Hampshire Services
HIAS SCHOOL IMPROVEMENT

HIAS MOODLE+ RESOURCE

# HIAS Progression in Calculation

## Multiplication and Division

Hampshire Maths Team
September 2023
Final version



Hampshire County Council

www.hants.gov.uk

# Overview

**This document gives a suggested guidance as to how calculation strategies may be taught in all year groups showing clear progression from Year 1 to Year 6.**

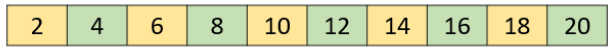
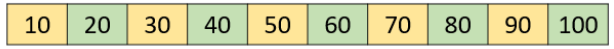
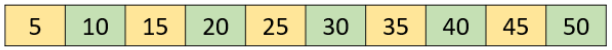
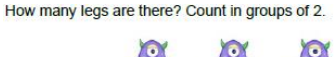
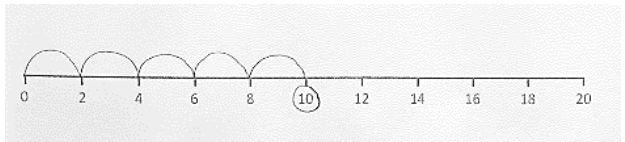
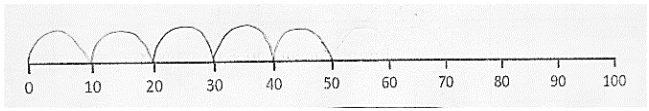
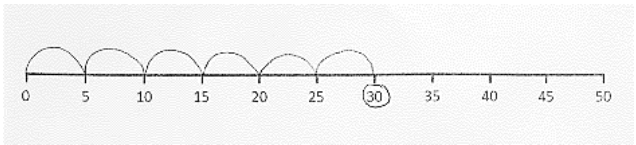
**Points to consider when using this resource:**
Teachers should use this resource flexibly to meet the needs of individual pupils. Teachers should be familiar with previous year groups and ensure that children are secure with concepts and strategies before moving on. Reference has been made to the National Curriculum when developing this resource and the progression within the Big Ideas provided by the NCETM. This resource works alongside Hampshire Schemes of Learning Unit plans but can also complement a blocked curriculum approach.

This document focuses upon progression in the formal calculation strategies. Manipulatives and visual representations should be used alongside the more formal recording of a strategy to ensure pupils develop both a conceptual and procedural understanding of a mathematical concept. Further details of multi-representations to support conceptual understanding/ mental fluency are detailed in the unit plans referred to within this document.

# Multiplication – Year 1

| **Selected National Curriculum Programme of Study Statements**<br>Pupils should be taught to:<br>• count in multiples of twos, fives and tens.<br>• 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. | **The Big Ideas (NCETM)**<br>Counting in steps of equal sizes is based on the big idea of 'unitising'; treating a group of, say, five objects as one unit of five.<br>Working with arrays helps pupils to become aware of the commutative property of multiplication, that 2 × 5 is equivalent to 5 × 2 |
|---|---|

**Please note that manipulatives and visual representations may be used alongside more formal recording as appropriate. It is important for pupils to explore structure and understand a concept before developing a more procedural approach, at which point all representations may be used alongside each other.**

| Stage 1 | Stage 2 | End of Year Expectation |
|---|---|---|
| **Count in multiples of twos**<br>Number track<br>  | **Count in multiples of tens**<br>Number track<br>  | **Count in multiples of fives**<br>Number track<br>  |
| **Solve one step multiplication, by calculating the answer using pictorial representations (twos)**<br>Structured number line, e.g:<br>  <br>  | **Solve one step multiplication, by calculating the answer using pictorial representations (tens).**<br>Structured number line, e.g:<br>*There are 10 crayons in a box.*<br>*How many crayons will I have if I buy 5 boxes?*<br>  | **Solve one step multiplication, by calculating the answer using pictorial representations (fives).**<br>Structured number line, e.g:<br>  <br>  |

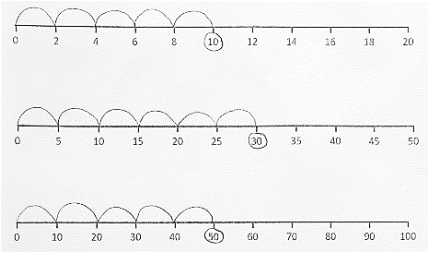
# Multiplication – Year 2

| **Selected National Curriculum Programme of Study Statements**<br>Pupils should be taught to:<br>• count in steps of two, three, and five from 0, and in tens from any number, forward and backward.<br>• recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers.<br>• solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in context. | **The Big Idea (NCETM)**<br>It is important that pupils both commit multiplication facts to memory and also develop an understanding of conceptual relationships. This will aid them in using known facts to work out unknown facts and in solving problems.<br>Pupils should look for and recognise patterns within tables and connections between them (e.g. 5× is half of 10×).<br>Pupils should recognise multiplication and division as inverse operations and use this knowledge to solve problems. They should also recognise division as both grouping and sharing. |
|---|---|

**Please note that manipulatives and visual representations may be used alongside more formal recording as appropriate. It is important for pupils to explore structure and understand a concept before developing a more procedural approach, at which point all representations may be used alongside each other.**

## Stage 1

**Count in steps of two, five from 0 and in tens from any number, forward and backward.**
Structured number line.



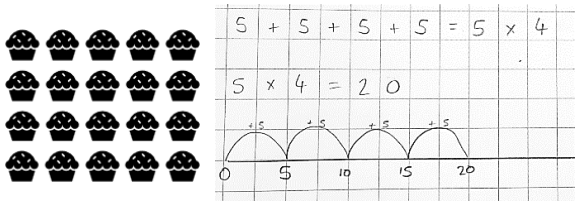

**Count in steps of 3.**
Number track

| 3 | 6 | 9 | 12 | 15 | 18 | 21 | 24 | 27 | 30 |
|---|---|---|---|---|---|---|---|---|---|

## Stage 2

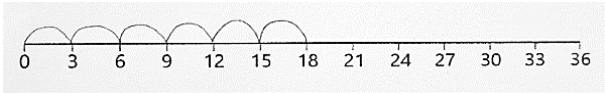
**Solve problems involving multiplication using repeated addition.**
Unstructured number line, e.g

*How many muffins are there altogether?*



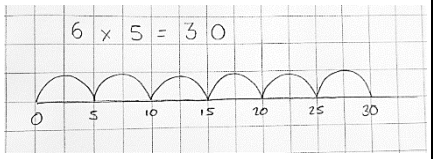

**Count in steps of 3.**
Structured number line, e.g.

*Tilly ran 3 miles every day.*
*How many miles has she run after 6 days?*



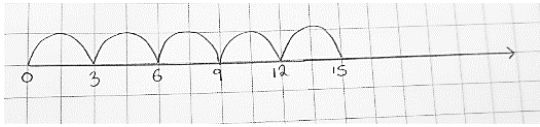

## End of Year Expectation

**Recall and use multiplication facts for the 2, 5 and 10 multiplication tables.**
Unstructured number line to 'prove it'

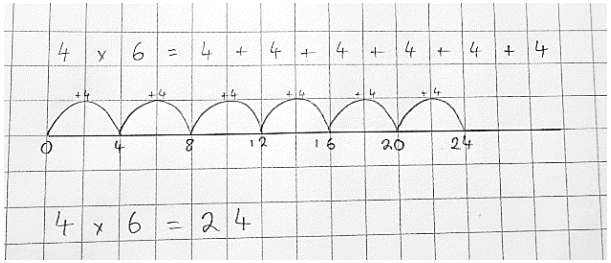
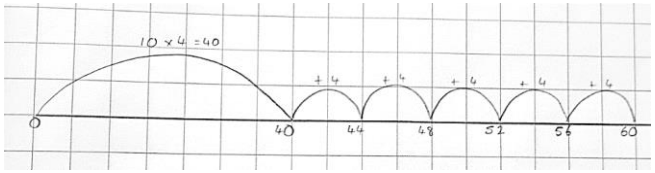
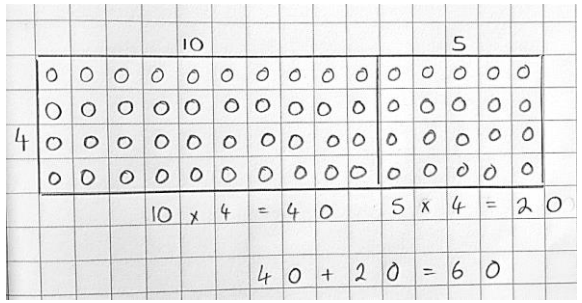
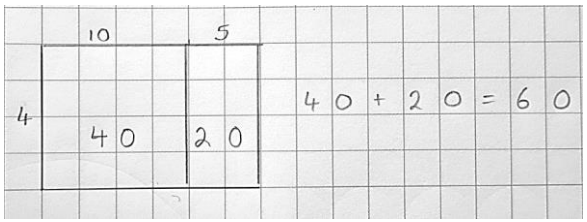



**Count in steps of 3.**
Unstructured number line



# Multiplication – Year 3

| **Selected National Curriculum Programme of Study Statements**<br>Pupils should be taught to:<br>• recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables.<br>• write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including 2-digit numbers times 1-digit numbers, using mental and progressing to formal written methods. | **The Big Ideas (NCETM)**<br>It is important for children not just to be able to chant their multiplication tables but also to understand what the facts in them mean, to be able to use these facts to figure out others and to use in problems. It is also important for children to be able to link facts within the tables (e.g. 5× is half of 10×).<br>They understand what multiplication means, see division as both grouping and sharing, and see division as the inverse of multiplication |
|---|---|

| Stage 1 | Stage 2 | End of Year Expectation |
|---|---|---|
| **Recall and use multiplication facts for the 3, 4 and 8 multiplication table.**<br>Unstructured number line, e.g:<br><br>*4 x 6 =* ☐<br><br>  <br> | **Recall and use multiplication facts for the 3, 4 and 8 multiplication tables.**<br>Using efficient jumps on a number line when working with larger calculations, e.g:<br><br>*15 x 4 =* ☐<br><br>  <br><br><br>15 x 4 = 60 | **Recall and use multiplication facts for the 3, 4 and 8 multiplication tables.**<br>Box array, e.g:<br><br>*15 x 4 =* ☐<br><br>  <br><br><br>  <br><br><br>15 x 4 = 60 |

Linked to Hampshire Scheme of Learning Units 3.3, 3.9, 3.11 and 3.14

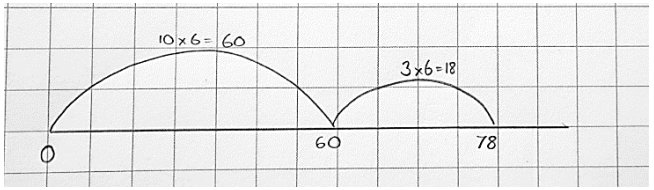
# Multiplication – Year 4

| **Selected National Curriculum Programme of Study Statements**<br>Pupils should be taught to:<br>• recall multiplication and division facts for multiplication tables up to 12 × 12.<br>• use place value, known and derived facts to multiply and divide mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together three numbers<br>• recognise and use factor pairs and commutativity in mental calculations.<br>• multiply 2-digit and 3-digit numbers by a 1-digit number using formal written layout. | **The Big Ideas (NCETM)**<br>Children understand what multiplication means and see division as both grouping and sharing, and to see division as the inverse of multiplication.<br>The distributive law can be used to partition numbers in different ways to create equivalent calculations. For example, 4 × 27 = 4 × (25 + 2) = (4 × 25) + (4 × 2) = 108. Looking for equivalent calculations can make calculating easier. For example, 98 × 5 is equivalent to 98 × 10 ÷ 2 or to (100 × 5) – (2 × 5). The array model can help show equivalences. |
|---|---|

## Stage 1

**Recall multiplication and division facts for multiplication tables up to 12 × 12.**
Using efficient jumps on a number line when working with larger calculations, e.g:

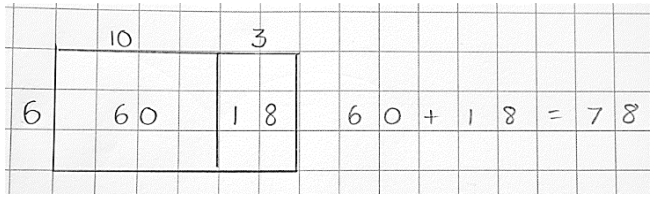
*13 x 6 = ☐*




13 x 6 =78

Box Array, e.g:

*13 x 6 = ☐*

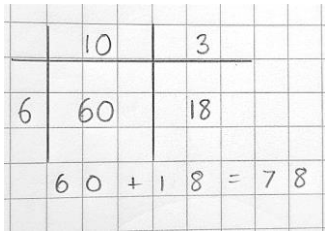



13 x 6 =78

## Stage 2

**Recall multiplication and division facts for multiplication tables up to 12 × 12.**
2 x 1 grid method, e.g:

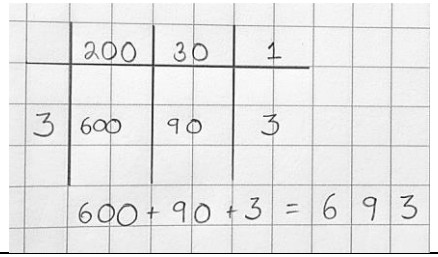
*13 x 6 = ☐*




13 x 6 =78

3 x 1 grid method, e.g:

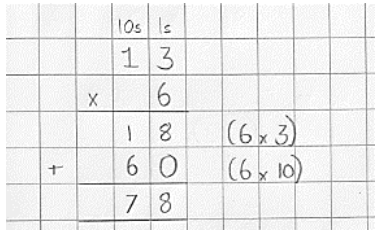
*231 x 3 = ☐*




## End of Year Expectation

**Recall multiplication and division facts for multiplication tables up to 12 × 12.**
2 x 1 expanded formal method, e.g:

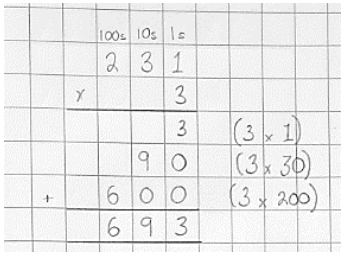
*13 x 6 = ☐*




13 x 6 =78

3 x 1 expanded formal method, e.g:

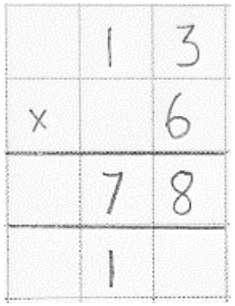
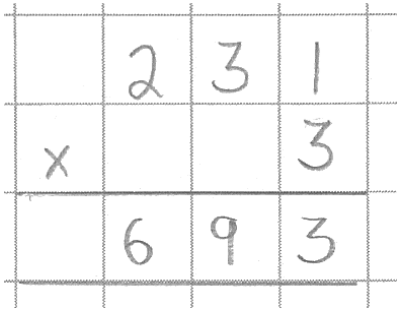
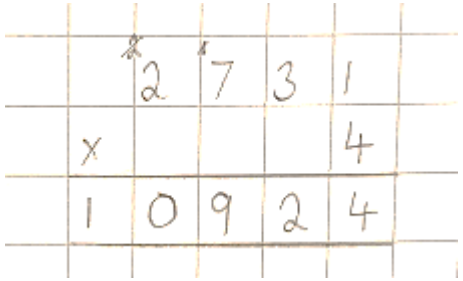
*231 x 3 = ☐*




Linked to Hampshire Scheme of Learning Units 4.3, 4.9, 4.11 and 4.14

# Short Multiplication – UKS2

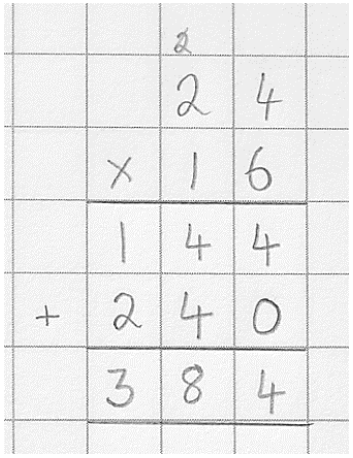
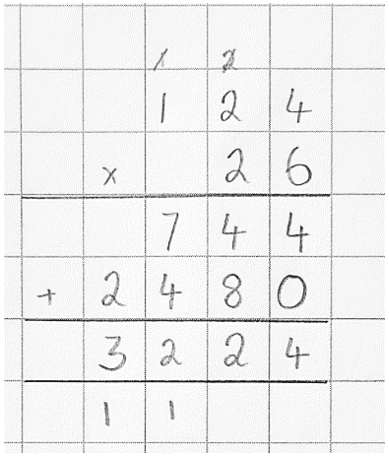
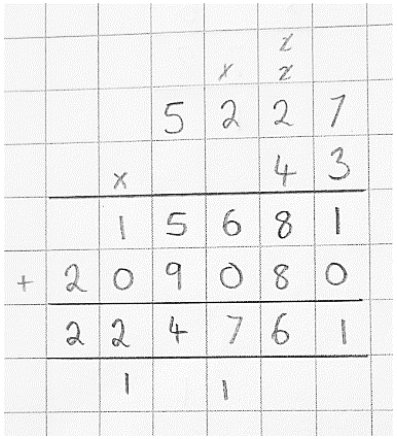
| **Selected National Curriculum Programme of Study Statements** | **The Big Ideas (NCETM)** |
|---|---|
| Year 5 Pupils should be taught to:<br>• multiply numbers up to four digits by a 1 or 2-digit number using a formal written method, including long multiplication for 2-digit numbers.<br>Year 6 Pupils should be taught to:<br>• multiply multi-digit numbers up to four digits by a 2-digit whole number using the formal written method of long multiplication. | Pupils have a firm understanding of what multiplication and division mean and have a range of strategies for dealing with large numbers, including both mental and standard written methods. They see the idea of factors, multiples and prime numbers as connected and not separate ideas to learn.<br>They recognise how to use their skills of multiplying and dividing in new problem-solving situations. |

| Stage 1 | Stage 2 | End of Year Expectation |
|---|---|---|
| **Multiply up to four digits by a 1-digit number,**<br><br>2 x 1 formal method of short multiplication, e.g:<br><br>*13 x 6 =* ☐<br><br>  <br><br><br>13 x 6 = 78 | **Multiply up to four digits by a 1-digit number.**<br><br>3 x 1 formal method of short multiplication, e.g:<br><br>*231 x 3 =* ☐<br><br>  <br><br><br>231 x 3 = 693 | **Multiply up to four digits by a 1-digit number.**<br><br>4 x 1 formal method of short multiplication, e.g:<br><br>*2731 x 4 =* ☐<br><br>  <br><br><br>2731 x 4 = 10 924 |

Linked to Hampshire Scheme of Learning Units **Year 5:** 5.11, 5.17 and **Year 6:** 6.2, 6.12, 6.17

# Long Multiplication – UKS2

| **Selected National Curriculum Programme of Study Statements** | **The Big Ideas** |
|---|---|
| Year 5 Pupils should be taught to:<br>• multiply numbers up to four digits by a 1 or 2-digit number using a formal written method, including long multiplication for 2-digit numbers.<br>Year 6 Pupils should be taught to:<br>• multiply multi-digit numbers up to four digits by a 2-digit whole number using the formal written method of long multiplication. | Standard written algorithms use the conceptual structures of the mathematics to produce efficient methods of calculation.<br>Standard written multiplication method involves a number of partial products. For example, 36 × 24 is made up of four partial products 30 × 20, 30 × 4, 6 × 20, 6 × 4. |

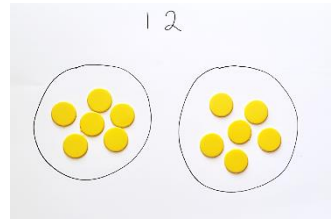
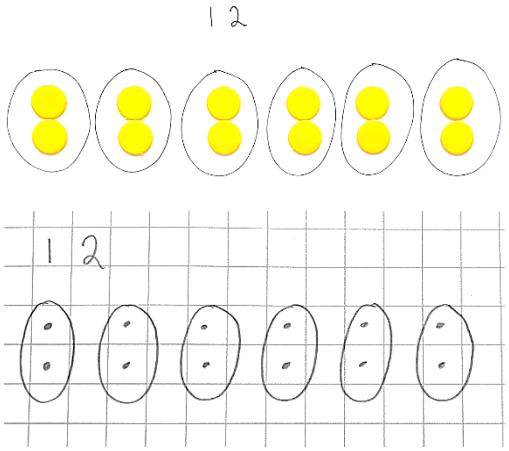
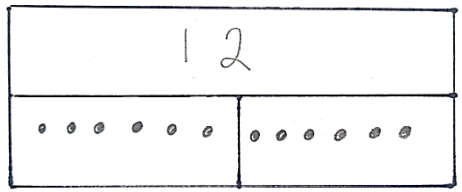
| Stage 1 | Stage 2 | End of Year Expectation |
|---|---|---|
| **Multiply up to four digits by a 2-digit number.**<br><br>Formal written method of long multiplication for 2-digit numbers, e.g:<br><br>*24 x 16 = ☐*<br><br>  <br><br>24 x 16 = 384 | **Multiply up to four digits by a 2-digit number.**<br><br>Formal written method of long multiplication for 2-digit numbers, e.g:<br><br>*124 x 26 = ☐*<br><br>  <br><br>124 x 26 = 3 224 | **Multiply up to four digits by a 2-digit number.**<br><br>Formal written method of long multiplication for 2-digit numbers, e.g:<br><br>*5227 x 43 = ☐*<br><br>  <br><br>5227 x 43 = 224 761 |

Linked to Hampshire Scheme of Learning Units **Year 5:** 5.11, 5.17 and **Year 6:** 6.2, 6.12, 6.17

# Division – Year 1

| **Selected National Curriculum Programme of Study Statements**<br>Pupils should be taught to:<br>• count in multiples of twos, fives and tens.<br>• 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. | **The Big Ideas (NCETM)**<br>Counting in steps of equal sizes is based on the big idea of 'unitising'; treating a group of, say, five objects as one unit of five.<br>Working with arrays helps pupils to become aware of the commutative property of multiplication, that 2 × 5 is equivalent to 5 × 2 |
|---|---|

**Please note that manipulatives and visual representations may be used alongside more formal recording as appropriate. It is important for pupils to explore structure and understand a concept before developing a more procedural approach, at which point all representations may be used alongside each other.**

| Stage 1 | Stage 2 | End of Year Expectation |
|---|---|---|
| **Making equal groups – sharing.**<br>Concrete objects and pictorial representations, e.g:<br>*I have 12 sweets and share them between myself and a friend (2 people), how many will we each have?*<br>  <br><br>"If I share **12** equally between **2** groups, there will be **6** in each group." | **Making equal groups – grouping.**<br>Concrete objects and pictorial representations, e.g:<br>*I have 12 cookies to put in bags.*<br>*If I put 2 in each bag how many bags will I need?*<br>  <br><br>"There are **12** altogether. There are **6** equal groups of **2**." | **Making equal groups (including finding half of a quantity).**<br>Bar models, e.g:<br>*I had 12 grapes and I ate half. How many are left?*<br>  <br><br>"There are **12** altogether. They are shared into **2** equal groups. There are **6** in each group. Each group is half of the whole. I know that there are **6** grapes left." |

Linked to Hampshire Scheme of Learning Units 1.3, 1.6 and 1.8

# Division – Year 2

| **Selected National Curriculum Programme of Study Statements**<br>Pupils should be taught to:<br>• count in steps of two, three, and five from 0, and in tens from any number, forward and backward.<br>• recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers.<br>• show that multiplication of two numbers can be done in any order (commutative) and division of one number by another cannot.<br>• solve problems involving division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts. | **The Big Idea (NCETM)**<br>It is important that pupils both commit multiplication facts to memory and also develop an understanding of conceptual relationships. This will aid them in using known facts to work out unknown facts and in solving problems.<br>Pupils should look for and recognise patterns within tables and connections between them (e.g. 5× is half of 10×).<br>Pupils should recognise multiplication and division as inverse operations and use this knowledge to solve problems. They should also recognise division as both grouping and sharing.<br>The recognition of pattern in multiplication helps pupils commit facts to memory, for example doubling twice is the same as multiplying by four, or halving a multiple of ten gives you the related multiple of five |
|---|---|

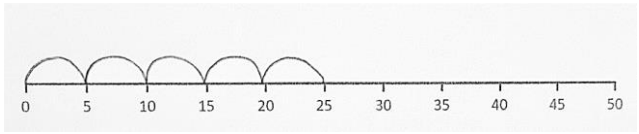
**Please note that manipulatives and visual representations may be used alongside more formal recording as appropriate. It is important for pupils to explore structure and understand a concept before developing a more procedural approach, at which point all representations may be used alongside each other.**

## Stage 1

**Count on in steps of two, three and five from 0.**

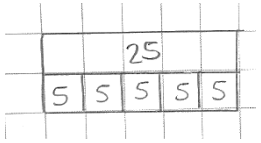
Skip counting on a structured number line, e.g:

*25 ÷ 5 =* ☐




25 ÷ 5 = 6

Bar model representation:

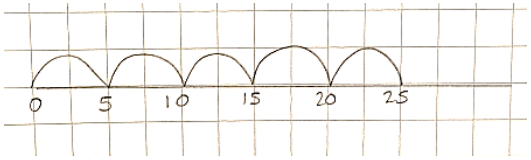



## Stage 2

**Count on in steps of two, three and five from 0.**

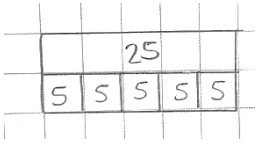
Skip counting on an unstructured number line, e.g:

*25 ÷ 5 =* ☐




25 ÷ 5 = 6

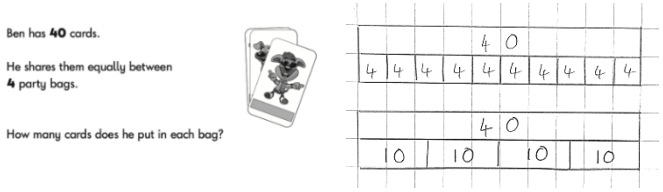
Bar model representation:




## End of Year Expectation

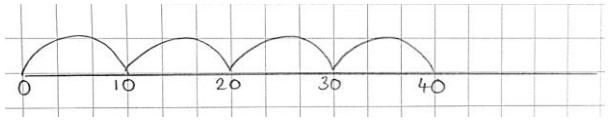
**Recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables.**

Number line or bar model to 'prove it'






"If I know that 4 x 10 = 40, then I know 40 ÷ 4 = 10".



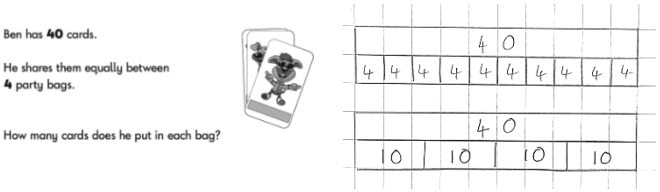
# Division – Year 3

| **Selected National Curriculum Programme of Study Statements**<br>Pupils should be taught to:<br>• recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables.<br>• write and calculate mathematical statements for multiplication and division using the multiplication tables that they know | **The Big Ideas (NCETM)**<br>It is important for children not just to be able to chant their multiplication tables but also to understand what the facts in them mean, to be able to use these facts to figure out others and to use in problems. It is also important for children to be able to link facts within the tables (e.g. 5× is half of 10×).<br>They understand what multiplication means, see division as both grouping and sharing, and see division as the inverse of multiplication |
|---|---|

## Stage 1

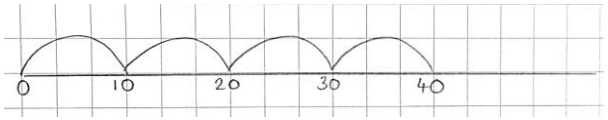
**Recall and use multiplication and division facts for the 2, 5 and 10 multiplication.**

Number line or bar model to 'prove it'






"If I know that 4 x 10 = 40, then I know 40 ÷ 4 = 10".

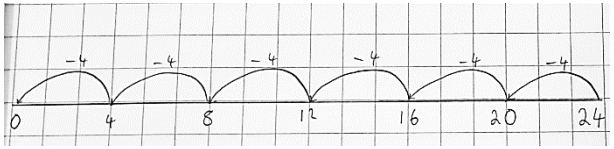



## Stage 2

**Recall and use multiplication and division facts for the 3, 4 and 8 multiplication.**

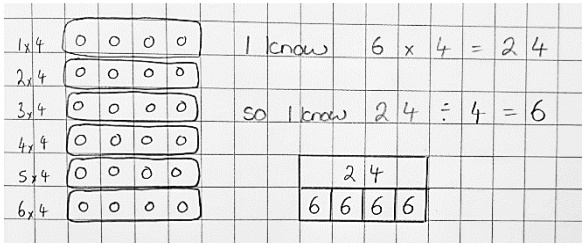
Counting back on a number line, e.g:

*24 ÷ 4 =* ☐




**Arrays and bar model, e.g:**

*24 ÷ 4 =* ☐

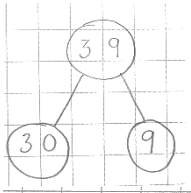



## End of Year Expectation

**Recall and use multiplication and division facts for the 3, 4 and 8 multiplication.**

Partitioning and box arrays, e.g:

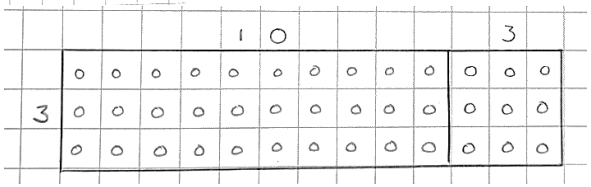
*39 sweets shared between 3 children.*
*How many sweets each?*



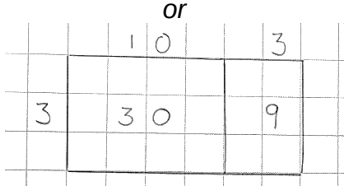

I know 30 ÷ 3 = **10** and

9 ÷ 3 = **3**

**10** + **3** = 13




*or*




39 ÷ 3 = 13

Linked to Hampshire Scheme of Learning Units 3.3, 3.9, 3.11 and 3.14

# Division – Year 4

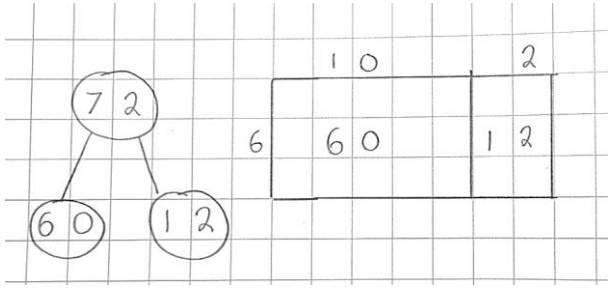
| **Selected National Curriculum Programme of Study Statements**<br>Pupils should be taught to:<br>• recall multiplication and division facts for multiplication tables up to 12 × 12.<br>• use place value, known and derived facts to multiply and divide mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together three numbers<br>• recognise and use factor pairs and commutativity in mental calculations.<br>• Pupils practise to become fluent in the formal written method of short multiplication and short division with exact answers (non-statutory) | **The Big Ideas (NCETM)**<br>Children understand what multiplication means and see division as both grouping and sharing, and to see division as the inverse of multiplication.<br>The distributive law can be used to partition numbers in different ways to create equivalent calculations. For example, 4 × 27 = 4 × (25 + 2) = (4 × 25) + (4 × 2) = 108. Looking for equivalent calculations can make calculating easier. For example, 98 × 5 is equivalent to 98 × 10 ÷ 2 or to (100 × 5) – (2 × 5). The array model can help show equivalences. |
|---|---|

## Stage 1

**Recall and use multiplication and division facts for multiplication tables up to 12 x 12.**

Partitioning, e.g:

*72 children go camping. There are 6 tents.*
*How many children can sleep in each tent?*




I know 60 ÷ 6 = **10** and

12 ÷ 6 = **2**

**10** + **2** = 12

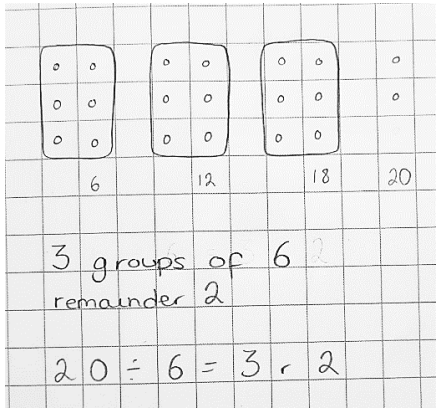
72 ÷ 6 = 12

## Stage 2

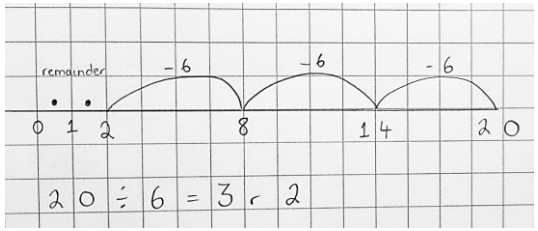
**Division with remainders.**

Arrays, e.g:

*20 eggs in boxes of 6.*
*How many boxes of eggs?*



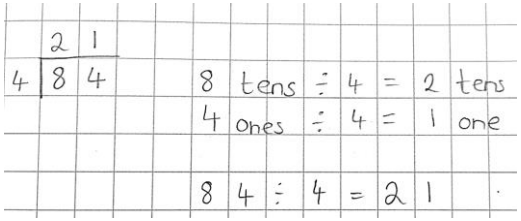

Number line, e.g:



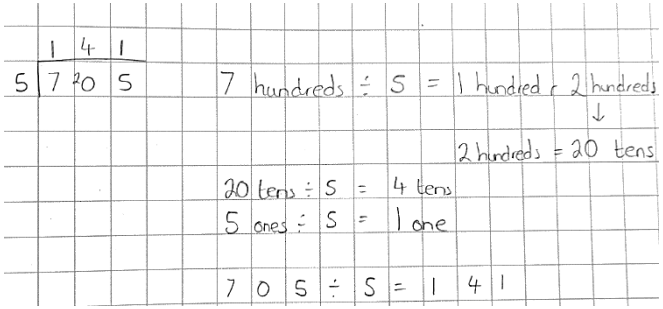

## End of Year Expectation

**Short division (up to 3-digit by 1-digit).**

*84 ÷ 4 =* ☐

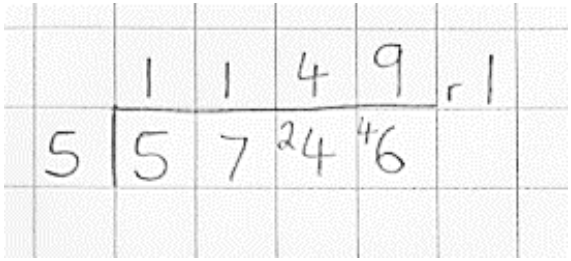
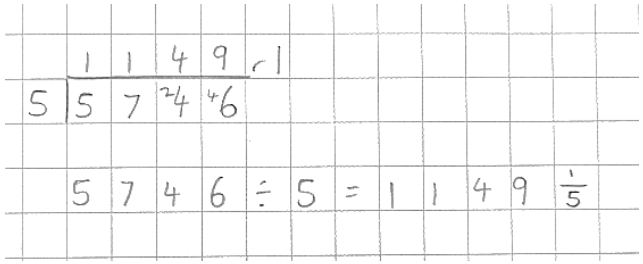
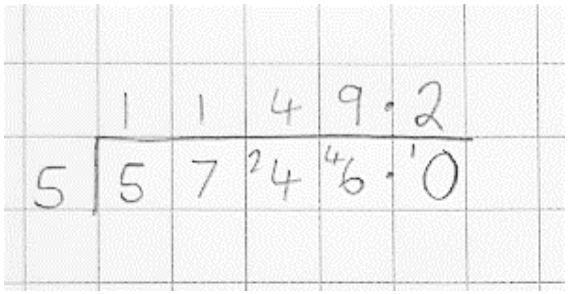



*705 ÷ 5 =* ☐



# Short Division – UKS2

| **Selected National Curriculum Programme of Study Statements**<br>Year 5 Pupils should be taught to:<br>• divide numbers up to four digits by a 1-digit number using the formal written method of short division and interpret remainders appropriately for the context.<br>Year 6 Pupils should be taught to:<br>• divide numbers up to four digits by a 2-digit whole number using the formal written method of long division, and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context. | **The Big Ideas (NCETM)**<br>Pupils have a firm understanding of what multiplication and division mean and have a range of strategies for dealing with large numbers, including both mental and standard written methods. They see the idea of factors, multiples and prime numbers as connected and not separate ideas to learn.<br>They recognise how to use their skills of multiplying and dividing in new problem-solving situations. |
|---|---|

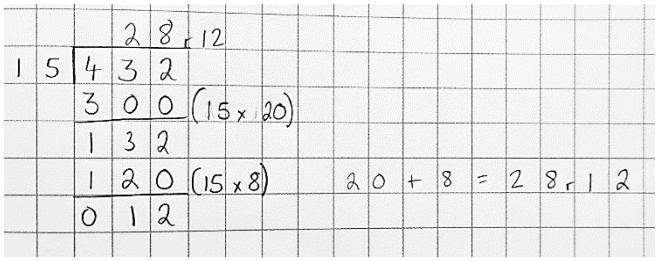
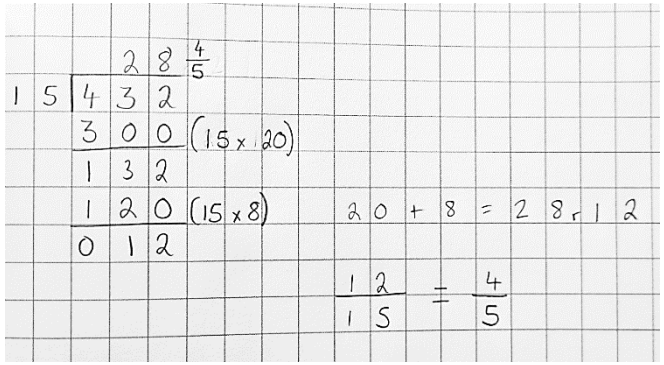
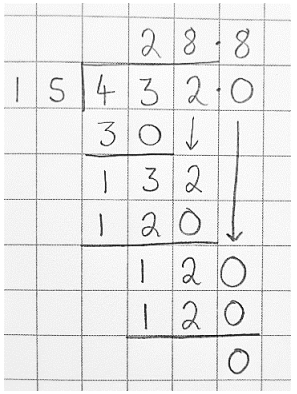
| Stage 1 | Stage 2 | End of Year Expectation |
|---|---|---|
| **Short division (up to 4-digit by 1-digit).**<br>Including remainders, e.g:<br>*5746 ÷ 5 =* ☐<br>  <br>5746 ÷ 5 = 1149 r 1 | **Short division (up to 4-digit by 1-digit).**<br>Remainders as fractions, e.g:<br>*5746 ÷ 5 =* ☐<br>  <br>5746 ÷ 5 = 1149 $\frac{1}{5}$ | **Short division (up to 4-digit by 1-digit).**<br>Remainders as decimals, e.g:<br>*5746 ÷ 5 =* ☐<br>  <br>5746 ÷ 5 = 1149.2 |

Linked to Hampshire Scheme of Learning Units **Year 5:** 5.11, 5.17 and **Year 6:** 6.2, 6.12, 6.17

# Long Division – Year 6

| **Selected National Curriculum Programme of Study Statements**<br>Pupils should be taught to:<br>• divide numbers up to four digits by a 2-digit whole number using the formal written method of long division, and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context.<br>• divide numbers up to four digits by a 2-digit number using the formal written method of short division where appropriate, interpreting remainders according to the context. | **The Big Ideas**<br>Standard written algorithms use the conceptual structures of the mathematics to produce efficient methods of calculation.<br>Standard written multiplication method involves a number of partial products. For example, 36 × 24 is made up of four partial products 30 × 20, 30 × 4, 6 × 20, 6 × 4. |
|---|---|

**Please note that pupils should not move on to this method until they are conceptually and procedurally secure with strategies outlined in previous year groups. As a result, some pupils may not complete the long division strategies whilst in Key Stage 2.**

| Stage 1 | Stage 2 | End of Year Expectation |
|---|---|---|
| **Long division.**<br>Chunking method, e.g:<br>*432 ÷ 15 =* ☐<br>  <br> | **Long division.**<br>Chunking method with fraction remainders, e.g:<br>*432 ÷ 15 =* ☐<br>  <br> | **Long division.**<br>Formal written method, e.g:<br>*432 ÷ 15 =* ☐<br>  <br> |

Linked to Hampshire Scheme of Learning Units 6.2, 6.12 and 6.17

# HIAS Maths Team

Jo Lees – Lead Inspector
Email: jo.lees@hants.gov.uk

Kate Spencer – Lead Inspector
Email: kathryn.spencer@hants.gov.uk

Rebecca Vickers – Teaching & Learning Advisor
Email: rebecca.vickers@hants.gov.uk

Nikki Barber – Teaching & Learning Advisor
Email –Nicola.Barber@hants.gov.uk

Olivia Goodburn – Teaching & Learning Advisor
Email – Olivia.Goodburn@hants.gov.uk

For further details on the full range of services available please contact us using the following email:

htlcdev@hants.gov.uk

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