

# Pathfinder Multi Academy Trust

## Calculation Policy

This calculation policy is a working document, to be revised and amended as necessary, and has been developed by the maths leaders in the Pathfinder Multi Academy Trust. It is a guide for staff, pupils and parents and is set out into year groups as a progression of calculation methods, skills and vocabulary. Teachers should use this policy **alongside** the additional guidelines (White Rose Maths Hub) and resource documents.

At the centre of the mastery approach to the teaching of mathematics is the belief that **all children have the potential to succeed**. They should have access to the same curriculum content and **deepen their conceptual understanding by tackling differentiated, challenging and varied problems**. Similarly, with calculation strategies, children must not simply rote learn procedures, but demonstrate their understanding of these procedures, through the use of Concrete Pictorial Abstract CPA as appropriate, and in reasoning and problem solving activities.

This policy outlines the different calculation methods which should be used as outcomes in the EYFS curriculum and the national curriculum in Y1 to Y6.

To ensure consistency throughout school this policy outlines the following Whole School and Year group expectations:

- A consistent approach to teaching and learning
- Agreed calculation strategies
- Non negotiable methods for written and mental calculations
- Precise mathematical vocabulary to be used (see additional guidelines)
- Consistent approach to setting out calculations
- Clear outcomes for every year group and key stage.

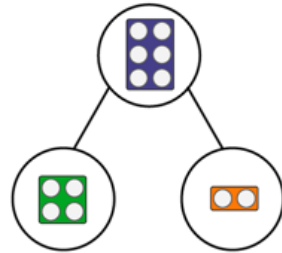
# EYFS OUTCOMES

Children should develop a deep, conceptual understanding of numbers up to 20, the relationships between them and the patterns therein.

## Addition

What? Count on to add two single-digit numbers; count sets of objects reliably up to 20.

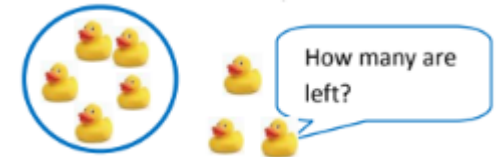
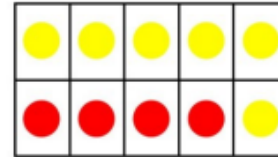
How? Number songs, rhymes and stories; counting on in ones using fingers, concrete and/or pictorial methods.



## Subtraction

What? Count back to subtract two single-digit numbers;

How? Number songs, rhymes and stories; counting back in ones using fingers, concrete and/or pictorial methods..



## Multiplication

What: Double a number up to 10; counting in 2s, 5s and 10s up to 20

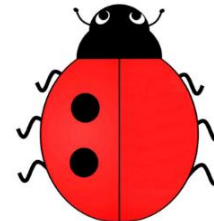
How? Number songs; using concrete and/or pictorial methods



## Division

What: Halve a number up to 10; sharing objects fairly

How? Number songs; halving groups using concrete and/or pictorial methods.



# YEAR ONE OUTCOMES

These are the non-negotiable outcomes for the year.

Further information and methods, including concrete, pictorial and abstract approaches, are included in the attached White Rose Maths guidelines.

## Addition

What do they need to be able to do?

- Add 1 and 2 digit numbers to 20

How should they do it?

- Use a numbered number line, beginning with the larger number and counting on in ones.

## Subtraction

What do they need to be able to do?

- Subtract a 1-digit number from a 2-digit number up to 20.

What do they need to be able to do?

- Use a numbered number line, beginning with the larger number and counting back in ones.

## Multiplication

What do they need to be able to do?

- Solve one-step problems involving multiplication; double numbers; counting in 2s, 5s and 10s.

What do they need to be able to do?

- Draw and count arrays; use concrete and/or pictorial methods to double.

## Division

What do they need to be able to do?

- Solve one-step problems involving division; halve numbers;

What do they need to be able to do?

- Use pictorial representation; using concrete and/or pictorial methods to halve.

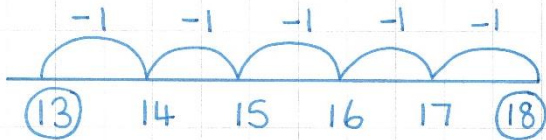
# YEAR ONE METHODS

These are the non-negotiable outcomes for the year.

Further information and methods, including concrete, pictorial and abstract approaches, are included in the attached White Rose Maths guidelines.

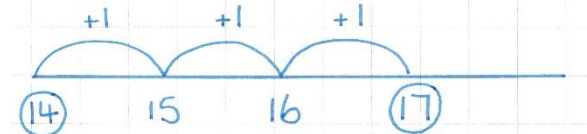
## Addition

$$18 - 5 = 13$$



## Subtraction

$$14 + 3 = 17$$



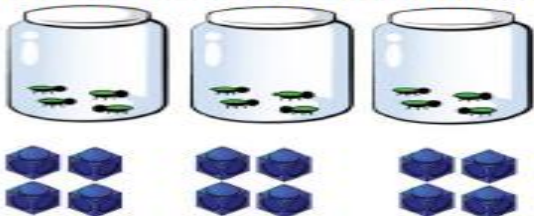
## Multiplication

Repeated grouping/repeated addition

$$3 \times 4$$

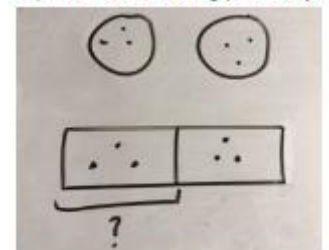
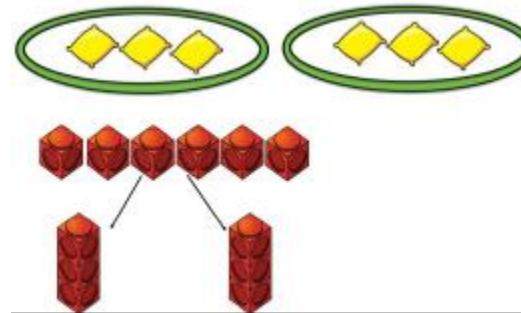
$$4 + 4 + 4$$

There are 3 equal groups, with 4 in each group.



## Division

Represent the sharing pictorially.



# YEAR TWO OUTCOMES

These are the non-negotiable outcomes for the year.

Further information and methods, including concrete, pictorial and abstract approaches, are included in the attached White Rose Maths guidelines.

## Addition

What do they need to be able to do?

- Add 2, two digit numbers
- Use the inverse to check a calculation

How should they do it?

- Use the partitioning method
- Introduce the column method as appropriate ( no regrouping)

## Subtraction

What do they need to be able to do?

- Subtract 2, two digit numbers.

How should they do it?

- Use an empty number line, starting at the right
- Introduce the column method as appropriate ( no regrouping)

## Multiplication

What do they need to be able to do?

- Use multiplication facts to solve problems

How should they do it?

- Use repeated addition
- Write a fact family
- Use knowledge of multiplication facts to write a number sentence

## Division

What do they need to be able to do?

- Solve one-step problems involving division; halve numbers;

How should they do it?

- Sharing and grouping amounts
- Write a fact family
- Use knowledge of division facts to write a number sentence

# YEAR TWO METHODS

These are the non-negotiable outcomes for the year.

Further information and methods, including concrete, pictorial and abstract approaches, are included in the attached White Rose Maths guidelines.

## Addition

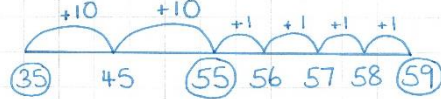
$$\begin{array}{r} 35 + 24 = 59 \\ \textcircled{30} \textcircled{5} \quad \textcircled{20} \textcircled{4} \end{array}$$

$$30 + 20 = 50$$

$$5 + 4 = 9$$

$$50 + 9 = 59$$

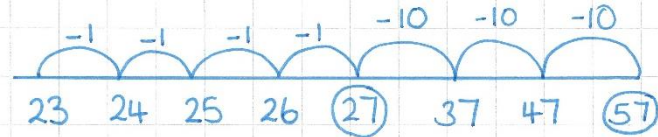
$$35 + 24 = 59$$



## Subtraction

$$57 - 34 = 23$$

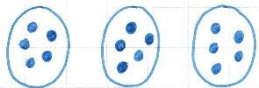
$$\textcircled{30} \textcircled{4}$$



## Multiplication

$$5 + 5 + 5 = 15$$

$$3 \times 5 = 15$$



3 groups of 5



$$3 \times 5 = 15$$

## Division

### Grouping

$$12 \div 2 = 6$$



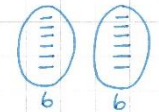
1 2 3 4 5 6

$$12 \div 2 = 6$$

count in twos - 2, 4, 6, 8, 10, 12

### Sharing

$$12 \div 2 = 6$$



equal groups

# YEAR THREE OUTCOMES

These are the non-negotiable outcomes for the year.

Further information and methods, including concrete, pictorial and abstract approaches, are included in the attached White Rose Maths guidelines.

## Addition

What do they need to be able to do?

- Add numbers up to 1000 using a formal columnar method.

How should they do it?

- Use column addition to add numbers up to 1000.

## Subtraction

What do they need to be able to do?

- Subtract numbers up to 1000 using a formal columnar method.

How should they do it?

- Use column subtraction to subtract larger numbers, including decomposition as necessary.

## Multiplication

What do they need to be able to do?

- Multiply a 2 digit number by a 1 digit number

How should they do it?

- Grid method of multiplication using partitioning. Some may move on to formal methods of columnar multiplication.

## Division

What do they need to be able to do?

- Divide a 2 digit number by a 1 digit number;


How should they do it?

- Use of chunking (subtracting large multiples of the divisor, using known multiplication facts.)

# YEAR THREE METHODS

These are the non-negotiable outcomes for the year.

Further information and methods, including concrete, pictorial and abstract approaches, are included in the attached White Rose Maths guidelines.

Addition 

$$\begin{array}{r} 243 \\ +368 \\ \hline 611 \\ \hline 11 \end{array}$$

Subtraction 

$$\begin{array}{r} 6 \quad 1 \quad 5 \\ 735 \\ -282 \\ \hline 453 \end{array}$$

Multiplication 

$46 \times 3 = 138$

x	40	6
3	120	18

$$\begin{array}{r} 120 \\ + 18 \\ \hline 138 \end{array}$$
$$\begin{array}{r} 46 \\ \times 3 \\ \hline 138 \\ \hline 1 \end{array}$$

Division 

$$\begin{array}{r} 64 \div 8 = 8 \\ \hline 40 \div 8 = 5 \quad + \quad 24 \div 8 = 3 \end{array}$$



# YEAR FOUR OUTCOMES

These are the non-negotiable outcomes for the year.

Further information and methods, including concrete, pictorial and abstract approaches, are included in the attached White Rose Maths guidelines.

## Addition

What do they need to be able to do?

- Add numbers up to 10,000.

How should they do it?

- Use formal column addition to add larger numbers,

## Subtraction

What do they need to be able to do?

- Subtract numbers up to 10,000

How should they do it?

- Use column subtraction to subtract larger numbers, including decomposition if necessary

## Multiplication

What do they need to be able to do?

- Multiply a two or three digit number by a 1 digit number

How should they do it?

- Formal short multiplication

## Division

What do they need to be able to do?

- Use mental methods to derive division facts (e.g. use  $7 \times 8$  to solve  $560 \div 7$ ;
- Begin to move towards a formal method of division, using concrete or pictorial methods.

# YEAR FOUR METHODS

These are the non-negotiable outcomes for the year.

Further information and methods, including concrete, pictorial and abstract approaches, are included in the attached White Rose Maths guidelines.

## Addition



$$\begin{array}{r}
 3784 \\
 + 2836 \\
 \hline
 6620 \\
 \hline
 \end{array}$$

## Subtraction



$$\begin{array}{r}
 8438 \\
 - 6275 \\
 \hline
 2163 \\
 \hline
 \end{array}$$

## Multiplication



$$\begin{array}{r}
 473 \\
 \times 6 \\
 \hline
 2838 \\
 \hline
 \end{array}$$

## Division

Step 1 Build the number	Step 2 Share the tens	Step 3 Share the ones																				
$87 - 4$  	 $80 - 4 = 20$ <table border="1"> <thead> <tr> <th>T</th> <th>O</th> </tr> </thead> <tbody> <tr> <td>10 10</td> <td></td> </tr> <tr> <td>10 10</td> <td></td> </tr> <tr> <td>10 10</td> <td></td> </tr> <tr> <td>10 10</td> <td></td> </tr> </tbody> </table>	T	O	10 10		10 10		10 10		10 10		 $80 - 4 = 20$ $7 - 4 = 1 \text{ r } 3$ $20 + 1 \text{ r } 3 = 21 \text{ r } 3$ $87 - 4 = 21 \text{ r } 3$ <table border="1"> <thead> <tr> <th>T</th> <th>O</th> </tr> </thead> <tbody> <tr> <td>10 10</td> <td>1</td> </tr> <tr> <td>10 10</td> <td>1</td> </tr> <tr> <td>10 10</td> <td>1</td> </tr> <tr> <td>10 10</td> <td>1</td> </tr> </tbody> </table>	T	O	10 10	1	10 10	1	10 10	1	10 10	1
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# YEAR FIVE OUTCOMES

These are the non-negotiable outcomes for the year.

Further information and methods, including concrete, pictorial and abstract approaches, are included in the attached White Rose Maths guidelines.

## Addition

What do they need to be able to do?

- Add numbers with over 4 digits using a formal columnar method.

How should they do it?

- Use column addition to add larger numbers, or numbers with decimals, as set out below.

## Subtraction

What do they need to be able to do?

- Subtract numbers with over 4 digits using a formal columnar method.

How should they do it?

- Use column subtraction to subtract larger numbers, or numbers with decimals, as set out below or
- Select an appropriate mental method e.g. using number bonds to subtract from a power of ten.

## Multiplication

What do they need to be able to do?

- Multiply by a one- or –two digit number
- Multiply by 10, 100 or 1000

How should they do it?

- Short multiplication or long multiplication (as set out below)
- Mental method or place value grid to multiply by 10, 100 or 1000

## Division

What do they need to be able to do?

- Divide a 3- or 4-digit number by a one digit number;
- Interpret remainders according to context, and represent appropriately (e.g. as a fraction, decimal, round up or down etc;)


How should they do it?

- Formal method of short division (see layout below)

# YEAR FIVE METHODS

These are the non-negotiable outcomes for the year.

Further information and methods, including concrete, pictorial and abstract approaches, are included in the attached White Rose Maths guidelines.

Addition 

$$\begin{array}{r} 1403.7 \\ + 329.5 \\ \hline 1733.2 \end{array}$$


Subtraction 

$$\begin{array}{r} 8438 \\ - 6275 \\ \hline 2163 \end{array}$$

Multiplication 

$$\begin{array}{r} 372 \\ \times 54 \\ \hline 1488 \\ 18600 \\ \hline 20088 \end{array}$$

$$\begin{array}{r} 473 \\ \times 6 \\ \hline 2838 \end{array}$$

Division 

$$8 \overline{) 793} \begin{array}{l} 099 \\ r. 1 \end{array}$$

# YEAR SIX OUTCOMES

These are the non-negotiable outcomes for the year.

Further information and methods, including concrete, pictorial and abstract approaches, are included in the attached White Rose Maths guidelines.

## Addition and Subtraction

What do they need to be able to do?

- Solve multi-step problems using an appropriate method.

How should they do it?

- As Year 5 – using a formal columnar method.

## Multiplication



What do they need to be able to do?

- Multiply a 4 digit number by a 2 digit number

How should they do it?

- Short multiplication or long multiplication (as set out below)

## Division



What do they need to be able to do?

- Divide a 3- or 4-digit number by a two digit number
- Interpret remainders according to context, and represent appropriately (e.g. as a fraction, decimal, round up or down etc;)

How should they do it?

- Formal method of long division

# YEAR SIX METHODS

These are the non-negotiable outcomes for the year.

Further information and methods, including concrete, pictorial and abstract approaches, are included in the attached White Rose Maths guidelines.

## Addition and Subtraction – consolidation of earlier methods.

### Multiplication



$$\begin{array}{r} 372 \\ \times 54 \\ \hline 1488 \\ 18600 \\ \hline 20088 \end{array}$$

### Division



$$4465 \div 19 = 235$$

$$\begin{array}{r} 0235 \\ 19 \overline{) 4465} \\ \underline{-38} \phantom{0} \\ 056 \\ \underline{-57} \phantom{0} \\ 095 \end{array}$$

- ① 19
- ② 38
- ③ 57
- ④ 76
- ⑤ 95

$$1371 \div 40 = 34 \text{ r } 11$$

$$\begin{array}{r} 0034 \text{ r } 11 \\ 40 \overline{) 1371} \\ \underline{-120} \phantom{0} \\ 0171 \\ \underline{-160} \phantom{0} \\ 011 \end{array}$$

- ① 40
- ② 80
- ③ 120
- ④ 160
- ⑤ 200