

## Hayfield Lane Calculation Policy: Multiplication and Division

### Vocabulary

*“Mathematical language is crucial to children’s development of thinking. If children don’t have the vocabulary to talk about division, or perimeters, or numerical difference, they cannot make progress in understanding these areas of mathematical knowledge.”*

Mathematical Vocabulary, DfE 2000

The National Curriculum for Mathematics is very clear that the correct use of mathematical language is central to a meaningful and deep understanding. Having a wide vocabulary of mathematical terminology available is essential for mathematical thinking and reasoning – we think in the same words that we speak. It is not enough for children to simply hear mathematical words; they need to ‘feel’ them in their own mouths. Therefore when introducing new vocabulary, everyone needs to repeat it out loud. It is also essential that new vocabulary is explained carefully and introduced alongside relevant real life contexts, practical resources or pictures so that children really understand.

Teachers need to have high expectations and only accept what is correct.

| ✓           | ✗                 |
|-------------|-------------------|
| ones        | units             |
| is equal to | equals            |
| zero        | oh (the letter O) |

Diagram illustrating multiplication:  $15 \times 2 = 30$

Labels and arrows:

- 15**: multiplicand factor (blue)
- 2**: multiplier factor (green)
- 30**: product (red)
- x**: multiplied by (times) (black)
- =**: is equal to (black)

Additional diagram showing a multiplication table:

|     |            |           |
|-----|------------|-----------|
| 25  | multiplier | } factors |
| x 6 | multiplier |           |
| 150 | product    |           |

Diagram illustrating division:  $182 \div 5 = 36 \text{ r } 2$

Labels and arrows:

- 182**: dividend (blue)
- 5**: divisor (red)
- 36**: quotient (green)
- 2**: remainder (pink)
- ÷**: divided by (black)
- =**: is equal to (black)

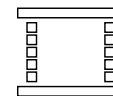
### Key Vocabulary

Equality, inequality, inverse  
 Multiplication, multiply, multiplied by  
 Divide, divided by, divided into  
 Times, lots of, groups of, once, twice  
 Ten times, ... times as (big, long, wide etc)  
 Multiple, double, halve, partition, array  
 Share, share equally, group, equal groups of  
 Product, factor, common factor/multiple,  
 Power of, square/cube/prime numbers  
 Left, left over, remainder

## Hayfield Lane Calculation Policy: Multiplication and Division

Divisor →  $7 \overline{)315}$ 
← Quotient 45  
← Dividend 315  
 -28  
 ---  
 35  
 -35  
 ---  
 0 ← Remainder

An **equation** is a mathematical statement, in symbols, that says two things are equivalent or the same [number sentence] e.g.  $2=10-8$ ,  $9-3=6$ ,  $5=5$



An **inequality** is a mathematical statement that two things are not the same  
 e.g.  $3 < 10 - 9$ ,  $12 - 8 > 2$        $5 > 2$        $2 < 5$



the  
(mainly KS1)



Progression in  
Early Stages

Note: children need a sound understanding of addition (and subtraction) before progressing onto multiplication (and division).

| Strategy                                            | Notes                                                                                                                                          | Representations                                                                                                                                                                                                                                                                      |
|-----------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Linking multiplication to addition through doubling |                                                                                                                                                | Practical resources e.g. Numicon:  ,                                                                                                                                                                                                                                                 |
| Repeated addition of the same number                | Encourage children to read number sentences aloud in different ways e.g. "five times two makes ten", "ten is equal to five multiplied by two". | Begin with mostly pictorial representations:<br>Record this by printing or drawing around Numicon pieces:<br><br><br>How many groups of 2 are there?<br><br>Use real life apparatus to count in repeated groups of the same number e.g.<br><br>How many wheels are there altogether? |

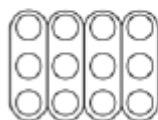
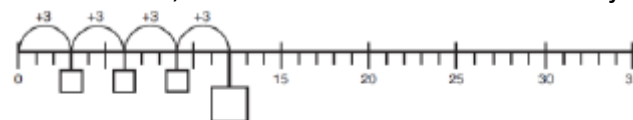
## Hayfield Lane Calculation Policy: Multiplication and Division



$$5 + 5 + 5 + 5 + 5 + 5 + 5 + 5 = \square$$



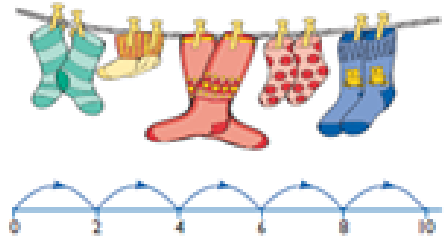
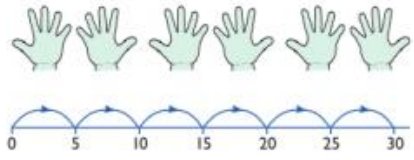
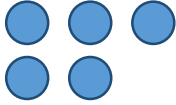
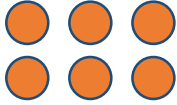
Count in twos, fives and tens aloud and with objects.



$$4 \times 3 = \square$$

Give multiplication problems set in a real life context and encourage children to visualise the problem e.g. How many fingers on two hands? How many sides on three triangles? How many legs on four ducks? Use number stories to communicate this.

## Hayfield Lane Calculation Policy: Multiplication and Division

|                                                              |                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|--------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Combining groups of the same size (repeated addition)</p> | <p>Move from addition sentences to multiplication sentences.</p> <p>Ensure the language matches the picture.</p> | <p>Use physical objects and representations such as the number line alongside each other:</p> <div style="display: flex; align-items: center; justify-content: space-around;">  <div> <math>2 + 2 + 2 + 2 + 2 = 10</math><br/> <math>2 \times 5 = 10</math><br/>                     2 multiplied by 5<br/>                     5 pairs<br/>                     5 hops of 2                 </div> </div> <div style="display: flex; align-items: center; justify-content: space-around; margin-top: 20px;">  <div> <math>5 + 5 + 5 + 5 + 5 + 5 = 30</math><br/> <math>5 \times 6 = 30</math><br/>                     5 multiplied by 6<br/>                     6 groups of 5<br/>                     6 hops of 5                 </div> </div> |
| <p>Represent odd and even numbers</p>                        | <p>Seeing this in different ways will help children understand the pattern in numbers.</p>                       | <p>Use resources e.g. Numicon</p> <p>They can generalise that when counting in 2s all numbers are even<br/>→ link to 2 times table</p> <div style="display: flex; justify-content: space-around; align-items: center; margin-top: 20px;"> <div style="text-align: center;">  <p><i>Odd</i></p> </div> <div style="text-align: center;">  <p><i>Even</i></p> </div> </div>                                                                                                                                                                                                                                                                                                                                                                         |

## Hayfield Lane Calculation Policy: Multiplication and Division

Use arrays to understand multiplication can be done in any order

Multiplication is commutative.

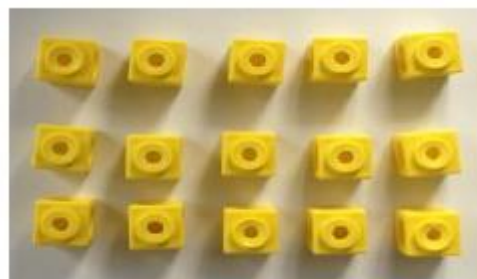
Use of concrete manipulatives and images of familiar objects begin to be organised into arrays.



$$2 \times 4 = 8$$

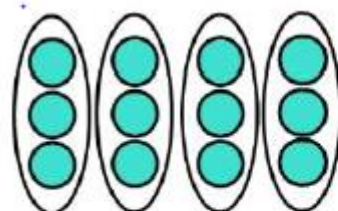


$$4 \times 2 = 8$$

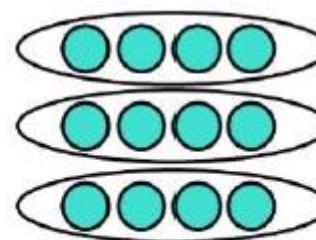


$$3 \times 5 = \square$$

$$5 \times 3 = \square$$



$$12 = 3 \times 4$$

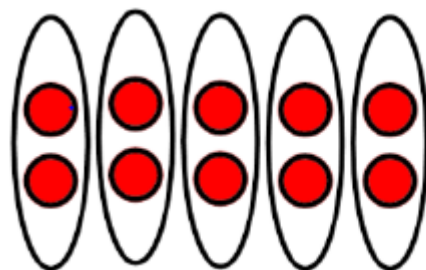
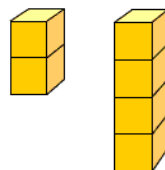


$$12 = 4 \times 3$$

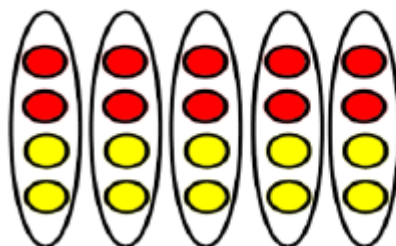
## Hayfield Lane Calculation Policy: Multiplication and Division

Begin to understand multiplication as scaling in terms of double and half

That tower of cubes is double/half the height of the other tower:



$$5 \times 2 = 10$$



$$5 \times 4 = 20$$

Use Cuisenaire and bar models to develop the vocabulary relating to 'times'

e.g. Pick up 4, five times

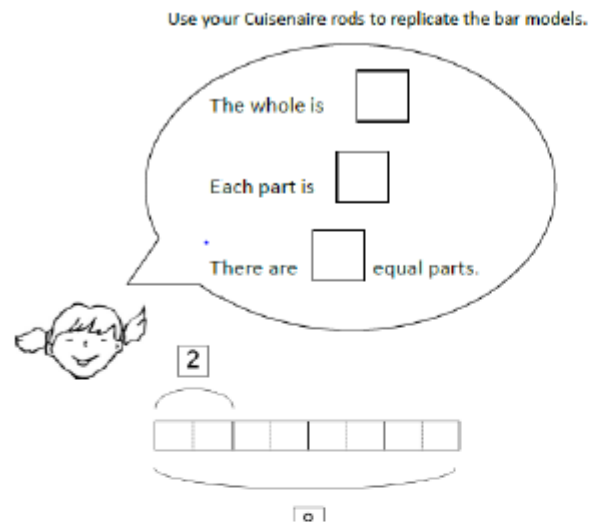


At this stage they double the 2x table facts to derive the 4x table facts.

## Hayfield Lane Calculation Policy: Multiplication and Division

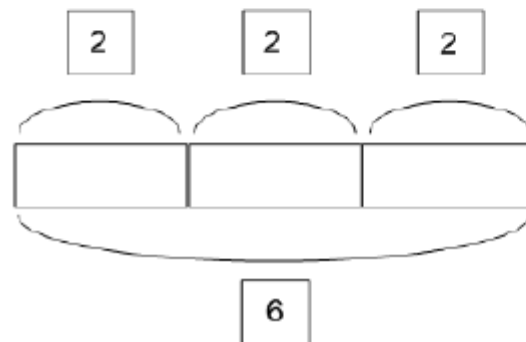
Use of part-part-whole model to establish the inverse relationship between multiplication and division.

This link should be made explicit from early on, using the language of part-part-whole model, so that pupils develop an early understanding of the relationship between multiplication and division. Bar models (with Cuisenaire rods) should only be used to identify the whole, the size of the parts and the number of the parts.



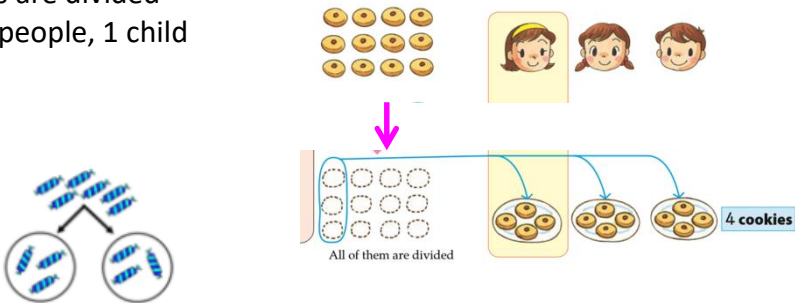
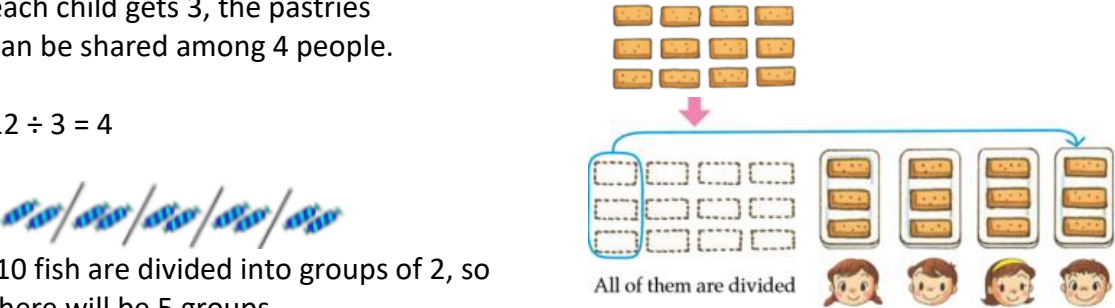
What multiplication and division equations can you write for each bar model?

Prove that the equations are correct using a bead string.



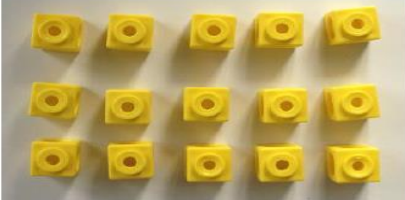
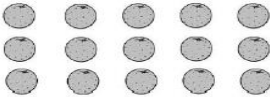
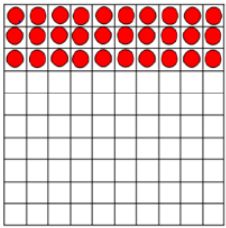
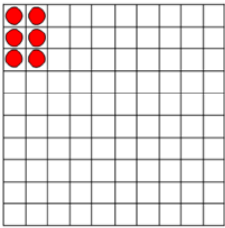
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|                             |                                                               |                                                                                                                                                                                                                                                                                                                     |
|-----------------------------|---------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Division as sharing</p>  | <p>Introduce intuitively with practical problems.</p>         | <p>When 12 cookies are divided evenly among 3 people, 1 child gets 4 cookies.</p> <p><math>12 \div 3 = 4</math></p>  <p>Here, if we have 6 fish and they need to be shared between two plates, each plate would hold 3 fish.</p> |
| <p>Division as grouping</p> | <p>This links to idea of repeated/successive subtraction.</p> | <p>If 12 pastries are divided so each child gets 3, the pastries can be shared among 4 people.</p> <p><math>12 \div 3 = 4</math></p>  <p>10 fish are divided into groups of 2, so there will be 5 groups.</p>                     |



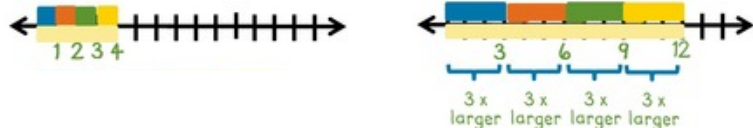
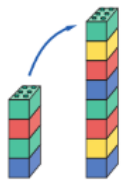
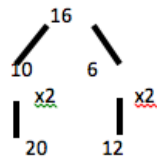
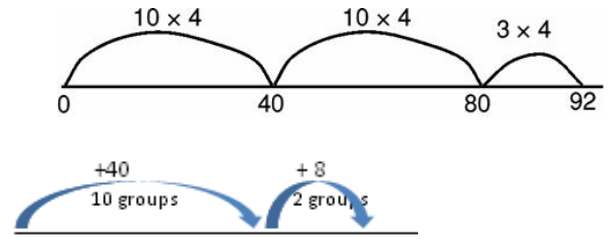
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|-------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|----|---|---|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---|----|---|---|----|---|
| <p>Use part-part-whole model to represent division equations and emphasis the relationship between division and multiplication.</p> | <p>Pupils use arrays of concrete manipulatives and images of familiar objects to find division equations. They begin to use dot arrays as a transition to more abstract concept.</p>                                          | <div style="text-align: center;">  </div> <div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div> <math>15 \div 5 = \boxed{3}</math><br/> <math>15 \div 3 = \boxed{5}</math> </div> <div>  </div> </div> <p style="text-align: center; font-size: small;">Write the division equations that the array represents.</p> <hr style="width: 100%; border: 0.5px solid black;"/> <div style="display: flex; justify-content: space-around; align-items: center;"> <div> <br/> <math>20 \div 4 = \boxed{\phantom{00}}</math> </div> <div> <br/> <math>20 \div 5 = \boxed{\phantom{00}}</math> </div> </div>                                                                                                                                                                                                                                                                                                   |   |    |   |   |                                                                                       |                                                                                       |   |    |   |   |    |   |
| <p>Multiplication of 2 digit numbers with partitioning (no regrouping)</p>                                                          | <p>Children should always consider whether partitioning is the best strategy – if it is possible to use strategies such as doubling (some may use doubling twice for x4) they need to choose the most efficient strategy.</p> | <div style="text-align: center;"> <math>3 \times 12</math><br/> <math>12 = 10 + 2</math> </div> <div style="display: flex; justify-content: space-around; align-items: center;"> <div> <math>3 \times 10</math><br/>  </div> <div> <math>3 \times 2</math><br/>  </div> </div> <p style="text-align: center; font-size: small;">Now add the total number of tens and ones</p> <div style="display: flex; justify-content: space-around; align-items: center; margin-top: 20px;"> <table border="1" style="border-collapse: collapse; text-align: center;"> <tr><td>x</td><td>10</td><td>2</td></tr> <tr><td>3</td><td></td><td></td></tr> </table> <table border="1" style="border-collapse: collapse; text-align: center;"> <tr><td>x</td><td>10</td><td>2</td></tr> <tr><td>3</td><td>30</td><td>6</td></tr> </table> </div> <p style="text-align: center; font-weight: bold; margin-top: 10px;"><math>3 \times 12 = 36</math></p> | x | 10 | 2 | 3 |  |  | x | 10 | 2 | 3 | 30 | 6 |
| x                                                                                                                                   | 10                                                                                                                                                                                                                            | 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |   |    |   |   |                                                                                       |                                                                                       |   |    |   |   |    |   |
| 3                                                                                                                                   |                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |   |    |   |   |                                                                                       |                                                                                       |   |    |   |   |    |   |
| x                                                                                                                                   | 10                                                                                                                                                                                                                            | 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |   |    |   |   |                                                                                       |                                                                                       |   |    |   |   |    |   |
| 3                                                                                                                                   | 30                                                                                                                                                                                                                            | 6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |   |    |   |   |                                                                                       |                                                                                       |   |    |   |   |    |   |

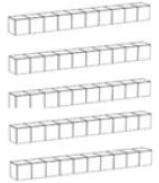
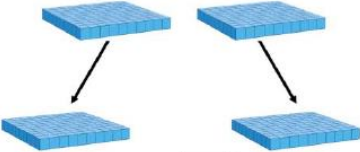
## Hayfield Lane Calculation Policy: Multiplication and Division

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|--------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|----|---|---|--|--|--|----|----|---|----|---|---|----|----|---|----|---|---|--|--|
| <p>Multiplication of a 2 digit number with partitioning (regrouping)</p>                         | <p>Using concrete manipulatives and later moving to using images that represent them will support pupils' early understanding, leading towards formal written method.</p> | <div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="text-align: center;"> <table border="1" style="border-collapse: collapse;"> <tr><td>×</td><td>10</td><td>4</td></tr> <tr><td>3</td><td></td><td></td></tr> <tr><td></td><td>30</td><td>12</td></tr> </table> </div> <div style="text-align: center;"> <table border="1" style="border-collapse: collapse;"> <tr><td>×</td><td>10</td><td>4</td></tr> <tr><td>3</td><td>30</td><td>12</td></tr> </table> </div> <div style="text-align: center;"> <p><math>14 \times 3 = 42</math></p> </div> </div> <div style="text-align: center; margin-top: 20px;"> <table border="1" style="border-collapse: collapse;"> <tr><td>×</td><td>40</td><td>5</td></tr> <tr><td>3</td><td></td><td></td></tr> </table> </div> | × | 10 | 4 | 3 |  |  |  | 30 | 12 | × | 10 | 4 | 3 | 30 | 12 | × | 40 | 5 | 3 |  |  |
| ×                                                                                                | 10                                                                                                                                                                        | 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |   |    |   |   |  |  |  |    |    |   |    |   |   |    |    |   |    |   |   |  |  |
| 3                                                                                                |                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |   |    |   |   |  |  |  |    |    |   |    |   |   |    |    |   |    |   |   |  |  |
|                                                                                                  | 30                                                                                                                                                                        | 12                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |   |    |   |   |  |  |  |    |    |   |    |   |   |    |    |   |    |   |   |  |  |
| ×                                                                                                | 10                                                                                                                                                                        | 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |   |    |   |   |  |  |  |    |    |   |    |   |   |    |    |   |    |   |   |  |  |
| 3                                                                                                | 30                                                                                                                                                                        | 12                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |   |    |   |   |  |  |  |    |    |   |    |   |   |    |    |   |    |   |   |  |  |
| ×                                                                                                | 40                                                                                                                                                                        | 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |   |    |   |   |  |  |  |    |    |   |    |   |   |    |    |   |    |   |   |  |  |
| 3                                                                                                |                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |   |    |   |   |  |  |  |    |    |   |    |   |   |    |    |   |    |   |   |  |  |
| <p>Recall and use times table facts</p>                                                          | <p>Make connections between times tables to help understanding e.g. x5 then x10, x2 then x4</p>                                                                           | <p>Regular counting on and back, in steps of 2, 3, 5 and 10. They count in 3 to support their later understanding of a third.</p> <p>Use a clock face to support understanding of counting in 5s.<br/>Use money to support counting in 2s, 5s, 10s, 20s, 50s.</p> <p>Use doubling to connect 2, 4 and 8 times tables.</p> <div style="text-align: right;"> </div>                                                                                                                                                                                                                                                                                                                                                                                                                                             |   |    |   |   |  |  |  |    |    |   |    |   |   |    |    |   |    |   |   |  |  |
| <p>Calculate mathematical statements for multiplication and division within the times tables</p> | <p>Recognise multiplication and division as inverses through the use of missing number problems.</p>                                                                      | <div style="display: flex; flex-wrap: wrap; justify-content: space-around;"> <div style="margin: 5px;"><math>6 \div 2 = \square</math></div> <div style="margin: 5px;"><math>\square = 6 \div 2</math></div> <div style="margin: 5px;"><math>6 \div \square = 3</math></div> <div style="margin: 5px;"><math>3 = 6 \div \square</math></div> <div style="margin: 5px;"><math>\square \div 2 = 3</math></div> <div style="margin: 5px;"><math>3 = \square \div 2</math></div> <div style="margin: 5px;"><math>\square \div \nabla = 3</math></div> <div style="margin: 5px;"><math>3 = \square \div \nabla</math></div> </div>                                                                                                                                                                                 |   |    |   |   |  |  |  |    |    |   |    |   |   |    |    |   |    |   |   |  |  |

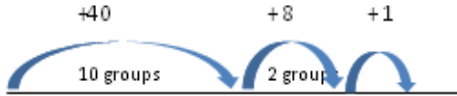
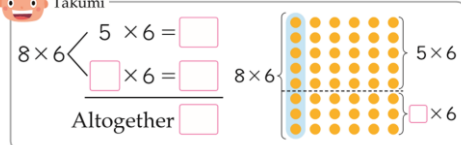
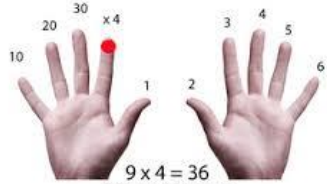
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|----------------------------------------------------|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Develop understanding of multiplication as scaling |  | e.g. 3 times bigger/taller                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Double numbers up to 10 + 10.                      |  |  <p>double 4 is 8<br/><math>4 \times 2 = 8</math></p> <p>Use known doubles to work out doubling two digit numbers<br/>e.g. double 16 = double 10 + double 6</p>                                                                                                                                                                                                                                                       |
| Efficient use of number lines                      |  | <p>Multiplication – using repeated addition of larger amounts e.g. <math>23 \times 4</math></p> <p>Division – Children need to be able to partition the dividend in different ways.<br/>e.g. <math>48 \div 4 = 12</math></p>                                                                                                                                                                                                                                                                            |
| Multiply and divide by 10, 100 and 1000            |  | <p><math>5 \times 1 = 5</math> </p> <p><math>5 \times 10 = 50</math> </p> <p><math>3 \times 1 = 3</math> </p> <p><math>3 \times 100 = 300</math> </p>  |

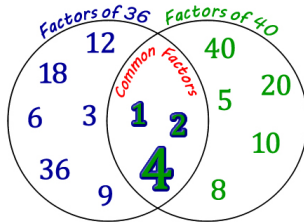
## Hayfield Lane Calculation Policy: Multiplication and Division

|                                                                                            |                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|--------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Use known facts for multiplying by multiples of 10, 100 and 100</p>                     | <p>Pupils' growing understanding of place value allows them to make use of known facts to derive multiplications using powers of 10. Use tables they are familiar with from their year group to show this.</p> | <div style="display: flex; flex-direction: column; align-items: flex-start;"> <div style="margin-bottom: 10px;"> <math>5 = 1 \times 5</math>  </div> <div style="margin-bottom: 10px;"> <math>50 = 10 \times 5</math>  </div> <div style="margin-bottom: 10px;"> <math>500 = 100 \times 5</math>  </div> <div style="margin-bottom: 10px;"> <math>5000 = 1000 \times 5</math>  </div> <div style="margin-bottom: 10px;"> <div style="display: flex; justify-content: space-around; width: 100%;"> <div> <math>3 \times 2 = 6</math>  </div> <div> <math>30 \times 2 = 60</math>  </div> <div> <math>300 \times 2 = 600</math>  </div> <div> <math>3000 \times 2 = 6000</math>  </div> </div> </div> </div> |
| <p>Division by partitioning and sharing into equal groups with no regrouping required.</p> | <p>Pupils apply the skills of sharing into equal groups; dividing 2 digit numbers by 3, 4 and 5. They should be encouraged to 'halve' rather than divide by 2.</p>                                             | <div style="display: flex; flex-direction: column; align-items: flex-start;"> <div style="margin-bottom: 20px;"> <math>50 \div 10 = \square</math>  </div> <div>  <div style="margin-top: 10px;"> <math>200 \div 100 = \square</math> </div> </div> </div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <p>Introduce remainders</p>                                                                | <p>Express results in different ways according to the context, including with remainders, as</p>                                                                                                               | <p><b><math>49 \div 4 = 12 \text{ r}1</math></b></p> <p>Sharing – 49 shared between 4. How many left over?</p> <p>Grouping – How many 4s make 49? Left over?</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

## Hayfield Lane Calculation Policy: Multiplication and Division

|                                                             |                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-------------------------------------------------------------|---------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                             | fractions, as decimals or by rounding e.g. $98 \div 4 = 24 \text{ r } 2 = 24.5 \approx 25$        |  <p>Give opportunities to solve grouping and sharing problems practically (including where there is a remainder but the answer needs to be given as a whole number) e.g. pencils are sold in packs of 10.</p> <p>How many packs will I need to buy for 24 children?</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Further develop understanding of division to find fractions |                                                                                                   | <p>Use children's intuition to support understanding of fractions as an answer to a sharing problem</p> <p>e.g. 3 apples shared between 4 people = <math>\frac{3}{4}</math></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Develop fluency with times tables up to $12 \times 12$      | Pupils use multiplication and division as inverses to support the introduction of ratio in Year 6 | <p>Develop efficient mental methods:</p> <ul style="list-style-type: none"> <li>- commutativity and associativity e.g. <math>4 \times 12 \times 5 = 4 \times 5 \times 12 = 20 \times 12 = 240</math></li> <li>- distributivity e.g. <math>39 \times 7 = 30 \times 7 + 9 \times 7 \rightarrow</math></li> <li>- derive related facts e.g. <math>3 \times 2 = 6</math>, <math>6 \div 3 = 2</math> so <math>30 \times 2 = 60</math>, <math>60 \div 3 = 20</math></li> <li>- make connections e.g. <math>\times 12</math> is double <math>\times 6</math> which is double <math>\times 3</math></li> </ul> <p>Use the context of a week and a calendar to support the 7 times table (e.g. how many days in 5 weeks?).</p> <p>Use of finger strategy for 9 times table.</p> <div style="text-align: right;">  <p>Takumi</p> <p><math>8 \times 6</math></p> <p><math>5 \times 6 = \square</math></p> <p><math>\square \times 6 = \square</math></p> <p>Altogether <math>\square</math></p> <p><math>8 \times 6 = \square</math></p> <p><math>5 \times 6</math></p> <p><math>\square \times 6</math></p> </div> <div style="text-align: right;">  <p><math>9 \times 4 = 36</math></p> <p>Fold your 4th finger down.</p> <p>The fingers before are tens and after are ones.</p> </div> |

## Hayfield Lane Calculation Policy: Multiplication and Division

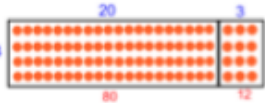
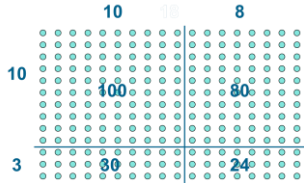
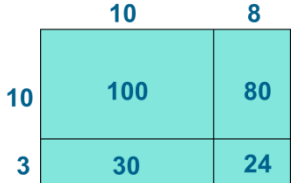
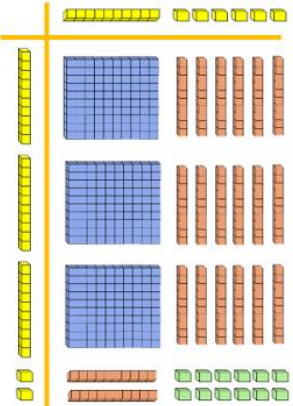
|                                                                                    |                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|------------------------------------------------------------------------------------|---------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Find common multiples and factors; square numbers and cube numbers; prime numbers  | Common factors can be related to finding equivalent fractions | <div style="display: flex; align-items: center; justify-content: center;">  <div style="margin-left: 20px;"> <p>4            <math>2^2</math> or <math>2 \times 2 = 4</math></p> <p>9            <math>3^2</math> or <math>3 \times 3 = 9</math></p> <p>16            <math>4^2</math> or <math>4 \times 4 = 16</math></p> </div> </div> <p style="text-align: center;">GREATEST Common Factor of 36 and 40 = 4</p> |
| Use the knowledge of the order of operations to calculate with the four operations |                                                               | <p>Children should experiment with order of operations, investigating the effect of positioning the brackets in different places, e.g. <math>20 - 5 \times 3 = 5</math>; <math>(20 - 5) \times 3 = 45</math></p> <div style="text-align: center;"> <p><b>BODMAS</b></p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <p>Brackets</p> <p>↓</p> </div> <div style="text-align: center;"> <p>Orders</p> <p>↓</p> </div> <div style="text-align: center;"> <p>Division or Multiplication</p> <p>↓</p> </div> <div style="text-align: center;"> <p>Addition or Subtraction</p> <p>↓</p> </div> </div> </div>                                                                                  |

## Hayfield Lane Calculation Policy: Multiplication and Division

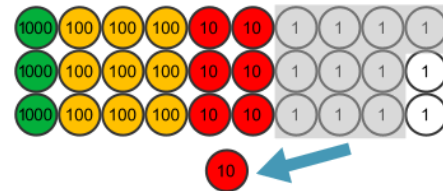
### Progression to Formal Methods of Multiplication (mainly Year 3 to Year 6)

Note: Each year the range of numbers to calculate with is extended. Every time, work through the complete sequence described below to ensure children have a deep understanding of *why* the algorithms work, not simply *how* to do them. This ensures children can apply the strategies in unfamiliar problems and increases their accuracy and reliability. For example, when teaching how to multiply decimals, start at step 1, don't just jump straight for the traditional written method and hope children make the connection with their earlier learning.

*See Appendix A: Building up to Written Multiplication*

| Strategy                           | Notes                                                                                                               | Representations                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                          |
|------------------------------------|---------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Step 1: Partition numbers visually | Lots of practice with physical objects at each level of difficulty is important to ensure conceptual understanding. | <p>Introduce by finding the number of counters in a regular array e.g. <math>23 \times 4 = 92</math><br/> <math>18 \times 13 = 234</math></p>   <p>Progression to a model that uses the 'area of a rectangle'.</p> <p>Children to draw the rectangles.</p> <p>Often called 'Grid method' e.g. <math>23 \times 4 = 92</math></p>   | <p>Place value model:</p> <p><math>32 \times 16</math></p>  <p><math>300 + 200 + 12 = 512</math></p> |

## Hayfield Lane Calculation Policy: Multiplication and Division

| Strategy                        | Notes                                                                                 | Representations                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                      |    |   |   |    |  |   |   |   |   |   |  |  |  |   |  |   |   |   |   |  |  |  |   |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |   |   |  |  |  |   |   |   |  |  |  |   |   |   |  |  |  |  |   |   |  |  |  |   |   |   |  |  |
|---------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|---|---|----|--|---|---|---|---|---|--|--|--|---|--|---|---|---|---|--|--|--|---|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|---|---|--|--|--|---|---|---|--|--|--|---|---|---|--|--|--|--|---|---|--|--|--|---|---|---|--|--|
| Step 2: Place Value Counters    |                                                                                       | <div>Without exchanging<br/>e.g. <math>1323 \times 3</math> – make 3 lots of 1323</div> <div></div>                                                                                                                                     | <div>With exchanging<br/>e.g. <math>1324 \times 3</math> – make 3 lots of 1324</div> <div></div> <div>Exchange/trade/swap ten 1s for one 10</div> |    |   |   |    |  |   |   |   |   |   |  |  |  |   |  |   |   |   |   |  |  |  |   |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |   |   |  |  |  |   |   |   |  |  |  |   |   |   |  |  |  |  |   |   |  |  |  |   |   |   |  |  |
| Step 3: Expanded Written Method | Compare side by side with pictorial representations – what is the same and different? | <div><math display="block">\begin{array}{r} 234 \\ \times 7 \\ \hline 28 \text{ (4 x 7)} \\ 210 \text{ (30 x 7)} \\ 1400 \text{ (200 x 7)} \\ \hline 1638 \end{array}</math></div>                                                                                                                                        | <div><math display="block">\begin{array}{r} 653 \\ \times 7 \\ \hline 3 \times 7 = 21 \\ 50 \times 7 = 350 \\ + 600 \times 7 = 4200 \\ \hline 4571 \end{array}</math></div>                                                          |    |   |   |    |  |   |   |   |   |   |  |  |  |   |  |   |   |   |   |  |  |  |   |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |   |   |  |  |  |   |   |   |  |  |  |   |   |   |  |  |  |  |   |   |  |  |  |   |   |   |  |  |
| Step 4: Compact Written Method  |                                                                                       | <div><table><tr><td></td><td>Th</td><td>H</td><td>T</td><td>1s</td></tr><tr><td></td><td>1</td><td>3</td><td>2</td><td>4</td></tr><tr><td>x</td><td></td><td></td><td></td><td>3</td></tr><tr><td></td><td>3</td><td>9</td><td>7</td><td>2</td></tr><tr><td></td><td></td><td></td><td>1</td><td></td></tr></table></div> |                                                                                                                                                                                                                                      | Th | H | T | 1s |  | 1 | 3 | 2 | 4 | x |  |  |  | 3 |  | 3 | 9 | 7 | 2 |  |  |  | 1 |  | <div><table><tr><td></td><td></td><td>1</td><td>8</td><td></td><td></td></tr><tr><td></td><td>x</td><td>1</td><td>3</td><td></td><td></td></tr><tr><td></td><td>1</td><td>8</td><td>0</td><td></td><td></td></tr><tr><td></td><td></td><td>5</td><td>4</td><td></td><td></td></tr><tr><td></td><td>2</td><td>3</td><td>4</td><td></td><td></td></tr></table></div> <div><math display="block">\begin{array}{r} \phantom{0}2\phantom{0}3\phantom{0}1 \\ 1342 \\ \times 18 \\ \hline 13420 \\ 10736 \\ \hline 24156 \end{array}</math></div> |  |  | 1 | 8 |  |  |  | x | 1 | 3 |  |  |  | 1 | 8 | 0 |  |  |  |  | 5 | 4 |  |  |  | 2 | 3 | 4 |  |  |
|                                 | Th                                                                                    | H                                                                                                                                                                                                                                                                                                                         | T                                                                                                                                                                                                                                    | 1s |   |   |    |  |   |   |   |   |   |  |  |  |   |  |   |   |   |   |  |  |  |   |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |   |   |  |  |  |   |   |   |  |  |  |   |   |   |  |  |  |  |   |   |  |  |  |   |   |   |  |  |
|                                 | 1                                                                                     | 3                                                                                                                                                                                                                                                                                                                         | 2                                                                                                                                                                                                                                    | 4  |   |   |    |  |   |   |   |   |   |  |  |  |   |  |   |   |   |   |  |  |  |   |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |   |   |  |  |  |   |   |   |  |  |  |   |   |   |  |  |  |  |   |   |  |  |  |   |   |   |  |  |
| x                               |                                                                                       |                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                      | 3  |   |   |    |  |   |   |   |   |   |  |  |  |   |  |   |   |   |   |  |  |  |   |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |   |   |  |  |  |   |   |   |  |  |  |   |   |   |  |  |  |  |   |   |  |  |  |   |   |   |  |  |
|                                 | 3                                                                                     | 9                                                                                                                                                                                                                                                                                                                         | 7                                                                                                                                                                                                                                    | 2  |   |   |    |  |   |   |   |   |   |  |  |  |   |  |   |   |   |   |  |  |  |   |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |   |   |  |  |  |   |   |   |  |  |  |   |   |   |  |  |  |  |   |   |  |  |  |   |   |   |  |  |
|                                 |                                                                                       |                                                                                                                                                                                                                                                                                                                           | 1                                                                                                                                                                                                                                    |    |   |   |    |  |   |   |   |   |   |  |  |  |   |  |   |   |   |   |  |  |  |   |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |   |   |  |  |  |   |   |   |  |  |  |   |   |   |  |  |  |  |   |   |  |  |  |   |   |   |  |  |
|                                 |                                                                                       | 1                                                                                                                                                                                                                                                                                                                         | 8                                                                                                                                                                                                                                    |    |   |   |    |  |   |   |   |   |   |  |  |  |   |  |   |   |   |   |  |  |  |   |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |   |   |  |  |  |   |   |   |  |  |  |   |   |   |  |  |  |  |   |   |  |  |  |   |   |   |  |  |
|                                 | x                                                                                     | 1                                                                                                                                                                                                                                                                                                                         | 3                                                                                                                                                                                                                                    |    |   |   |    |  |   |   |   |   |   |  |  |  |   |  |   |   |   |   |  |  |  |   |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |   |   |  |  |  |   |   |   |  |  |  |   |   |   |  |  |  |  |   |   |  |  |  |   |   |   |  |  |
|                                 | 1                                                                                     | 8                                                                                                                                                                                                                                                                                                                         | 0                                                                                                                                                                                                                                    |    |   |   |    |  |   |   |   |   |   |  |  |  |   |  |   |   |   |   |  |  |  |   |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |   |   |  |  |  |   |   |   |  |  |  |   |   |   |  |  |  |  |   |   |  |  |  |   |   |   |  |  |
|                                 |                                                                                       | 5                                                                                                                                                                                                                                                                                                                         | 4                                                                                                                                                                                                                                    |    |   |   |    |  |   |   |   |   |   |  |  |  |   |  |   |   |   |   |  |  |  |   |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |   |   |  |  |  |   |   |   |  |  |  |   |   |   |  |  |  |  |   |   |  |  |  |   |   |   |  |  |
|                                 | 2                                                                                     | 3                                                                                                                                                                                                                                                                                                                         | 4                                                                                                                                                                                                                                    |    |   |   |    |  |   |   |   |   |   |  |  |  |   |  |   |   |   |   |  |  |  |   |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |   |   |  |  |  |   |   |   |  |  |  |   |   |   |  |  |  |  |   |   |  |  |  |   |   |   |  |  |

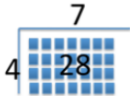
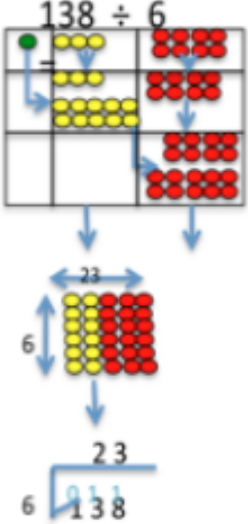


## Hayfield Lane Calculation Policy: Multiplication and Division

### Progression to Formal Methods of Division (mainly Year 4 to Year 6)

Note: Each year the range of numbers to calculate with is extended. Every time, work through the complete sequence described below to ensure children have a deep understanding of *why* the algorithms work, not simply *how* to do them. This ensures children can apply the strategies in unfamiliar problems and increases their accuracy and reliability. For example, when teaching how to divide decimals, start at step 1, don't just jump straight for the traditional written method and hope children make the connection with their earlier learning.

*See Appendix B: Building up to Written Division*

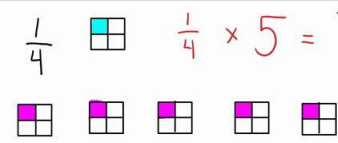
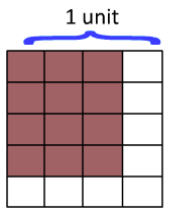
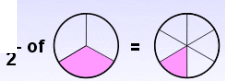
| Strategy                           | Notes | Representations                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|------------------------------------|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Step 1: Partition numbers visually |       | <p>Introduce division as an array – physically create the array and draw the bus stop around it</p> <div style="display: flex; align-items: center; gap: 20px;">   </div>                                                                                                                                                                                                                                         |
| Step 2: Place Value Counters       |       | <p>Use place value counters to demonstrate what is going on. e.g. exchanging:</p> <div style="display: flex; align-items: center; gap: 20px;"> <div style="text-align: center;"> <math display="block">\begin{array}{r} 112 \\ 3 \overline{) 336} \end{array}</math>  </div> <div style="text-align: center;"> <math display="block">\begin{array}{r} 23 \\ 6 \overline{) 138} \end{array}</math>  </div> </div> |

## Hayfield Lane Calculation Policy: Multiplication and Division

| Strategy                                          | Notes                                                                                                                                                                                                                    | Representations                                                                                             |                         |
|---------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|-------------------------|
| Step 3: Expanded Written Method – “Long Division” | Compare side by side with pictorial representations – what is the same and different?                                                                                                                                    | <div>Divide: </div> <div>Multiply: </div> <div>Subtract: </div> <div>Bring Down: </div> <div>Repeat: </div> | <div></div> <div></div> |
| Step 4: Compact Written Method – “Short Division” | Formal short division should only be introduced once children have a good understanding of division, its links with multiplication and the idea of ‘chunking up’ to find a target number (see use of number lines above) |                                                                                                             |                         |

## Hayfield Lane Calculation Policy: Multiplication and Division

### Multiplying and Dividing Fractions (mainly Year 5 and Year 6)

| Strategy                                                     | Notes                                                                                        | Representations                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------------------------------------------------|----------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Multiply proper fractions and mixed numbers by whole numbers | Use bar models and other images to support conceptual understanding before introducing rules | $5 \times \frac{4}{5}$ 5 groups of $\frac{4}{5}$<br><br>$\frac{4}{5} + \frac{4}{5} + \frac{4}{5} + \frac{4}{5} + \frac{4}{5} = \frac{20}{5}$<br><br>$1 \frac{1}{4} \times 3 = \frac{5}{4} \times \frac{3}{1} = \frac{15}{4} = 3 \frac{3}{4}$                                                                                      |
| Associate a fraction with division                           |                                                                                              | <p>Explain how much pizza each person would get if they divided 4 pizzas between 5 people:</p> <p>4 divided by 5 = <math>\frac{4}{5}</math> = 0.8</p>                                                                                                                                                                                                                                                                                                                                                  |
| Multiply two simple fractions together                       |                                                                                              | $\frac{4}{5} \times \frac{3}{4}$<br><br>1 unit: $\frac{1}{2} \times \frac{1}{3} = \frac{1 \times 1}{2 \times 3} = \frac{1}{6}$<br><br>Across the top, shade in 4 out of 5.<br>Vertically shade in 3 out of 4.<br>Then diagram shows the product: $\frac{12}{20}$ total number of spaces is denominator and shaded is numerator |
| Divide proper fractions by whole numbers                     |                                                                                              | <p>Ronald and Jamie have <math>\frac{1}{2}</math> candy bar. If <math>\frac{1}{2}</math> a candy bar is split into 2 pieces, what is the size of each piece?</p> <p><math>\frac{1}{2} \div 2 = \frac{1}{4}</math> </p> <p>Use 'what do you notice' type questioning to elicit that <math>\frac{1}{4} \div 2 = \frac{1}{4} \times \frac{1}{2}</math></p>                                                           |

## Hayfield Lane Calculation Policy: Multiplication and Division

### National Curriculum Progression: Multiplication and Division

*Taken from the NCETM*

|                                                  | Year 1                                                                      | Year 2                                                                                                                                                                                                                                                                                     | Year 3                                                                                                                                                                                                                                               | Year 4                                                                                                                                                                           | Year 5                                                                                                                                                                                                                                                                                                                     | Year 6                                                                                                                                                                           |
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| <b>Understanding multiplication and division</b> |                                                                             |                                                                                                                                                                                                                                                                                            | <i>Choose an appropriate strategy to solve a calculation based upon the numbers involved (recall a known or related fact, calculate mentally, use a jotting, written method)</i>                                                                     | <i>Choose an appropriate strategy to solve a calculation based upon the numbers involved (recall a known or related fact, calculate mentally, use a jotting, written method)</i> | <i>Choose an appropriate strategy to solve a calculation based upon the numbers involved (recall a known or related fact, calculate mentally, use a jotting, written method)</i>                                                                                                                                           | <i>Choose an appropriate strategy to solve a calculation based upon the numbers involved (recall a known or related fact, calculate mentally, use a jotting, written method)</i> |
|                                                  |                                                                             | <i>Understand multiplication as repeated addition<br/>Understand division as sharing and grouping and that a division calculation can have a remainder<br/>Show that multiplication of two numbers can be done in any order (commutative) and division of one number by another cannot</i> | <i>Understand that division is the inverse of multiplication and vice versa<br/>Understand how multiplication and division statements can be represented using arrays<br/>Understand division as sharing and grouping and use each appropriately</i> | <i>Recognise and use factor pairs and commutativity in mental calculations</i>                                                                                                   | <i>Identify multiples and factors, including finding all factor pairs of a number, and common factors of two numbers</i>                                                                                                                                                                                                   |                                                                                                                                                                                  |
| <b>Multiplication and division facts</b>         |                                                                             | <i>Recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers</i>                                                                                                                                              | <i>Recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables</i>                                                                                                                                                     | <i>Recall multiplication and division facts for multiplication tables up to <math>12 \times 12</math></i>                                                                        | <i>Know and use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers<br/>Establish whether a number up to 100 is prime and recall prime numbers up to 19<br/>Recognise and use square numbers and cube numbers, and the notation for squared (<math>^2</math>) and cubed (<math>^3</math>)</i> | <i>Identify common factors, common multiples and prime numbers</i>                                                                                                               |
|                                                  | <i>Recall and use doubles of all numbers to 10 and corresponding halves</i> | <i>Derive and use doubles of simple two-digit numbers</i>                                                                                                                                                                                                                                  | <i>Derive and use doubles of all numbers to 100 and corresponding halves</i>                                                                                                                                                                         | <i>Use partitioning to double or halve any number, including</i>                                                                                                                 | <i>Use partitioning to double or halve any number, including</i>                                                                                                                                                                                                                                                           | <i>Use partitioning to double or halve any number</i>                                                                                                                            |

## Hayfield Lane Calculation Policy: Multiplication and Division

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|                                             |                                                                                                         | <i>(numbers in which the ones total less than 10)</i><br><i>Derive and use halves of simple two-digit even numbers (numbers in which the tens are even)</i>                                                                          | <i>Derive and use doubles of all multiples of 50 to 500</i>                                                                                                                                                   | <i>decimals to one decimal place</i>                                                                                                                                        | <i>decimals to two decimal places</i>                                                                                                                                                             |                                                                                                                                                                                                                                                                      |
| <b>Mental methods</b>                       |                                                                                                         | Calculate mathematical statements for multiplication ( <i>using repeated addition</i> ) and division within the multiplication tables and write them using the multiplication ( $\times$ ), division ( $\div$ ) and equals (=) signs | 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 methods     | Use place value, known and derived facts to multiply and divide mentally, including:<br>- multiplying by 0 and 1<br>- dividing by 1<br>- multiplying together three numbers | Multiply and divide numbers mentally drawing upon known facts<br>Solve problems involving multiplication and division including using their knowledge of factors and multiples, squares and cubes | Perform mental calculations, including with mixed operations and large numbers                                                                                                                                                                                       |
| <b>Written methods</b>                      | <i>*Written methods are informal at this stage – see mental methods for expectation of calculations</i> | <i>*Written methods are informal at this stage – see mental methods for expectation of calculations</i>                                                                                                                              | Write and calculate mathematical statements for multiplication using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, progressing to formal written methods | Multiply two-digit and three-digit numbers by a one-digit number using formal written layout                                                                                | 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 multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication<br><br>Multiply one-digit numbers with up to two decimal places by whole numbers                                                      |
|                                             |                                                                                                         |                                                                                                                                                                                                                                      | Write and calculate mathematical statements for division using the multiplication tables that they know, including for two-digit numbers divided by one-digit numbers, progressing to formal written methods  | <i>Divide numbers up to 3 digits by a one-digit number using the formal written method of short division and interpret remainders appropriately for the context</i>         | Divide numbers up to 4 digits by a one-digit number using the formal written method of short division and interpret remainders appropriately for the context                                      | 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<br><br>Use written division methods in cases where the answer has up to two decimal places |
| <b>Estimating and checking calculations</b> |                                                                                                         |                                                                                                                                                                                                                                      | <i>Use estimation to check answers to calculations and determine, in the context of</i>                                                                                                                       | <i>Use estimation and inverse to check answers to calculations and determine, in the context</i>                                                                            | <i>Use estimation and inverse to check answers to calculations and determine,</i>                                                                                                                 | <i>Use estimation and inverse to check answers to calculations and determine,</i>                                                                                                                                                                                    |

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|                                                                                          |                                                                                                                                                                                       |                                                                                                                                                                                                                                    | <i>a problem, an appropriate degree of accuracy</i>                                                                                                                                                                                                    | <i>of a problem, an appropriate degree of accuracy</i>                                                                                                                                                                                                                                           | <i>in the context of a problem, an appropriate degree of accuracy</i>                                                                                                                                                                                                                                 | in the context of a problem, an appropriate degree of accuracy                                         |
| <b>Order of operations</b>                                                               |                                                                                                                                                                                       |                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                       | Use their knowledge of the order of operations to carry out calculations involving the four operations |
| <b>Solving multiplication and division problems including those with missing numbers</b> | Solve one-step problems involving multiplication and division, by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher | Solve problems involving multiplication and division ( <i>including those with remainders</i> ), using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts | Solve problems, including missing number problems, involving multiplication and division ( <i>and interpreting remainders</i> ), including positive integer scaling problems and correspondence problems in which n objects are connected to m objects | Solve problems involving multiplying and adding, including using the distributive law to multiply two digit numbers by one digit, <i>division (including interpreting remainders)</i> , integer scaling problems and harder correspondence problems such as n objects are connected to m objects | Solve problems involving addition, subtraction, multiplication and division and a combination of these, including understanding the meaning of the equals sign<br><br>Solve problems involving multiplication and division, including scaling by simple fractions and problems involving simple rates | Solve problems involving addition, subtraction, multiplication and division                            |