



## Calculations Policy

Date of issue	Next review	Version	Signed: Chair of Governors	Signed: Headteacher
Feb 2020	Feb 2022	2		

### Single Equality Statement

This Single Equality Scheme for schools in Mundella Primary School provides a format for addressing the statutory duties of the Equality Act 2010 and The Children and Families Act 2014. This supersedes and brings together all previous statutory duties in relation to race, gender and disability and also addresses the duty to promote community cohesion, thus meeting the school's statutory duties in these areas.

Our Access and Single Equality Scheme is available to view and download on our website.

### Governor Statement

The Governing Body of Mundella Primary School works as a 'whole team', meeting 6 times per year; spread evenly across the year, without any separate committees excepting finance. In addition to these meetings, we have termly Governor Monitoring Visits (GMV); usually lasting around four hours and organised to effectively observe, scrutinise, challenge and support a range of school activities and personnel.

An agenda for each meeting and GMV will include all the tasks which the governing body is required to consider, and the governing body will plan assignments or activities; arising from the business of the meeting or that fall into the annual monitoring schedule, which will be recorded in the minutes and then undertaken as directed.

In addition to 'commissioning' activities or actions on their behalf, the governing body may wish to delegate monitoring activities to 'monitoring pairs' or 'individuals'. This could apply to statutory functions, and/or the priorities of the School Plan. They may also arrange to visit the school, or attend school activities, at any time; at the discretion of the Headteacher, to undertake monitoring activities as and when they are available to do so.

In each case, where a function has been delegated there is a statutory duty to report any action or decision to the governing body at the next meeting.

### **Developmental Aims:**

- To introduce children to the processes of calculation through practical, oral and mental activities.
- To support children in developing ways of recording to support their thinking and calculation methods
- Enable children to learn to interpret and use the signs and symbols.
- To facilitate children's use of models and images, such as empty number lines, to support their mental and informal written methods of calculation.
- To enable children to strengthen and refine their mental methods in order to develop informal written methods.
- To support children in becoming more efficient and succinct in their recordings which will ultimately lead to efficient written methods that can be used more generally.
- By the end of Key Stage 2 children should be equipped with mental and written methods that they understand and can use correctly.
- By the end of Key Stage 2, when faced with a calculation, children will be able to decide which method is most appropriate and have strategies to check its accuracy.
- At whatever stage in their learning, and whatever method is being used, children's methods of calculating will be underpinned by a secure and appropriate knowledge of number facts, along with the mental skills that are needed to carry out the process and judge if it was successful.

### **The overall aims when children leave primary school are for them to:**

- have a secure understanding of mental maths facts to apply to written mathematics;
- have a secure knowledge of number facts and a good understanding of the four operations
- have an efficient, reliable, compact written method of calculation for each operation that children can apply with confidence when undertaking calculations that they cannot carry out mentally;
- be able to use this knowledge and understanding to solve problems;

## Mental methods of calculation

Oral and mental mathematics is essential, particularly so in calculation. Early practical, oral and mental work lays the foundations by providing children with a good understanding of how the four operations build on efficient counting strategies and a secure knowledge of place value and number facts. Later learning and skill development must ensure that children recognise how the operations relate to one another and how the rules and laws of arithmetic are to be used and applied. Ongoing oral and mental mathematics learning provides practice and consolidation of these ideas. It must give children the opportunity to apply what they have learned to particular cases, exemplifying how the rules and laws work, and to general cases where children make decisions and choices for themselves.

The ability to calculate mentally forms the basis of all methods of calculation and has to be maintained and refined. A good knowledge of numbers or a 'feel' for numbers is the product of structured practice and repetition. It requires an understanding of number patterns and relationships developed through directed enquiry, use of models and images and the application of acquired number knowledge and skills. Secure mental calculation requires the ability to:

- recall key number facts instantly - for example, all addition and subtraction facts for each number to at least 10, sums and differences of multiples of 10
- recall all times tables up to 12 x 12 by the end of year 4 -

**Foundation** – by end of year begin counting sequences, doubling, halving and sharing

**Year 1** – counting sequences (which follow times tables e.g. 2, 4, 6, 8 10 ... for x2). By the end of year 1, children can start learning 2, 10 and 5 times tables.

**Year 2** – Refine 2, 10, 5 times tables. Learn 11 times table

**Year 3** – Recall and use 2, 10, 5, 11 times tables. Learn 3, 4, 8 times tables.

**Year 4** - Recall and use 2, 10, 5, 11, 3, 4, 8 and learn 6, 7 and 12 times tables.

**Year 5/6** – continue practice of all times tables up to 12 x 12, use these to inform division and to work out other times tables higher than 12 (e.g. double 12 times tables to generated 24 times tables).

- use taught strategies to work out the calculation - for example, recognise that addition can be done in any order and use this to add mentally a one-digit number or a multiple of 10 to a one-digit or two-digit number, partition two-digit numbers in different ways including into multiples of ten and one and add the tens and ones separately and then recombine, when applying mental methods in special cases.
- understand how the rules and laws of arithmetic are used and applied - for example, to add or subtract mentally combinations of one-digit and two-digit numbers, and to calculate mentally with whole numbers and decimals.

The aim is that by the end of Key Stage 2, the great majority of children should be able to use an efficient written method for each operation with confidence and understanding. Children will develop the ability to use what are commonly known as 'standard' written methods - methods that are efficient and work for any calculations, including those that involve whole numbers or decimals. They are compact and consequently help children to keep track of their recorded steps. Being able to use these written methods gives children an efficient set of tools they can use when they are unable to carry out the calculation in their heads or do not have access to a calculator. We want children to know that they have a reliable, written method to which they can turn when the need arises.

In setting out these aims, the intention is that there will be a consistent approach to the learning of calculation strategies and that all teachers understand the progression of skills and key concepts. The great majority of children will benefit greatly from learning how to use the most efficient methods. The challenge for teachers will be in determining when their children should move on to a refinement in the method and become confident and more efficient at written calculation. Guidance is given below for the steps in reaching the most efficient methods for each of the four number operations.

# Progression in Teaching Addition

## Mental Skills

Recognise the size and position of numbers

Count on in ones and tens

Know number bonds to 10 and 20

Add multiples of 10 to any number

Partition and recombine numbers

Bridge through 10

## Models and Images

Counting apparatus

Place value apparatus

Place value cards

Number tracks

Numbered number lines

Marked but unnumbered number lines

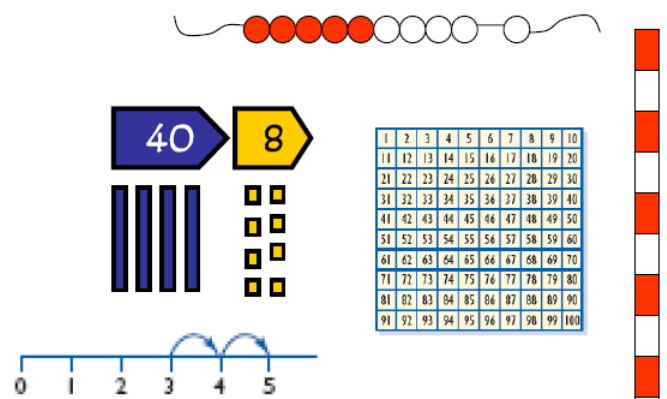
Empty number lines

Hundred square

Counting stick

Bead string

Cuisenaire rods (bar modelling)



## Key Vocabulary

add

addition

Plus

And

count on

more






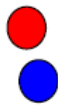


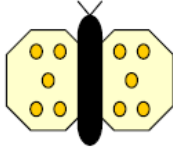
sum

total

altogether

increase

add and count on  
addition plus  
more sum total  
altogether increase

End of year expectation	<p style="text-align: center;"><b>Progression of skills and methods</b></p> <p style="text-align: center;">(addition)</p>																																																																																																				
EYFS	<div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 5px; margin-right: 20px;">Recognise numbers 0 to 10</div> <div style="font-size: 2em; font-weight: bold; color: purple;">0 1 2 3 4 5 6 7 8 9 10</div> </div>																																																																																																				
EYFS	<div style="display: flex; align-items: center;">  <div style="border: 1px solid black; border-radius: 50%; padding: 10px; display: inline-block; text-align: center;">       1, 2, 3, 4, 5, 6 ... there are 6 teddies     </div> <div style="margin-left: 20px; border: 1px solid black; padding: 5px;">Count reliably up to 10 everyday objects</div> </div>																																																																																																				
EYFS	<div style="display: flex; align-items: center;"> <div style="margin-right: 20px;">    <p style="margin-left: 20px;"><math>25 + 10 = 35</math></p> </div> <table border="1" style="font-size: 0.8em; border-collapse: collapse; margin-right: 20px;"> <tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td></tr> <tr><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td><td>16</td><td>17</td><td>18</td><td>19</td><td>20</td></tr> <tr><td>21</td><td>22</td><td>23</td><td>24</td><td>25</td><td>26</td><td>27</td><td>28</td><td>29</td><td>30</td></tr> <tr><td>31</td><td>32</td><td>33</td><td>34</td><td>35</td><td>36</td><td>37</td><td>38</td><td>39</td><td>40</td></tr> <tr><td>41</td><td>42</td><td>43</td><td>44</td><td>45</td><td>46</td><td>47</td><td>48</td><td>49</td><td>50</td></tr> <tr><td>51</td><td>52</td><td>53</td><td>54</td><td>55</td><td>56</td><td>57</td><td>58</td><td>59</td><td>60</td></tr> <tr><td>61</td><td>62</td><td>63</td><td>64</td><td>65</td><td>66</td><td>67</td><td>68</td><td>69</td><td>70</td></tr> <tr><td>71</td><td>72</td><td>73</td><td>74</td><td>75</td><td>76</td><td>77</td><td>78</td><td>79</td><td>80</td></tr> <tr><td>81</td><td>82</td><td>83</td><td>84</td><td>85</td><td>86</td><td>87</td><td>88</td><td>89</td><td>90</td></tr> <tr><td>91</td><td>92</td><td>93</td><td>94</td><td>95</td><td>96</td><td>97</td><td>98</td><td>99</td><td>100</td></tr> </table> <div style="border: 1px solid black; padding: 5px; margin-left: 20px;">Count in ones and tens</div> </div>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
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EYFS	<div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 5px; margin-right: 20px;">Begin to use the + and = signs to record mental calculations in a number sentence</div> <div style="margin-right: 20px; border: 1px solid black; padding: 5px;"><math>6 + 4 = 10</math></div> <div style="margin-left: 20px;">  </div> </div>																																																																																																				
EYFS	<div style="display: flex; align-items: center;"> <div style="margin-right: 20px;">  </div> <div style="margin-right: 20px; font-size: 2em; font-weight: bold; color: red;"><math>5 + 5 = 10</math></div> <div style="border: 1px solid black; padding: 5px; margin-left: 20px;">Know doubles of numbers</div> </div>																																																																																																				

Y1

Know by heart all pairs of numbers with a total of 10 and 20

10 = 5 + 5

6 and how many more make 10?  
6 + □ = 10

15 + 5 = 20

5 + ? = 10

10 = 5 + 5  
10 = 1 + 9  
10 = 2 + 8

Y1

1 + 2 = 3

2 + 1 = 3

2 + 5 = 7

5 + 2 = 7

Know that addition can be done in any order

Y1

Put the biggest number first and count on

?

3 + 5

5 + 3 = 8

Y1

8 + 7 = 15

8 + 2 = 10

10 + 5 = 15

Add two single-digit numbers that bridge 10

Y1 – number bonds to 20  
1 step problems/ missing number problems

Y1 into Y2

Begin to partition numbers in order to add

53

50 3

10p 10p 10p 3p 3p 3p 3p

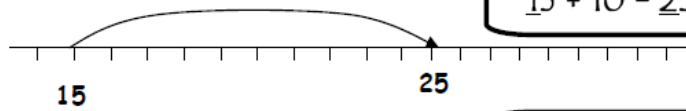
30p + 4p = 34p

Y2

Know which digit changes when adding 1s or 10s to any number

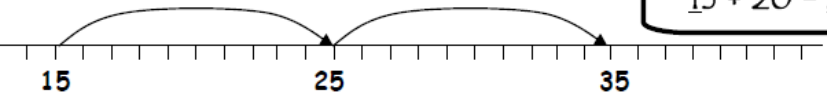


$15 + 1 = 16$



$15 + 10 = 25$

Can be demonstrated visually as in diagram but this **should not** be used as a written method.

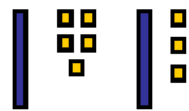


$15 + 20 = 35$

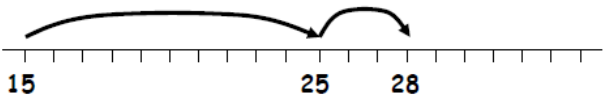
Y2

Y2 – know that addition is commutative

Missing number problems/ check calculations using inverse knowledge



Adding two two-digit numbers (without bridging)  
Counting in tens and ones  
Partitioning and recombining

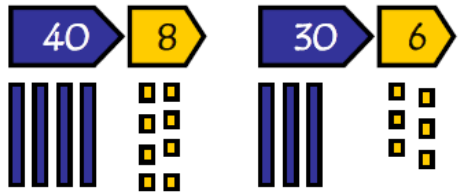
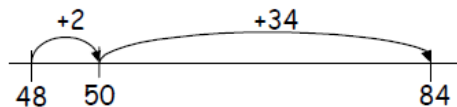
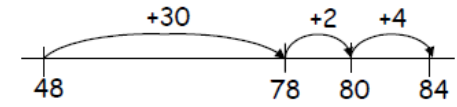


$15 + 13 = 28$

Y2 into Y3

Y3

Adding two two-digit numbers (bridging through tens boundary)  
Using a number line  
OR  
Using place value cards and place value apparatus to partition numbers and recombine



$48 + 36 = 84$

Partition is a mental method, but it is useful for children to record jottings as in the diagram.

$$\begin{array}{r}
 40 + 30 + 8 + 6 \\
 \hline
 40 + 30 = 70 \\
 8 + 6 = 14 \\
 70 + 14 = 84
 \end{array}$$



Y3

Y3 – estimate and check answers using inverses

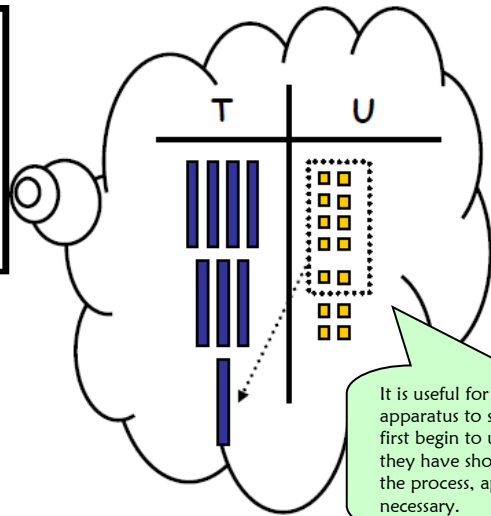
Missing number problems using number facts and place value

Y3 into Y4 (building up to 4 digit numbers)

**Expanded method**  
 It is important that the children have a good understanding of place value and partitioning using concrete resources and visual images to support calculations. The expanded method enables children to see what happens to numbers in the standard written method.

$$48 + 36$$

$$\begin{array}{r} 48 \\ + 36 \\ \hline \end{array}$$



It is useful for children to use apparatus to support them when they first begin to use this method. When they have shown an understanding of the process, apparatus may not be necessary.

T	U
40	+ 8
30	+ 6
80	+ 4
10	—

Y4

Column addition of up to 4 digits

Estimate using inverse knowledge

2-step problems

$$\begin{array}{r} 48 \\ + 36 \\ \hline 84 \\ \hline 1 \end{array}$$

**Standard written method**  
 The previous stages reinforce what happens to the numbers when they are added together using more formal written methods.

Y5

Children should now be expected to: Use standard written method for column addition

- use this method for larger numbers including more than 4 digits
- use this method to add numbers with up to 2 decimal places.
- solve addition problems involving measures and money.
- Estimate using rounding and expect a fair level of accuracy
- Multi-step problems

Y6	<p>Using the standard written method to:</p> <ul style="list-style-type: none"><li>• add decimals (including those which do not have the same amount of decimals digits).</li><li>• solve addition problems involving measures and money.</li><li>• use as an inverse operation to check subtraction calculations.</li><li>• use BODMAS to solve multi-function problems of several steps</li><li>• estimate with an appropriate degree of accuracy.</li></ul>
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To add successfully, children need to be able to:

- recall all addition pairs to  $9 + 9$  and complements in 10;
- add mentally a series of one-digit numbers, such as  $5 + 8 + 4$ ;
- add multiples of 10 (such as  $60 + 70$ ) or of 100 (such as  $600 + 700$ ) using the related addition fact,  $6 + 7$ , and their knowledge of place value;
- partition two-digit and three-digit numbers into multiples of 100, 10 and 1 in different ways.

**Note:** It is important that children's mental methods of calculation are practised and secured alongside their learning and use of an efficient written method for subtraction.

# Progression in Teaching Subtraction

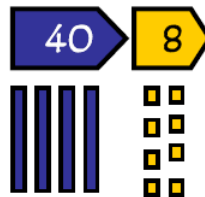
## Mental Skills

Recognise the size and position of numbers Count back in ones and tens

Know number facts for all numbers to 20 Subtract multiples of 10 from any number

Partition and recombine numbers (only partition the number to be subtracted)

Bridge through 10



1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100



## Counting apparatus

Place value apparatus

Place value cards

Number tracks

Numbered number lines

Marked but unnumbered lines

Hundred square

Empty number lines.

Counting stick

Bead strings

Cuisenaire rods (bar modelling)

## Vocabulary

subtract

take away

minus




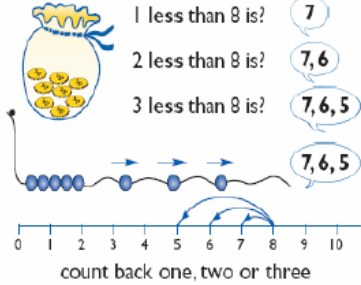
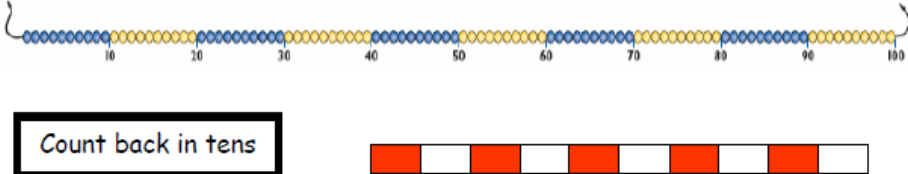
count back

less

fewer

difference between

count back    take away  
fewer    subtract  
minus    less  
difference between

End of year expectation	<p style="text-align: center;"><b>Progression of skills and methods</b></p> <p style="text-align: center;">(subtraction)</p>																																																																																																				
EYFS	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; padding: 5px; width: 20%;"> <p>Begin to count backwards in familiar contexts such as number rhymes or stories</p> </div> <div style="text-align: center;"> <p>Five fat sausages frying in a pan ...</p>  </div> <div style="text-align: center;"> <p>Ten green bottles hanging on the wall ...</p>  </div> </div>																																																																																																				
EYFS	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; padding: 10px; border-radius: 15px; width: 30%; text-align: center;"> <p style="font-size: 24px; color: purple;">10, 9, 8, 7 ...</p> </div> <div style="border: 1px solid black; padding: 5px; width: 30%;"> <p>Continue the count back in ones from any given number</p> </div> </div>																																																																																																				
EYFS	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; padding: 5px; width: 25%;"> <p>Begin to relate subtraction to 'taking away'</p> </div> <div style="text-align: center;">  </div> <div style="border: 1px solid black; padding: 5px; width: 25%;"> <p>Three teddies take away two teddies leaves one teddy</p> </div> </div>																																																																																																				
EYFS	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>count back one, two or three</p> </div> <div style="border: 1px solid black; padding: 5px; width: 20%;"> <p>Find one less than a number</p> </div> </div>																																																																																																				
EYFS/ Y1	<div style="display: flex; justify-content: space-between; align-items: center;"> <div style="border: 1px solid black; padding: 5px; width: 20%;"> <p>Count back in tens</p> </div> <div style="text-align: center;">  </div> <div style="width: 20%;"> <table border="1" style="font-size: 8px; border-collapse: collapse;"> <tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td></tr> <tr><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td><td>16</td><td>17</td><td>18</td><td>19</td><td>20</td></tr> <tr><td>21</td><td>22</td><td>23</td><td>24</td><td>25</td><td>26</td><td>27</td><td>28</td><td>29</td><td>30</td></tr> <tr><td>31</td><td>32</td><td>33</td><td>34</td><td>35</td><td>36</td><td>37</td><td>38</td><td>39</td><td>40</td></tr> <tr><td>41</td><td>42</td><td>43</td><td>44</td><td>45</td><td>46</td><td>47</td><td>48</td><td>49</td><td>50</td></tr> <tr><td>51</td><td>52</td><td>53</td><td>54</td><td>55</td><td>56</td><td>57</td><td>58</td><td>59</td><td>60</td></tr> <tr><td>61</td><td>62</td><td>63</td><td>64</td><td>65</td><td>66</td><td>67</td><td>68</td><td>69</td><td>70</td></tr> <tr><td>71</td><td>72</td><td>73</td><td>74</td><td>75</td><td>76</td><td>77</td><td>78</td><td>79</td><td>80</td></tr> <tr><td>81</td><td>82</td><td>83</td><td>84</td><td>85</td><td>86</td><td>87</td><td>88</td><td>89</td><td>90</td></tr> <tr><td>91</td><td>92</td><td>93</td><td>94</td><td>95</td><td>96</td><td>97</td><td>98</td><td>99</td><td>100</td></tr> </table> </div> </div>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
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EYFS

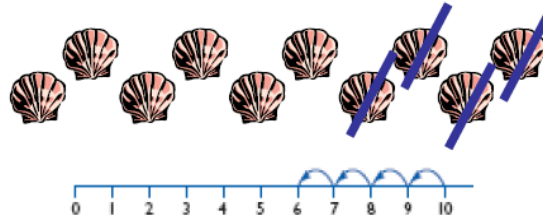
Begin to use the - and = signs to record mental calculations in a number sentence

Maria had six sweets and she ate four. How many did she have left?



$$6 - 4 = 2$$

Y1



If I take away four shells there are six left

Count backwards along a number line to 'take away'

Y1



$$6 + ? = 10 \quad ? + 6 = 10$$

$$10 - 6 = ? \quad 10 - 4 = 6$$

		$20 = 12 + 8$	$8 + 12 = 20$
		$20 - 8 = 12$	$20 - 12 = 8$

Know by heart subtraction facts for numbers up to 10 and 20

Y1

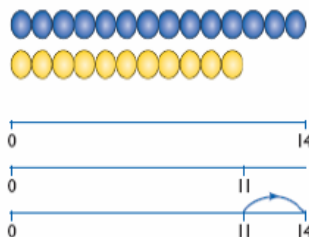
Number bonds to 20 by end of Y1

1-step problems

Missing number problems



The difference is?



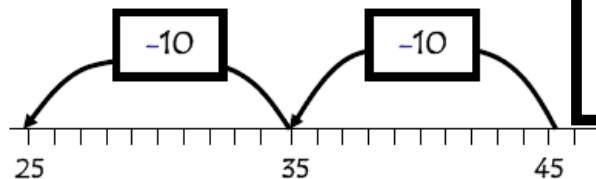
The difference between 11 and 14 is 3.  
 $14 - 11 = 3$   
 $11 + \square = 14$

Begin to find the difference by counting up from the smallest number

Y1/Y2

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Children should be able to do this mentally. This visual aid (in the form of a number line) may be used support those who need it.



Subtract 1 or multiples of 10 from any two-digit number.

$$45 - 20$$

Y2

**Continue to use a number line to find the difference by adding on from the smaller to the larger number. (including bridging through tens boundary).**

$42 - 25 =$

Children may choose to add on different quantities first. They may prefer to add on 5 to begin with to get themselves to the nearest tens number.

25                      35                      40                      42

$10 + 5 + 2 = 17$

Y2

To know that subtraction is NOT commutative

Missing number problems

Check calculations using inverse knowledge

**Begin to partition numbers in order to take away**

Y3

Estimate and check using inverse knowledge. Missing number problems using number facts and place value.

Use up to 3 digits

\*This method is a mental method, but it is useful for children to record jottings as in the diagram.

Partitioning number to be subtracted - with exchanging (links to counting back on number line)

$43 - 27 = 16$

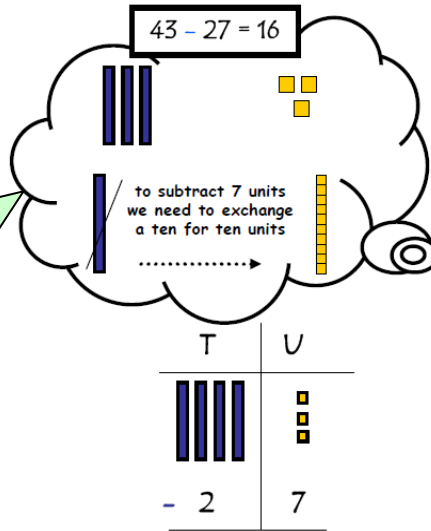
$43 - 20 = 23$

$23 - 7 = 16$

Level 3  
leading  
into Level  
4

This is an important method that should not be skipped as it helps children understand the process of subtraction (particularly the 'borrowing' element).

Apparatus can be used to demonstrate the process of 'borrowing'.



#### Expanded method

It is important that the children have a good understanding of place value and partitioning using concrete resources and visual images to support calculations. The expanded method enables children to see what happens to numbers in the standard written method.

$$\begin{array}{r} {}^{30} \cancel{40} + {}^{10} + 3 \\ - 20 + 7 \\ \hline 10 + 6 \end{array}$$

Y4 –  
Formal  
method  
using up to  
4 digits  
Estimate  
using inverse  
knowledge.  
2-step  
problems

**Standard written method**  
The previous stages reinforce what happens to numbers when they are subtracted using more formal written methods. It is important that the children have a good understanding of place value and partitioning.

$$\begin{array}{r} {}^3 \cancel{4} 13 \\ - 27 \\ \hline 16 \end{array}$$

Y5

Children at Y5 should now be expected to:

- use this method for larger numbers with more than 4 digits
- use this method to subtract numbers with up to 2 decimal places.
- solve subtraction problems involving measures and money.
- **Multi-step problems**
- **Estimate using rounding and expect a fair level of accuracy**

Y6

Using the standard written method:

- subtract decimals (including those which do not have the same amount of decimal digits).
- solve subtraction problems involving measures and money.
- use as an inverse operation to check addition calculations.
- **use BODMAS to solve multi-step problems**
- **estimation with an appropriate degree of accuracy**

To subtract successfully, children need to be able to:

- recall all addition and subtraction facts to 20
- subtract multiples of 10 (such as  $160 - 70$ ) using the related subtraction fact,  $16 - 7$ , and their knowledge of place value
- partition two-digit and three-digit numbers into multiples of one hundred, ten and one in different ways (e.g. partition 74 into  $70 + 4$  or  $60 + 14$ ).

**Note:** It is important that children's mental methods of calculation are practised and secured alongside their learning and use of an efficient written method for subtraction.

# Progression in Teaching Multiplication

## Mental Skills

Recognise the size and position of numbers

Count on in different steps 2s, 5s, 10s

Double numbers up to 10

Recognise multiplication as repeated addition

Quick recall of multiplication facts

Use known facts to derive associated division facts

Use known facts to generate other facts (e.g. double the 2 x table to find 4 x table)

Multiplying by 10, 100, 1000 and understanding the effect

## Counting apparatus

Place value apparatus

Arrays

100 squares

Number tracks

Numbered number lines

Marked but unnumbered lines

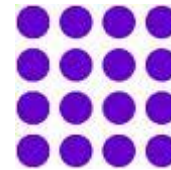
Empty number lines

Multiplication squares

Counting stick

Bead strings

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100



## Vocabulary

lots of

groups of

times

multiply

multiplication

multiple

product

once, twice, three times

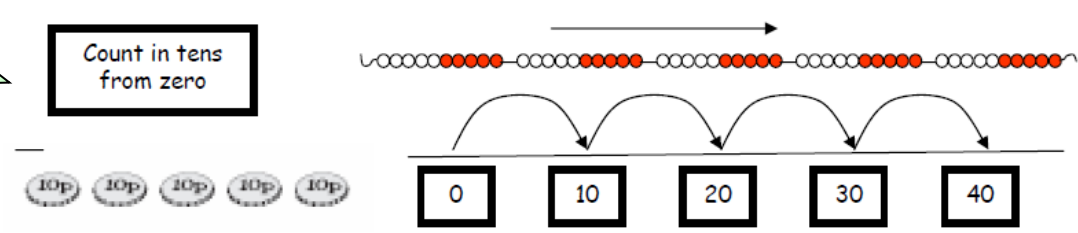
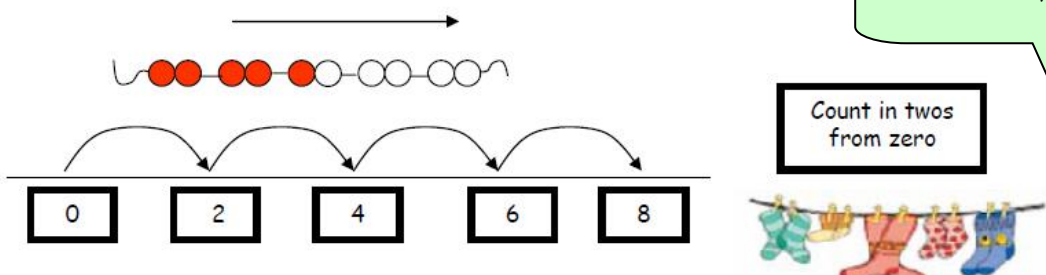
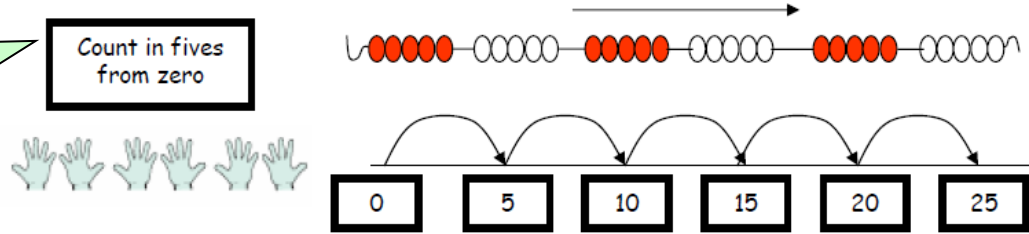
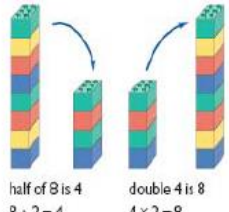
array, row, column

double

repeated addition

multiplication      product  
once, twice, three times  
double      groups of  
repeated addition      lots of  
array, row, column      multiply  
times      multiple



End of year expectation	Progression of skills and methods (multiplication)
EYFS NB Introduce in Foundation if children are ready.	<p style="text-align: center;"><b>Count in tens from zero</b></p>  <p style="text-align: right;">NB Introduce in Foundation if children are ready.</p>
EYFS	<p style="text-align: center;"><b>Count in twos from zero</b></p> 
EYFS NB Introduce in Foundation if children are ready.	<p style="text-align: center;"><b>Count in fives from zero</b></p> 
EYFS Solve problems using doubling, halving and sharing.	<p style="text-align: center;"><b>Know doubles and corresponding halves</b></p> 

Y1

Know multiplication tables to 10 x 10

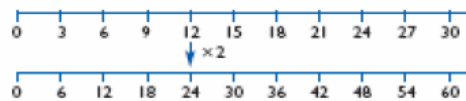
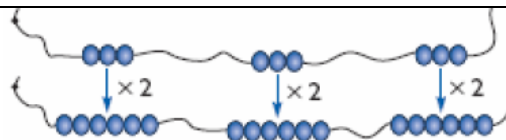
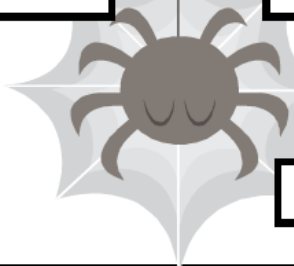
$2 \times 5 = 10$

$\times 5$

$6 \times 5 = 30$

$3 \times 5 = 15$

$8 \times 5 = 40$





$12 \times 2 = 24$


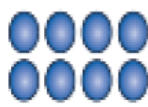
Twice as many



Use known facts to work out new ones

Y1 and Y2

Y1 – Solve 1-step problems using arrays, concrete and pictorial representations with adult support


 $2 \times 4$ 

 $4 \times 2$


 $2 \times 4 = 8$ 

 $4 \times 2 = 8$


 $4 \times 2 = 8$ 

 $2 \times 4 = 8$

Understand multiplication as an array

Y2

Understand that ...

$24 \times 20 = 24 \times 2 \times 10$

$24 \times 50 = 24 \times 5 \times 10$

Use factors to multiply

Y2

$2 + 2 + 2 + 2$

Understand multiplication as repeated addition

$2 + 2 + 2 + 2 = 8$

$4 \times 2 = 10$

2 multiplied by 4

4 lots of 2

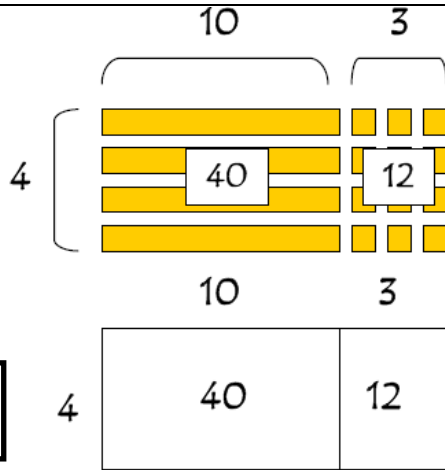
Y2 into Y3

Solve problems using arrays, repeated addition and multiplication facts.

Problem solving in context.

Visual

Written recording



When first introducing the grid method, use resources to show the visual process, as well as recording the workings within a grid.

Use place value apparatus to support the multiplication of  $U \times TU$  alongside the grid method

$4 \times 13$

The grid method should be introduced during Year 3 for those children who are working at a level 3 or above.

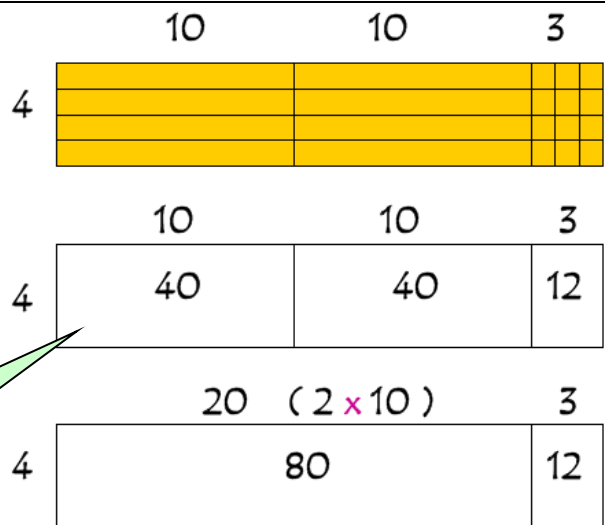
$40 + 12 = 52$

Y3

Use place value apparatus to represent the multiplication of  $U \times TU$  alongside the grid method

$4 \times 23$

The top grid method is made simpler by partitioning the 23 down further to  $10 + 10 + 3$ .  
If children are confident with this, they may just partition 23 into  $20 + 3$  (as in bottom diagram).



$80 + 12 = 92$

Y3

Informal written (grid) progressing towards formal written.

Solve missing number problems

Positive integer scaling problems

Correspondence problems

Multiplying TU x TU

14 x 33

X	30	3	
10	300	30	= 330 +
4	120	12	= 132
			<u>462</u>

300
120
30
+ 12
<u>462</u>

Y4 – then onto standard written method (see below)

Multiply 2 and 3 digits by 1 digit using formal written method

Solve x problems (using distributive law) Integer scaling problems Harder correspondence problems

Expanded standard written method

38 x 7 =

30 + 8
x 7
56
<u>210</u>
<u>266</u>

(7 x 8 = 56)  
(7 x 30 = 210)

38 x 7 =

TU
38
x 7
56
<u>210</u>
<u>266</u>

To demonstrate the process, it may help to record, in brackets, each step. Move away from this as children are ready.

Y5

4-digit numbers by 1 or 2 digits using formal method

Solve problems combining 4 rules Solve x problems including scaling by simple fractions Problems involving simple rates

Standard written method

38 x 7 =

38
x 7
<u>266</u>

5

This step involves adding the 56 and 210 mentally.

38 x 27 =

38
x 27
266
<u>760</u>
<u>1026</u>

This method can then be used to multiply TU by TU numbers. If needed, the brackets, as in previous step, could be used to support mental workings.

1

Y6	<p>Using the standard written method:</p> <ul style="list-style-type: none"><li>• multiply decimals (including those which do not have the same amount of decimals digits).</li><li>• solve multiplication problems involving measures and money.</li><li>• multiply multi-digit numbers by a 2-digit whole number using the formal written method of long multiplication</li><li>• <b>problem solving using all 4 rules</b></li><li>• <b>use BODMAS to know the order of operations in calculations involving the 4 rules</b></li><li>• <b>estimate to an appropriate degree of accuracy</b></li><li>• <b>use as an inverse operation to check division calculations.</b></li></ul>
----	--

To multiply successfully, children need to be able to:

- recall all multiplication facts to 12x12
- partition number into multiples of one hundred, ten and one
- work out products such as  $70 \times 5$ ,  $70 \times 50$ ,  $700 \times 5$  or  $700 \times 50$  using the related fact  $7 \times 5$  and their knowledge of place value
- add two or more single-digit numbers mentally
- add multiples of 10 (such as  $60 + 70$ ) or of 100 (such as  $600 + 700$ ) using the related addition fact,  $6 + 7$ , and their knowledge of place value
- add combinations of whole numbers using the column method (see above).

**Note:** It is important that children's mental methods of calculation are practised and secured alongside their learning and use of an efficient written method for multiplication.

# Progression in Teaching Division

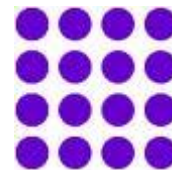
## Mental Skills

- Recognise the size and position of numbers
- Count back in different steps 2s, 5s, 10s
- Halve numbers to 20
- Recognise division as repeated subtraction
- Quick recall of division facts
- Use known facts to derive associated facts
- Divide by 10, 100, 1000 and understanding the effect
- Divide by multiples of 10

## Counting apparatus

- Arrays
- 100 squares
- Number tracks
- Numbered number lines
- Marked but unnumbered lines
- Empty number lines
- Multiplication squares

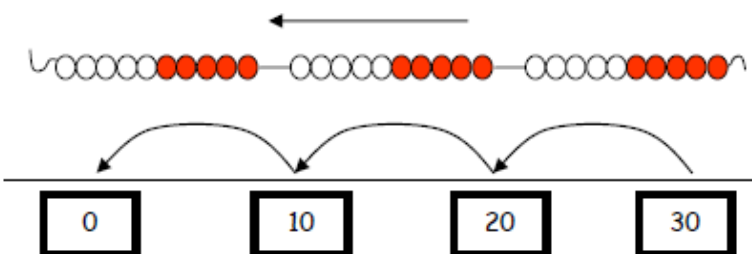
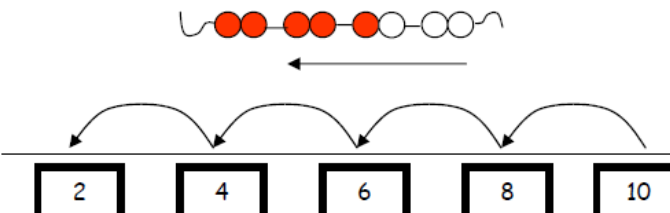
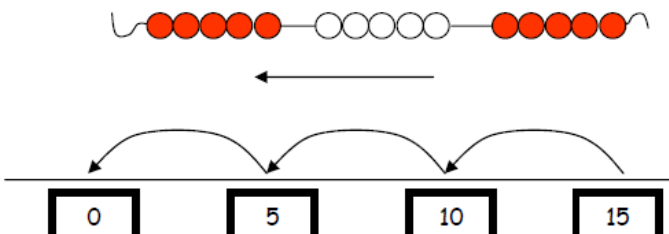
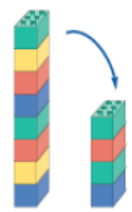
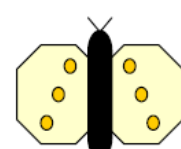
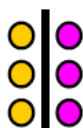
1	2	3	4	5	6	7	8	9	10
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21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
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61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100



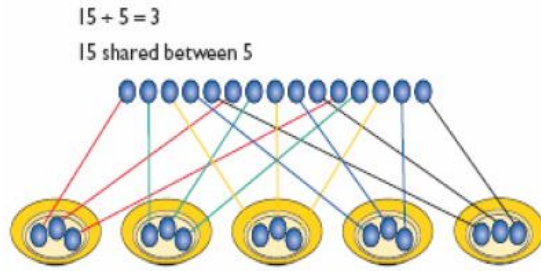
## Vocabulary

- lots of
- groups of
- share
- group
- halve
- half
- divide
- division
- divided by
- remainder
- factor
- quotient
- divisible

group                      groups of  
lots of                      divide  
divided by                      quotient  
division                      factor  
remainder                      divisible  
half                      halve                      share

End of year expectation	Progression of skills and methods
EYFS	<p style="text-align: center;">(division)</p> <div style="display: flex; justify-content: space-between; align-items: center;"> <div style="border: 1px solid black; padding: 5px; width: 15%;">Count back in tens</div> <div style="text-align: center;">  </div> </div> <div style="margin-top: 10px;"> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin-left: 10%;">NB Introduce in Foundation if children are ready.</div> </div>
EYFS	<div style="display: flex; justify-content: space-between; align-items: center;"> <div style="text-align: center;">  </div> <div style="border: 1px solid black; padding: 5px; width: 15%;">Count back in twos</div> </div> <div style="margin-top: 10px;"> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin-left: 10%;">NB Introduce in Foundation if children are ready.</div> </div>
EYFS	<div style="display: flex; justify-content: space-between; align-items: center;"> <div style="border: 1px solid black; padding: 5px; width: 15%;">Count back in fives</div> <div style="text-align: center;">  </div> </div> <div style="margin-top: 10px;"> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin-left: 10%;">NB Introduce in Foundation if children are ready.</div> </div>
EYFS	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>half of 8 is 4 <math>8 \div 2 = 4</math></p> </div> <div style="text-align: center;">  </div> <div style="text-align: center;">  </div> </div> <div style="margin-top: 10px; text-align: center;"> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;">Half of 6 is 3 <math>\frac{1}{2}</math> of 6 = 3</div> </div> <div style="margin-top: 10px; text-align: right;"> <div style="border: 1px solid black; padding: 5px; width: fit-content;">Know halves</div> </div>
Y1	<div style="display: flex; justify-content: space-between; align-items: center; margin-top: 20px;"> <div style="border: 1px solid black; padding: 5px; width: 30%;">Use known multiplication facts to work out corresponding division facts</div> <div style="text-align: right; margin-right: 20px;"> <p>If <math>2 \times 10 = 20</math> then <math>20 \div 10 = 2</math> <math>20 \div 2 = 10</math></p> </div> </div>

Y1&2



Understand division as sharing

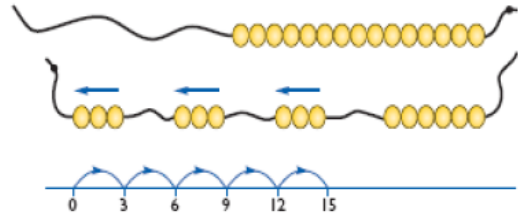
Y2&3

Understand division as grouping

How many 3s in 15?

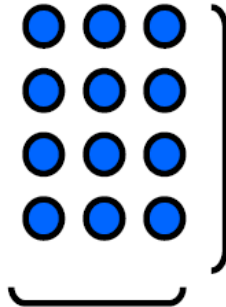


$15 \div 3 = 5$



Y2&3

Y1,2 &3 – to solve problems (in context) using manipulatives



12 divided into groups of 3 gives 4 groups  
 $12 \div 3 = 4$

12 divided into groups of 4 gives 3 groups  
 $12 \div 4 = 3$

Reinforce division as grouping through the use of arrays



Y4 – NB this method should **only** be used if children find it hard to move between the arrays method and the standard written method. For some children this method may be confusing and time consuming due to its multiple steps.

### Chunking method



$$100 \div 7 = 14 \text{ r } 2$$

$$\begin{array}{r} 100 \\ -70 \text{ (} 10 \times 7 \text{)} \\ \hline 30 \\ -28 \text{ (} 4 \times 7 \text{)} \\ \hline 2 \end{array}$$

$$518 \div 7 = 74$$

$$\begin{array}{r} 518 \\ -350 \text{ (} 50 \times 7 \text{)} \\ \hline 168 \\ -140 \text{ (} 20 \times 7 \text{)} \\ \hline 28 \\ -28 \text{ (} 4 \times 7 \text{)} \\ \hline 0 \end{array}$$

Fact Box	
$1 \times 7 = 7$	
$2 \times 7 = 14$	
$5 \times 7 = 35$	
$10 \times 7 = 70$	
$20 \times 7 = 140$	
$50 \times 7 = 350$	
$100 \times 7 = 700$	

Y4 & 5

### Standard written method (short division)

$$\begin{array}{r} 27 \\ 3 \overline{) 821} \end{array}$$

Children at Y5 will

- use this method for larger numbers  $\text{HTU} \div \text{U}$ ,  $\text{ThHTU} \div \text{U}$
- use this method to divide numbers with up to 2 decimal places.
- solve division problems involving measures and money.
- use as the inverse operation to check multiplication calculations.
- **Problem solving – remainders expressed according to the context**
- **Mixed 4 rules problem solving**
- **Scaling by simple fractions**
- **Simple rates**

Y6

Up to 4 digits by 2 digits

### Standard written method (long division)

As we are dividing by 51, children may find it useful to write their 51 times tables down the side of there page to support them. This can be done using mental repeated addition.

To calculate 748 divided by 51,  
First, set the sum out as shown:

$$51 \overline{) 748}$$

We work out 74 divided by 51, and write the answer (1) above the 4.

$1 \times 51 = 51$ , so we write this underneath 74.

Subtract 51 from 74 to get the remainder (23).

$$\begin{array}{r} 1 \\ 51 \overline{)748} \\ \underline{-51} \\ 23 \end{array}$$

We now bring down the next digit (8) and write it on the end of the 23. This is the same as writing the remainder at the top:

$$\begin{array}{r} 1 \\ 51 \overline{)748} \\ \underline{-51} \\ 238 \end{array}$$

We now work out 238 divided by 51, and write the answer (4) above the 8. You use estimation skills here: 51 is roughly 50 and  $4 \times 50 = 200$ . You can work out  $51 \times 4 = 204$  separately.

We write 204 underneath the 238 and subtract to find the remainder. There are no more digits to bring down, so we have our answer:

$$\begin{array}{r} 14 \\ 51 \overline{)748} \\ \underline{-51} \\ 238 \\ \underline{-204} \\ 34 \end{array}$$

NB: In Year 6, children will also be expected to convert their remainder to a fraction or decimal answer depending on the context of the problem.

So the answer is **14 remainder 34**.

Children working at Y6 should also be expected to:

- solve division problems involving measures and money.
- use as an inverse operation to check multiplication calculations.
- convert remainders to decimal remainders.
- **problem solving using all 4 rules**
- **use BODMAS to know the order of operations in calculations involving the 4 rules**
- **estimate to an appropriate degree of accuracy**

To carry out written methods of division successful, children need to be able to:

- understand division as repeated subtraction
- estimate how many times one number divides into another - for example, how many sixes there are in 47, or how many 23s there are in 92
- multiply a two-digit number by a single-digit number mentally
- subtract numbers using the column method.

**Note:** It is important that children's mental methods of calculation are practised and secured alongside their learning and use of an efficient written method for division.

## Concluding Statement

Calculation strategies, both mental and written, underpin much of children's achievement in other areas of mathematics, especially in problem solving and investigative learning. Encourage children to reflect upon which method or strategy they find most reliable and suits their style of learning.

By the end of Key Stage 2 it is important that children record their working out, and often marks may be awarded in SATs for clear calculations. Children should therefore be encouraged to jot down their thought processes from an early age. Many children enjoy the challenge of completing calculations at speed: mental maths challenges involving all four operations should be encouraged, especially in Key Stage 2.