



## **Dean Field Community Primary School**



### **Calculation Policy** **Year 3**

This booklet contains the calculation methods used in year 3 for each of the four operations – addition, subtraction, multiplication and division.

Please use this document as a tool to support your child at home. The methods we use in school may or may not be familiar to you. Children can become confused when they seek support from an adult at home because often, the adult will teach the method they themselves were taught.

Knowing how the methods in this booklet work will help you to help your child. All staff in school use this document so that we can ensure consistency in our approach.

# Year 3

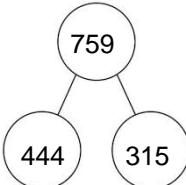
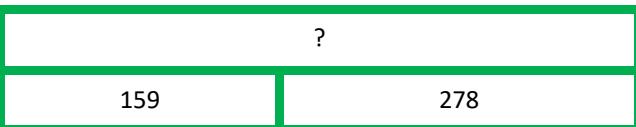
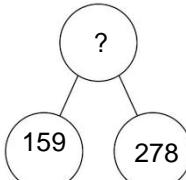
## LOWER KEY STAGE 2

The principal focus of mathematics teaching in lower key stage 2 is to ensure that pupils become increasingly fluent with whole numbers and the four operations, including number facts and the concept of place value. This should ensure that pupils develop efficient written and mental methods and perform calculations accurately with increasingly large whole numbers.

**Addition and subtraction:** Children are taught to use place value and number facts to add and subtract numbers mentally and they will develop a range of strategies to enable them to become less reliant on the ‘counting in 1s’ or fingers-based methods of Key Stage 1. In particular, children will learn to add and subtract multiples and near multiples of 10, 100 and 1000 (year 4) and will become fluent in complementary addition as an accurate means of achieving fast and accurate answers to 3-digit subtractions. Standard written methods for adding larger numbers are taught, learned and consolidated, and written column subtraction is also introduced.

**Multiplication and division:** This key stage is also the period during which all the multiplication and division facts are thoroughly memorised, including all facts up to  $12 \times 12$ . Efficient written methods for multiplying or dividing a 2-digit or 3-digit number by a 1-digit number are taught, as are mental strategies for multiplication or division with large but ‘friendly’ numbers, e.g. when dividing by 5 or multiplying by 20.

**Fractions and decimals:** Children will develop their understanding of fractions, learning to simplify fractions and find equivalents as well as finding fractions of amounts and quantities. The concept of a decimal number is introduced and children consolidate a firm understanding of 1-place decimals, dividing whole numbers by 10 and 100 and seeing the effect on the digits.

	National Curriculum Objectives	Mental calculation	Written calculation
Y3 +	<p><u>Add and Subtract numbers mentally, including:</u></p> <ul style="list-style-type: none"> <li>• a three-digit number and 1s</li> <li>• a three-digit number and 10s</li> <li>• a three-digit number and 100s</li> </ul> <p><u>Add and subtract numbers with up to 3 digits, using formal written methods of columnar addition and subtraction</u></p> <p><u>Estimate the answer to a calculation and use</u></p>	<p>Use place value knowledge to add a 3-digit number and ones, tens and hundreds up to 1000.</p> <p>Place value grids and counters are used to help children visualise and understand what they are doing mentally.</p> <p>Children are encouraged to use the basic number facts they know to help them.</p> <p>For example:</p> <p><u>Adding ones:</u>  <math>5 + 3 = 8</math> so, <math>345 + 3 = 348</math></p> <p><u>Adding tens:</u>  <math>6 + 4 = 10</math> so, <math>456 + 4 = 460</math></p>	<p><b>Continue to use part whole models and bar models</b></p> <p><b>Use to represent related addition and subtraction facts.</b></p>  <p><math>444 + 315 = 759</math>  <math>315 + 444 = 759</math>  <b>So...</b>  <math>759 - 444 = 315</math>  <math>759 - 315 = 444</math></p> <p><b>Use to help solve missing number problems/ inverse. Use to check answers to a calculation.</b></p> <p>We know that <math>159 + 278 = ?</math></p> <p>We can help visualise this problem by putting it into a bar model (or part whole model), now we know we need to add them together. We can do <math>159 + 278</math> to find our missing number (<math>=437</math>).</p> <p>We can now do <math>437 - 289</math> to check. If we get 159 we are correct.</p>  

**inverse operations to check answers**

$$70 + 20 = 90 \text{ so, } 8\cancel{7}6 + \underline{20} = 8\cancel{9}6$$

Where numbers bridge over 100, children are encouraged to look at the hundreds and tens as a 2-digit number:

$$\underline{89}1 + 10 = \underline{90}1$$

**Adding hundreds:**

$$400 + 300 = 700 \text{ so,}$$

$$\underline{47}2 + \underline{30}0 = \underline{77}2$$

Relate number bonds to 10 to number bonds to 100 and 1000 (e.g.  $3 + 7 = 10$  so  $30 + 70 = 100$  therefore  $300 + 700 = 1000$  and be able to recall them.

**Column addition for up to two 3-digit number, with 1 or more regrouping**

Use of (compact) column addition with up to two 3-digit numbers (may also do 3 digit number + 2 digit number, or three 3 digit numbers added together etc). May have no regrouping, one regroup or multiple regroups.

**Regroup once**

5	2	4
+	2	0
7	3	2
		1

Starting with the ones, add each column in turn. When adding 4 ones + 8 ones = 12 = 1 ten and 2 ones.

Place 1 ten under the equal sign on the ten column and the 2 ones in the answer ('hang it on the washing line')

**Regroup multiple times**

2	3	7
+	6	8
3	0	5
1	1	

Starting with the ones, add each column in turn. Regroup tens and hundreds as required ('hang it on the washing line')

NB: Children to understand commutative law. Numbers can be added in any order and it will not effect the answer.

NB: Emphasis to be made on the place value of each digit so children do not think it is 8 - 7. Ask questions such as 'What is the value of 8 in this calculation?', 'Can you show me this number partitioned?'

**Estimate the answer to a calculation**

Children to look for the nearest multiple of 10 or 100 and add the 2 numbers together to get an estimate.

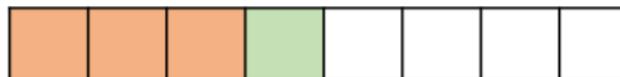
$$51 + 29 = \boxed{\phantom{0}} \quad 50 + 30 = 80$$

$$204 + 198 = \boxed{\phantom{0}} \quad 200 + 200 = 400$$

Add and subtract fractions with the same denominator within one whole

**Add and subtract fractions with the same denominator**

- Children use practical equipment and pictorial representations to add two or more fractions with the same denominator where the total is less than 1.
- Children understand that we only add the numerators and the denominators stay the same.

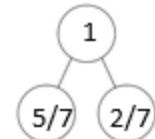


We can use this model to calculate  $\frac{3}{8} + \frac{1}{8} = \frac{4}{8}$

NB: Children need to recognise that fractions add to 1 whole

$$\frac{1}{3} + \frac{2}{3} = 1$$

$$\frac{3}{8} + \frac{5}{8} = 1$$



**Adding amounts of money**

Children add two amounts of money using pictorial representations to support them. They are encouraged to add the pounds first and then add the pence. Children then exchange the pence for pounds to complete their calculations.

£2 and 35p + £1 and 75 p. There is £3 and 110p. Altogether there is £1 and 10p.



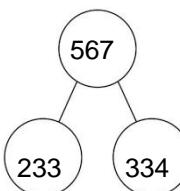
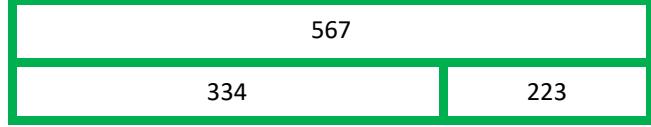
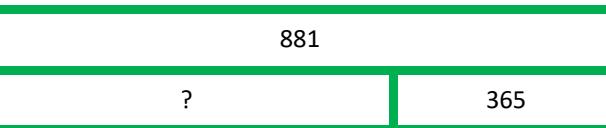
£2 and 35p



Add and subtract amounts of money to give change, using both £ and p in practical contexts



£5 and 30p + £3 and 75p. There is £8 and 105p. Altogether there is £9 and 5p.

		<p><b>Adding measurement</b></p> <p>Use of column addition with up to two 4-digit numbers (may also use up to two 5-digit number). May have no regrouping, one regroup or multiple regroups.</p> <ul style="list-style-type: none"> <li>Differentiate using the partitioning method.</li> </ul> <p>e.g. litre and millilitre 5l and 161ml + 1l and 437ml</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;">5</td><td style="text-align: center;">1</td><td style="text-align: center;">6</td><td style="text-align: center;">1</td></tr> <tr> <td style="text-align: center;">+</td><td style="text-align: center;">1</td><td style="text-align: center;">4</td><td style="text-align: center;">3</td></tr> <tr> <td colspan="4" style="text-align: center;"><hr/></td></tr> <tr> <td style="text-align: center;">6</td><td style="text-align: center;">5</td><td style="text-align: center;">9</td><td style="text-align: center;">8</td></tr> </table>	5	1	6	1	+	1	4	3	<hr/>				6	5	9	8
5	1	6	1															
+	1	4	3															
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6	5	9	8															
<b>Y3</b> —	<p><b>Add and subtract numbers mentally, including:</b></p> <p><b>Add and subtract numbers with up to 3 digits, using formal written methods of columnar addition and subtraction</b></p> <p>For example:</p> <p><b>Subtracting ones:</b> <math>5 - 3 = 2</math> so, <math>345 - 3 = 342</math></p> <p><b>Subtracting tens:</b> <math>70 - 20 = 50</math> so, <math>876 - 20 = 856</math></p> <p>Where numbers bridge over 100, children are encouraged to look at the hundreds and tens as a 2-digit number: <math>801 - 10 = 791</math></p> <p><b>Subtracting hundreds:</b></p>	<p><b>Continue to use part whole models and bar models</b></p> <p><b>Use to represent related addition and subtraction facts.</b></p>  $233 + 334 = 567$ $334 + 233 = 567$ <p><b>So...</b></p> $567 - 334 = 233$ $567 - 233 = 334$  <p><b>Use to help solve missing number problems and represent inverse.</b></p> <p>We know that <math>781 - ? = 365</math></p> <p>We can help visualise this problem by putting it into a bar model (or part whole model) like on the right.</p> <p>Now we can see the other subtraction we need to do.</p> <p>We now know we can do <math>881 - 365</math> to find our missing number which is 516</p>  <p><b>Column subtraction for up to two 3-digit number, with 1 or more exchange</b></p>																

Estimate the answer to a calculation and use inverse operations to check answers

Add and subtract fractions with the

$$400 - 300 = 100 \text{ so,}$$
$$\underline{4}72 - \underline{3}00 = \underline{1}72$$

Use of (compact) column subtraction with up to two 3-digit numbers (may also do 3-digit number – 2 digit number etc). May have no exchanging, one exchange or multiple exchanging.

### One exchange

A column subtraction diagram for the calculation  $472 - 305$ . The numbers are arranged in three columns: hundreds, tens, and ones. Above the hundreds column, there is a small '1' with a diagonal line through it, indicating an exchange. The digits are: hundreds (4, 3), tens (7, 0), and ones (2, 5). The result is 135.

2	3	10
-	1	0 5
	1	3 5

Starting with the ones, subtract each column in turn. When subtracting 0 ones from 5 ones, exchange 1 ten from the tens column to make 1 ten and 4 ones (14). Change the 4 tens into 3 tens.

NB: Emphasis to be made on the place value of each digit so children do not think it is 2 - 1. Ask questions such as 'What is the value of 2 in this calculation?', 'Can you show me this number partitioned?'

### Multiple exchanging

A column subtraction diagram for the calculation  $459 - 268$ . The numbers are arranged in three columns: hundreds, tens, and ones. There are two exchanges indicated by small '1's with diagonal lines: one in the tens column and one in the hundreds column. The digits are: hundreds (4, 2), tens (5, 6), and ones (9, 8). The result is 238.

4	5	9
-	2	6 8
	2	3 8

Starting with the ones, subtract each column in turn. Exchange in the tens / hundreds as required

### Estimation:

Children to look for the nearest multiple of 10 or 100 and subtract the 2 numbers to get an estimate.

$$59 - 31 = \boxed{\quad} \quad 60 - 30 = 30$$

$$598 - 203 = \boxed{\quad} \quad 600 - 200 = 400$$

### Add and subtract fractions with the same denominator

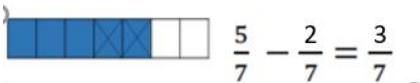
Children use practical equipment and pictorial representations to subtract fractions with the same denominator within one whole.

same denominator  
within one whole

Add and subtract  
amounts of money to  
give change, using both  
£ and p in practical  
contexts

Children understand that we only subtract the numerators and the denominators stay the same.

Use the models to help you subtract the fractions.

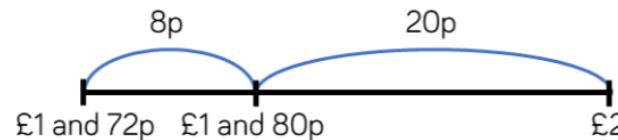

$$\frac{5}{7} - \frac{2}{7} = \frac{3}{7}$$

**Subtracting amounts of money**

Children use different methods to subtract money. They will see examples where they can physically remove the coins, and examples where they will need to use their knowledge of converting money to exchange £1 for 100 pence. Children also use number lines to count on or back to calculate the difference between two amounts.



Alex has £3 and 50p. She gives £2 and 10p to her sister. How much money does she have left?  $\text{£}3 - \text{£}2 = \text{£}1$ .  $50\text{p} - 10\text{p} = 40\text{p}$ . Alex has £1 and 40p remaining.



Tommy has £1 and 72p. Rosie has £2. How much more money does Rosie have than Tommy?

Rosie has 28p more than Tommy

**Subtracting measurement**

Use of column subtraction with up to two 4-digit numbers (may also use up to two 5-digit number). May have no regrouping, one regroup or multiple regroups.

- Differentiate using the partitioning method.

e.g. litre and millilitre  
7l and 263ml – 2l and 621ml

6	7	1	2	6	3
-	2	6	2	1	
	4	6	4	2	

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

Write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods

Know by heart all the multiplication facts in the  $\times 3$ ,  $\times 4$  and  $\times 8$  tables  
Recognise that multiplication is commutative

$$3 \times 5 = 15$$

$$5 \times 3 = 15$$

NB: Reinforce division facts as inverse of multiplication throughout teaching.

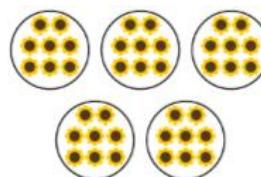
Multiplying by 1  
Know that any number  $\times$  by 1 = itself  
**For example:**  $8 \times 1 = 8$

Multiplying by 0  
Know that any number  $\times$  by 0= 0



Understanding multiplication as equal groups of and that multiplication is commutative.

There are 3 equal groups of 4.  
 $3 \times 4 = 12$  or  $4 \times 3 = 12$



There are 5 equal groups of 8.  
 $5 \times 8 = 40$  or  $8 \times 5 = 40$

Using known multiplication facts and partitioning to answer 2 digit by 1digit calculations :

Tens	Ones
10 10 10	1 1
10 10 10	1 1
10 10 10	1 1

$$\begin{array}{r} 3 \ 2 \\ \times \ 3 \\ \hline 9 \ 6 \end{array}$$

$$30 \times 3 = 90 \quad (3 \times 3)$$

$$2 \times 3 = 6$$

$$30 + 6 = 36$$

#### Formal written method: 2 digit numbers by 1 digit number (2, 3, 4, 5 and 8 times tables)

##### No regrouping

$$\begin{array}{r} & 3 & 4 \\ \times & & 2 \\ \hline & 6 & 8 \end{array}$$

##### With Regrouping

$$\begin{array}{r} & 2 & 4 \\ \times & & 4 \\ \hline & 9 & 6 \\ & 1 & \end{array}$$

$$\begin{array}{r} & 3 & 4 \\ \times & & 8 \\ \hline & 2 & 7 & 2 \\ & 2 & 3 & \end{array}$$

NB: Emphasis to be made on the place value of each digit so children do not think it is  $2 \times 3$ . Ask questions such as 'What is the value of 3 in this calculation?', 'Can you show me this number partitioned?'

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

Know by heart all the division facts derived from the  $\times 2$ ,  $\times 3$ ,  $\times 4$ ,  $\times 5$ ,  $\times 8$  and  $\times 10$  tables.

Recognise that division is not commutative

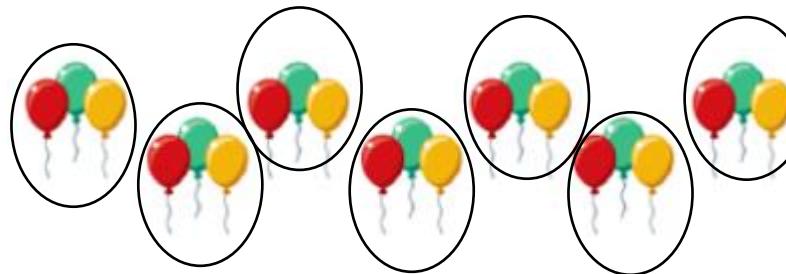
Use place value and number facts in mental division

Check that Children can halve even numbers to 100, halve odd numbers to 20

NB: Reinforce multiplication facts as inverse of division throughout teaching columns.

Write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods

To understand division as equal groupings:



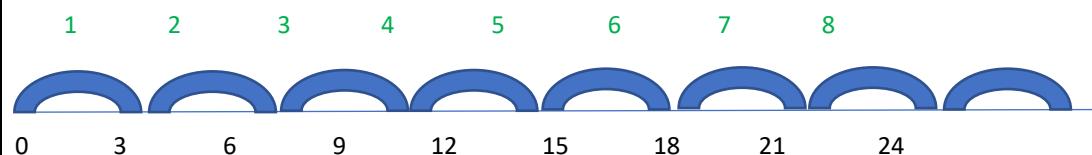
21 shared into equal groups of 3.

$$21 \div 3 = 7 \text{ or } 21 \div 7 = 3$$

Chunking on a number line: (numbers that will divide equally by 2, 3, 4, and 8)

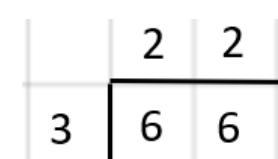
Using a number line to count from zero in the multiple until you get to the required amount. Count the number of jumps made to get the answer.

$$24 \div 3 = 8$$

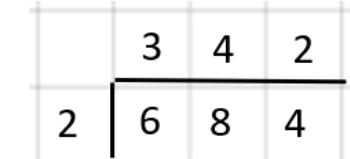


Bus stop method: (2 and 3 digit, multiples of 2, 3, 4, 5 and 8- no remainders)

No regrouping



With regrouping



NB: Emphasis to be made on the place value of each digit so children do not think it is 3 ÷ 6. Ask questions such as 'What is the value of 6 in this calculation?', 'Can you show me this number partitioned?'

$$\begin{array}{r} 1 \quad 2 \\ \hline 8 \quad | \quad 9 \quad \textcolor{teal}{1} \quad 6 \end{array}$$

Diagrams to help:

1 equal group of 8 and 1 remaining



$$\begin{array}{r} 1 \quad 5 \quad 2 \\ \hline 4 \quad | \quad 6 \quad \textcolor{teal}{2} \quad 0 \quad 8 \end{array}$$

1 equal group of 4 and 2 remaining

