meet the needs of all our learners.

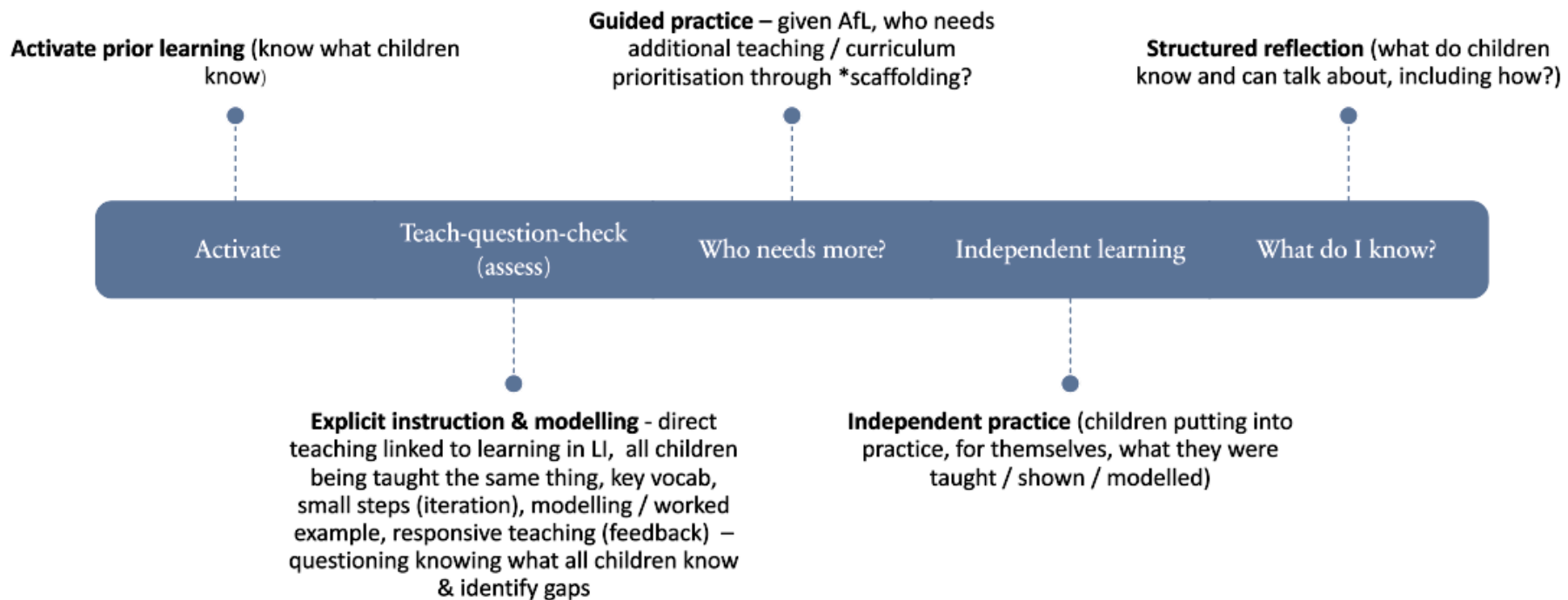
As we develop our Teaching for Mastery Maths lessons, we interrogate the WRM resources, identifying and fully understanding the choices behind the lesson design. We make appropriate adjustments to the lesson to account for what we know about our learners, including their previous learning experiences, potential misconceptions and prerequisite knowledge gained from RTP material. We look deeply into the questions and problems posed to correctly identify the structures, representations and variation so that we can reproduce these to challenge or support our learners if and when necessary. We also look closely at the coherence within and across lessons so that we can preempt misconceptions and build towards those all important generalisations. We work hard to ensure that all learners have equal access to the manipulatives and resources needed to replicate the images used in the WRM resources alongside the linguistic representations in the form of sentence stems and key vocabulary. The WRM unit overviews suggest possible sentence stems and generalisations to expose along the way as well as the key ‘take-away’ learning for each small step. It also suggests key questions that can be used to challenge and support learners as well as encouraging them to make connections, hypothesise, test theories and reach generalisations.

	<b><i>The Five Big Ideas</i></b>
Cohesion	<b>Look at the small step overview</b> - what should my learners be taking away at the end of my lesson? <b>Interrogate the slides and workbook:</b> What are the small steps I’m taking them on and why have they been sequenced in this way? What could go wrong and how can I pre-empt this?
Representation and Structure	<b>Interrogate the slides and workbook:</b> Which concrete resources have been used to expose the structure of the concept and how can I replicate these for all learners? How has CPA been used effectively to support understanding? Why have these particular representations been used? How can I replicate/adjust/develop these models to either support or challenge my learners? What questions have been chosen and why? Where are the opportunities to make links and build connections within the questions/problems posed? <b>Look at the small step overview:</b> Which linguistic representations (sentences stems/vocabulary) are suggested and how can I build these in so that learners have enough opportunities to hear it, read it, rehearse it and use it independently in the correct context?
Variation	<b>Interrogate the slides and workbook:</b> What are the small steps of the lesson and how have they been logically ordered and connected? During the sequence of questions, what has been kept the same? What has changed? (varied) Where is the conceptual variation: what has been varied in order to emphasise a) What it is (both standard

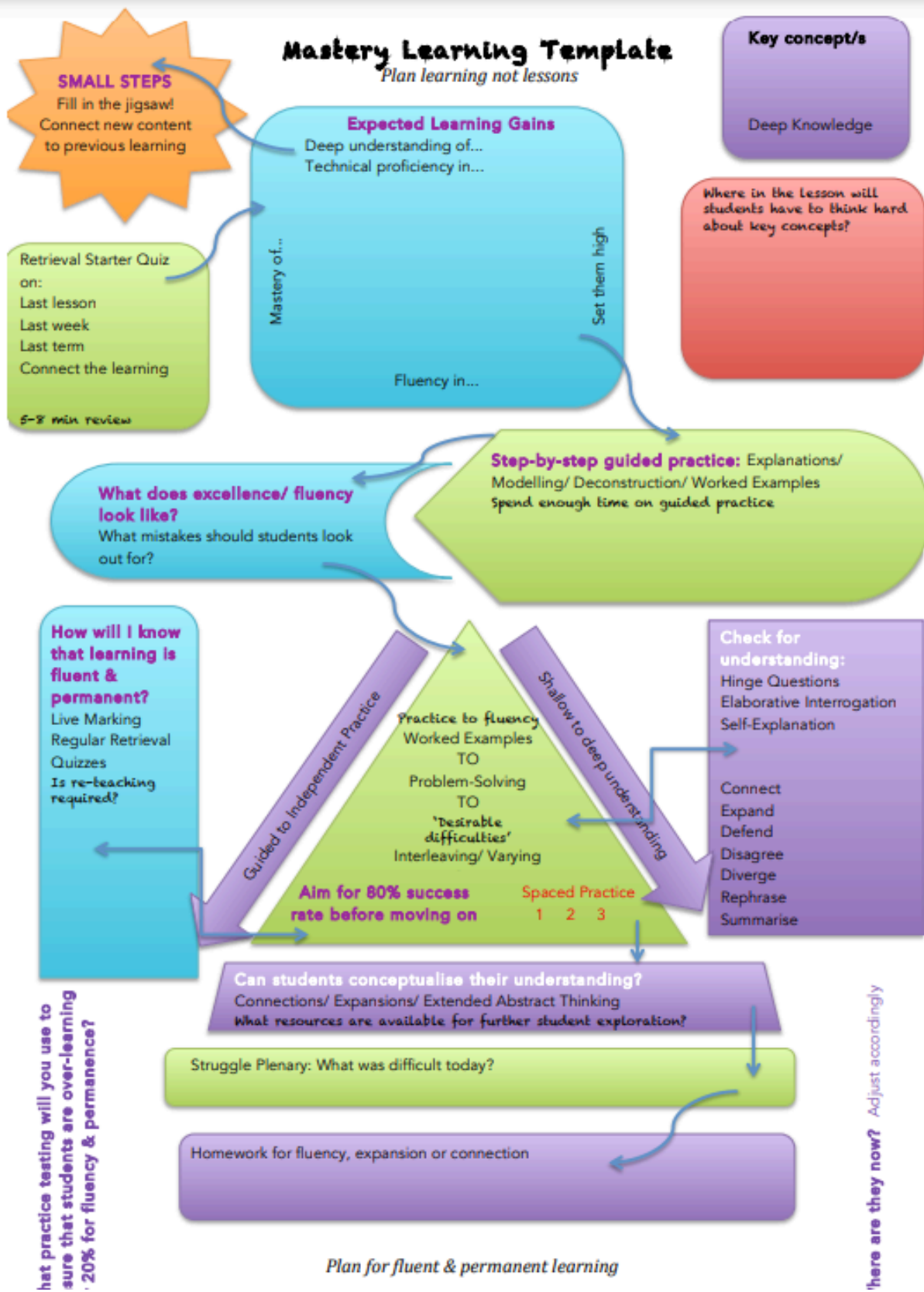
	<p>and non-standard examples) b) What it is not. Where is the procedural variation? What has been varied in order to expose the essential features of the concept or idea? Are there adequate examples, non examples and what aspects are being varied (and what is not being varied) and for what purpose? What further examples can I provide in order to challenge and support my learners, strategically varying one thing at a time so that the underlying structure of the mathematics is exposed?</p> <p>Look at the Classroom Slides on <u>Curriculum Prioritisation in Primary Mathematics</u> and select the <i>NCETM Primary Mastery Professional Development Materials</i> for further help with this.</p>
Mathematical Thinking	<p><b>Look at the small step overview:</b> What questions are suggested to help support and deepen understanding? What questions can I ask which might encourage learners to connect their learning? <b>Interrogate the slides and workbook:</b> Where are the opportunities to explore the answer as a starting point? How can I maintain the pace of the lesson and offer adequate scaffolding so that the majority of learners access reasoning and problem solving opportunities? - both in direct teaching, guided practice and independent work. How can I model mathematical thinking/curiosity? How can I encourage and guide my learners towards being mathematically curious, ultimately challenging themselves appropriately?</p> <p>Look at the Classroom Slides on <u>Curriculum Prioritisation in Primary Mathematics</u> and select the <i>NCETM Primary Mastery Professional Development Materials</i> for further help with this.</p>
Fluency	<p><b>Interrogate the slides and workbook:</b> How do the fluency tasks promote mathematical thinking without abandoning procedural fluency? What opportunities can I create to develop fluency outside of the lesson? What strategies can I remind/guide the learners to utilise in order to develop automaticity, thus drawing the full attention to the concept? Where are learners given opportunities to flexibly move between different contexts and representations of mathematics, to recognise relationships and make connections, and to choose appropriate methods and strategies to solve problems? Have I prepared enough examples of my own to support and challenge learners if necessary?</p>



# MASTERY LESSON DESIGN



Designing Learning



<p>Before the learning, teachers should:</p>	
<ul style="list-style-type: none"> <li>● Interrogate the WRM resources using the Five Big Ideas as a starting point. (See above.)</li> <li>● Watch the video if one of the 5 big ideas is unclear to you.</li> <li>● Use the RTP materials from NCETM to assess learner’s current levels of understanding if unsure. Resequence small steps in response to this, if necessary.</li> <li>● Identify learners who may benefit from pre-teaching of skills, underlying knowledge, vocabulary and schedule this to take place before the lesson or resources that may scaffold their learning.</li> <li>● Use misconceptions from previous lesson to prepare additional resources.</li> <li>● Locate and prepare equipment so that there is enough for all learners to access. The manipulatives should reflect what is used in the WRM slides and workbook as closely as possible.</li> <li>● Identify learners who could potentially move at a faster pace through direct teaching/guided/independent. How could the suggested tasks be adjusted to meet their needs/deepen their mathematical thinking?</li> <li>● Identify learners who may need to spend more time practising and rehearsing before working independently. Prepare further examples and models to help secure their learning, varying the examples carefully.</li> <li>● Prepare sentences stems, vocabulary and big ideas for TAs.</li> </ul>	
<p>During the Early stages of learning...</p>	
<p>Teachers should:</p> <ul style="list-style-type: none"> <li>● Use carefully chosen questions/models to connect new content to previous learning</li> <li>● Revisit and connect to: Last lesson, last week, last term, last year</li> <li>● Observe - listen - assess</li> <li>● Give immediate feedback</li> <li>● Revisit tricky areas or misconceptions from previous step of learning</li> </ul>	<p>Learners should:</p> <ul style="list-style-type: none"> <li>● Independently complete enough work to establish a secure starting point for new learning</li> <li>● Use resources available to them</li> <li>● Rehearse vocabulary</li> </ul>

During the Instructional stage of learning...	
<p>Teachers should:</p> <ul style="list-style-type: none"> <li>● Limit talk</li> <li>● Encourage learners to describe what they notice - similarities/differences, using a maths 'lens'</li> <li>● Identify learners to use in demonstrations/to model</li> <li>● Teach/model - CPA</li> <li>● Reinforce on separate whiteboard if necessary</li> <li>● Challenge/support</li> <li>● Secure connections by guiding the learner through varied practice</li> <li>● Check for understanding</li> <li>● Challenge misconceptions</li> <li>● Model vocabulary/sentence stems - lead rehearsal of language - expect accurate use of precise mathematical language</li> <li>● Promote discussion between learners to further develop ideas</li> <li>● Model mathematical thinking - pose possible questions to deepen learner's understanding</li> <li>● Use the answer as the starting point - extract reasoning from learners</li> </ul>	<p>Learners should:</p> <ul style="list-style-type: none"> <li>● Use mathematical talk to share, develop and deepen ideas</li> <li>● Identify opportunities to use previous learning and start articulating/using connections</li> <li>● Use resources available to them to model, extend and support their understanding</li> <li>● Work in pairs or small groups</li> <li>● Work at a pace appropriate for their level of understanding, revisiting concepts where necessary or deepening their knowledge</li> <li>● Rehearse sentences stems and vocabulary at every available opportunity</li> <li>● Provide reasoning, articulating and justifying using precise mathematical language</li> <li>● Explore ways to challenge themselves or move their learning forward</li> </ul>
During Guided/Independent practice...	
<p>Teachers should:</p> <ul style="list-style-type: none"> <li>● Move between guided and instructional phases as and when necessary for whole class or small groups or individuals</li> <li>● Reinforce key messages/sentence stems/vocabulary</li> <li>● Make decisions/judgements</li> <li>● Offer alternative representations/review the varied practice to gain clarity for less confident learners</li> <li>● Listen for and acknowledge precise mathematical vocabulary</li> </ul>	<p>Learners should:</p> <ul style="list-style-type: none"> <li>● Practise and rehearse with and without manipulatives</li> <li>● Practise and rehearse and secure precise mathematical vocabulary</li> <li>● Grow in confidence, accuracy and curiosity</li> <li>● Work at a pace that is acceptable for their level of understanding</li> <li>● Compare work with and challenge other learners</li> </ul>

<ul style="list-style-type: none"> <li>• Keep pairs, groups fluid</li> <li>• Move learners forward with their learning - encourage mathematical curiosity - pose 'I wonder' theories</li> <li>• Live mark - offer immediate feedback to challenge/support</li> <li>• Identify fluent and permanent learning - be prepared</li> <li>• Remove scaffolds as and when necessary to most children work towards independence and fluency</li> <li>• Praise good learning behaviours</li> </ul>	<ul style="list-style-type: none"> <li>• Respond to adult feedback</li> <li>• Ask questions - check understanding</li> <li>• Make connections and use these to establish automaticity and fluency</li> </ul>
<p>During the reflection stage...</p>	
<p>Teachers should:</p> <ul style="list-style-type: none"> <li>• Guide learners towards identifying the 'take away' learning - the key learning from that lesson</li> <li>• Encourage learners to think about where their learning may lead to next</li> <li>• Step through misconceptions</li> <li>• Share and discuss examples of children extending their own ideas/being mathematically curious</li> <li>• Praise good learning behaviours</li> <li>• Offer feedback - mark - identify tricky areas and unpick these</li> <li>• Display vocabulary/sentence stems for future use</li> </ul>	<p>Learners should:</p> <ul style="list-style-type: none"> <li>• Ask questions</li> <li>• Answer and explain using precise mathematical language</li> <li>• Correct themselves and others using examples and non examples</li> <li>• Challenge others</li> <li>• Mark their own work, completing corrections</li> <li>• Compare answers and discuss the most efficient/accurate methods used</li> </ul>



**Jurassic Maths Hub Teaching for Mastery Statement Principle:**

The intention of teaching for mastery is to give all pupils (including those with SEND) access to equitable classrooms; classrooms where pupils can all participate and be influential, and classrooms where pupils are encouraged and supported to develop a deep connected and sustained understanding of the mathematics being explored.

The following may indicate that a teacher is aiming to provide an environment and experiences in line with teaching for mastery:

- All pupils working on the same focus with different support provided to enable all pupils to access the mathematics independently
- Pupils behaving as mathematicians as part of a mathematics community, including:
  - Making decisions both independently and collaboratively
  - Working flexibly to answer questions, reflecting on the efficiency and simplicity of their chosen methods
  - Making conjectures and generalisations and applying and testing these
  - Having a go, willing to share even when unsure and understanding that this is when learning is taking place
  - Being comfortable with not getting everything 'right', embracing purposeful struggle
  - Talking mathematics by - Articulating their thinking, taking responsibility for asking questions of others to clarify understanding, agreeing and disagreeing and justifying their thinking, responding in full sentences with the intention that everyone understands them
  - Exploring the mathematics guided by the teacher
  - Working and learning collaboratively
- The use of subject-specific vocabulary by all adults and pupils in the school from EYFS onwards
- The use of different, appropriate representations, by both adults and pupils, for making sense of the mathematics (exposing structure) and demonstrating understanding
- The use of questioning to develop understanding
- Books show pupils working on the same mathematics representing their thinking and understanding in different ways (including with diagrams, models, symbols and writing) rather than pupils working through many different examples. This may result in less in the books (especially for younger pupils and pupils with SEND) and no obvious differentiation by task. The most effective way to find out what pupils understand about their mathematics will be to talk them.

Pupils really understand a mathematical concept, idea or technique if they can:

- Describe it in their own words;
- Represent it in a variety of ways (e.g. using concrete materials, pictures and symbols)
- Explain it to someone else;
- Make up their own examples (and non-examples) of it;
- See mathematical connections between it and other facts or ideas;
- Recognise it in new situations and contexts;
- Make use of it in various ways, including in new situations