

## FOSSE MEAD PRIMARY ACADEMY

# Calculation 

methods

## Maths at Fosse

Underpinning all teaching of numeracy across Fosse Mead Primary Academy are core principles:

## Consistency

Accessibitity

## Challenge

Fun

## Engagement

Teaching core number skills underpins strong Numeracy teaching and in turn strong Numeracy learning. Across the school, counting and calculation should be used to engage and support learning.

Throughout all of our Calculation teaching the focus on consistency is key alongside high quality teaching which ensures all pupils fully understand the concept they are being taught.

The following pages show the formalised methods for calculation used in the different year groups across FMPA. In order to reach these methods, pupils move through the CPA approaches alongside the range ofpractical methods used throughout White Rose Maths.

The steps leading to this point can be seen in the CPA documentation which breaks down each operation individually.


Physical -> images -> number sentence

## Cubes:

Initial teaching is physical with gathering groups of cubes and counting your total.

Fingers:
Addition then moves to counting on using fingers.

Numberline:
Abstract concept of numbers is introduced with children jumping along a numberline- Big Maths step 9
$2 d+2 d$
At the end of Year 1 addition of a 2 digit and 2 digit number is taught by holding one number in the head and counting along the second number on a numberline.

Physical:
Multiplication begins with the physical concept of 'lots of' an object- often using cubes.

Images:
Continuing with the concept of lots of, children are shown to create lots of an object as images or dots and count them up.


GD:
Children are extended to begin learning their multiplication facts for rapid recall through a range of active methods and regular practise.

Principle Irrelevant Matter:
During Year 1 the concept of PIM is introduced where the 'thing' you are multiplying can change but your answer is the same eg KG or M

Physical -> images -> number
sentence -> PIM

## Physical:

Children begin by sharing physical objects into halves, quarters or thirds.

## Grouping:

The physical sharing is quickly moved to using dots to split a number into groups, using either circles or grids.


GD:
Move on from using written grouping methods to learning core facts of division.

Physical -> grouping -> number sentence

$\square$ column methods

Cubes:
Knowledge is secured using physical objects.

Numberline/ number square:
Children use numberlines and number squares to solve addition by counting on.

Column methods:
Speedy Col forms the core of addition methods in year 2.

| 2 |
| :--- |
| $+\quad 3$ |
| 5 |\(\quad \begin{aligned} \& Initially the 1 d+1 d number sentences are <br>

\& used to secure the layout.\end{aligned}\)

$$
12
$$

Children very quickly move on to $2 d+2 d$ using the column layout initially without carrying then with.


Physical -> numberline -> column methods

Cubes:
Physical methods are used to secure subtraction knowledge.

Column methods:
Speedy Col forms the core of subtraction methods in Year
9
$-\frac{2}{7}$$\quad \begin{aligned} & \text { Initially the 1d-1d number sentences are used } \\ & \text { to secure the layout. }\end{aligned}$
7 -
Children very quickly move on to $2 \mathrm{~d}-2 \mathrm{~d}$ using the column layout without borrowing.

- $\frac{13}{11}$


## EVIDENTIARY METHODS

Within addition and subtraction FAB methods are used for mental addition and subtraction to provide evidence for SATs

Physical:
Multiplication begins with the physical concept of 'lots of' an object- often using cubes.

Images:
Continuing with the concept of lots of, children are shown to create lots of an object as images or dots and count them up.


TT facts:
Children learn their core TT facts following the TMET Teaching Times Tables schedule with their knowledge being secured through practise on TT rockstars.

## Principle Irrelevant Matter:

During Year 2 the concept of PIM is continued where the 'thing' you are multiplying can change but your answer is the same eg KG or M


Physical -> images -> number sentence -> PIM

## Physical:

Children begin by sharing physical objects into groups.

## Grouping:

The physical sharing is quickly moved to using dots to split a number into groups, using either circles or grids.


## Division Facts

Move on from using written grouping methods to learning core facts of division, these are beginning to link as switchers of multiplication facts.

Physical -> grouping -> number sentence


Column methods:
Speedy col methods are used throughout Year 3 up to step 6.
Children begin by securing the use of $2 \mathrm{~d}+$

2 d without carrying. \begin{tabular}{r}
12 <br>

\hline | 23 |
| :--- |
| 35 | <br>

\hline
\end{tabular}

1
12 Pupils are then extended through to solving
$+\underline{19}$ a $2 \mathrm{~d}+2 \mathrm{~d}$ with carrying.
31

Decimals and addition:
The use of decimals in column addition are introduced in the frame of money- where both numbers have 2dp and lining up the decimal is the new skill.

TT facts:
Children learn their core TT facts following the TMET Teaching Times Tables schedule with their knowledge being secured through practise on TT rockstars.

SMILE:
The concept of smile multiplication is used alongside the PIM principle when multiplying $10 \mathrm{~s}, 100$ s or 1000 s

$$
\underbrace{20 \times 3}_{6}=60
$$

Column multiplication:
Children begin by laying out 1dx1d as column to bridge their knowledge before moving to 2d x 1d within Times Tables they are secure with (Speedy Col step 1)


Column methods:

Speedy col methods are used throughout Year 3 up to step 5
Children begin by securing the use of $2 d-\quad-\frac{11}{31}$
2d without borrowing.

$$
\begin{aligned}
2 \text { B2 } & \text { Pupils are then extended through to solving } \\
-\quad 19 & \text { a } 2 \mathrm{~d}-2 \mathrm{~d} \text { with borrowing. }
\end{aligned}
$$

|  | 21 <br> Pupils then move on to completing 3d-3d <br> with borrowing- remaining within equal <br> number of digits. |
| :--- | ---: |

## Decimals and subtraction:

The use of decimals in column subtraction are introduced in the frame of money- where both numbers have 2 dp and lining up the decimal is the new skill.

## Division Facts

Learning of the division facts (switchers) from Times Tables continues throughout the year, secured through practise on TT Rockstars.

SMILE:
The concept of smile division is used to support It's Nothing New where children can 'spot' division facts.

$$
60 \div 3=20
$$

Bus Stop division:
Bus stop method is used within times tables the children are aware of, initially with no carrying in the question moving on to carrying numbers and leaving remainders.



Column methods:
Speedy col methods are used throughout Year 4

|  | 1 |
| :--- | :---: |
| Pupils begin by securing 3d+ 3d with | 212 |
| carrying- remaining within equal | +119 <br> number of digits. <br> 11 |
| 2812  <br> $+\frac{6419}{9231}$ Throughout the year pupils move to $4 d+4 d$ |  |

Pupils also complete column addition with mixed numbers of digits such as $4 d+2 d$, focusing on Squiggleworth for place value.

$$
\begin{array}{r}
11 \\
4578 \\
+\quad 43 \\
\hline 4621
\end{array}
$$

Decimal addition is taught through money with GD pupils experiencing $£$ and $p$ adding to $p$.

## COLUMN METHODS

Column methods:
Speedy col methods are used throughout Year 4

| Pupils begin by securing their | ${ }^{2}{ }^{1} 2$ | 21 272 |
| :---: | :---: | :---: |
| knowledge up to 3d-3d. | - 19 | 119 |
|  | 13 | 113 |

Pupils then move on to completing $4 \mathrm{~d}-4 \mathrm{~d}$ with borrowing - remaining within equal number of digits.

Finally pupils move to subtraction with a mixed number of digits such as 4d-2d, focussing on Squiggleworth for place value.

| Decimal subtraction is | 71 |
| :--- | ---: |
| continued in the context | $£ 2.85$ |
| of money, though num- | $-\quad £ 1.36$ |
| bers are both presented | $£ 1.49$ |
| as $£$ and $p$. |  |

## Division Facts

Learning of the division facts (switchers) from Times Tables continues throughout the year, secured through practise on TT Rockstars.

SMILE:
The concept of smile division is used to support It's Nothing New where children can 'spot' division facts.

$$
160 \div 8=20
$$

Bus Stop division:
Bus stop method is used within times tables the children are aware of, initially with no carrying in the question moving on to carrying numbers and leaving remainders up to $3 \mathrm{~d} \div 1 \mathrm{~d}$



Column methods:
Speedy Col methods are used throughout Year 5 building on the previous teaching and moving to decimals.


This moves to numbers with mixed decimal places.


Children finally move to whole numbers + decimal numbers, using 0 place holders alongside their secure understanding of place value.

$$
\begin{array}{r}
5.00 \\
+\quad 1.23 \\
\hline 6.23
\end{array}
$$

## COLUMN METHODS

Column methods:
Column methods from previous years are continued and extended into decimals.

Initially children experience subtraction with
71
2.82 an equal number of given decimal places.
$-\frac{1.69}{1.13}$

This moves to numbers with mixed decimal places.


Children finally move to whole numbers- decimal numbers, using 0 place holders alongside their secure understanding of place value.

$$
\begin{array}{r}
48.01 \\
-\quad 1.23 \\
\hline 3.77
\end{array}
$$

TT facts:
Children learn their core TT facts following the TMET Teaching Times Tables schedule with their knowledge being secured through practise on TT rockstars.

SMILE:
The concept of smile multiplication is secured alongside the PIM principle when multiplying 10s, 100s or 1000s


Column multiplication:
Children work through Speedy Col multiplication drive to $4 \mathrm{~d} x$ 2d


SMILE and Column

Division Facts
Learning of the division facts (switchers) from Times Tables continues throughout the year, secured through practise on TT Rockstars.

SMILE
The concept of smile division is used to support It's Nothing New where children
 can 'spot' division facts.

Bus Stop division:
Methods for Bus Stop division taught in previous years are revisited and secured with pupils being able to divide any number by a 1 digit number.

## Column methods:

All previous Year group methods are revised and re-taught ensuring children have a secure understanding of carrying.

Focus time is given to completing addition with decimal numbers.

Column methods:
All previous Year group methods are revised and re-taught ensuring children have a secure understanding of borrowing and place value.

Focus time is given to completing subtraction with decimal numbers.

Division Facts
Learning of the division facts (switchers) from Times Tables continues throughout the year, secured through practise on TT Rockstars.

Bus Stop division:
Methods for Bus Stop division taught in previous years are revisited moving to resolving remainders in questions up to


$$
3 \longdiv { 2 8 4 7 \cdot 3 3 } \begin{array} { c } 
{ 8 ^ { 2 } 5 ^ { 1 } 4 2 } \\
{ 2 } \\
{ 1 0 1 0 }
\end{array}
$$

## Learn-Its

Learn-Its are core number facts that are crucial to being able to complete calculations quickly and effectively. To successfully learn the Learn-Its children should practise them in class at a manageable rate ensuring they also practise the switchers and fact families.

Switchers- these are the inverse, if you know $3 \times 4=12$ then you also know that 12 $\div 4=3$

Switchers link into Fact Families where children learn a series of connected number sentences.

## $7+8=15$ <br> $8+7=15$ <br> $15-7=8$ <br> $15-8=7$

## The 36 Addition 'Learn Its'

| + | $\mathbf{2}$ | $\mathbf{3}$ | $\mathbf{4}$ | $\mathbf{5}$ | $\mathbf{6}$ | $\mathbf{7}$ | $\mathbf{8}$ | $\mathbf{9}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| $\mathbf{2}$ | 4 |  |  |  |  |  |  |  |
| $\mathbf{3}$ | 5 | 6 |  |  |  |  |  |  |
| $\mathbf{4}$ | 6 | 7 | 8 |  |  |  |  |  |
| $\mathbf{5}$ | 7 | 8 | 9 | 10 |  |  |  |  |
| $\mathbf{6}$ | 8 | 9 | 10 | 11 | 12 |  |  |  |
| $\mathbf{7}$ | 9 | 10 | 11 | 12 | 13 | 14 |  |  |
| $\mathbf{8}$ | 10 | 11 | 12 | 13 | 14 | 15 | 16 |  |
| $\mathbf{9}$ | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |

The $\mathbf{3 6}$ Multiplication 'Learn Its'

| $\mathbf{x}$ | $\mathbf{2}$ | $\mathbf{3}$ | $\mathbf{4}$ | $\mathbf{5}$ | $\mathbf{6}$ | $\mathbf{7}$ | $\mathbf{8}$ | $\mathbf{9}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| $\mathbf{2}$ | 4 |  |  |  |  |  |  |  |
| $\mathbf{3}$ | 6 | 9 |  |  |  |  |  |  |
| $\mathbf{4}$ | 8 | 12 | 16 |  |  |  |  |  |
| $\mathbf{5}$ | 10 | 15 | 20 | 25 |  |  |  |  |
| $\mathbf{6}$ | 12 | 18 | 24 | 30 | 36 |  |  |  |
| $\mathbf{7}$ | 14 | 21 | 28 | 35 | 42 | 49 |  |  |
| $\mathbf{8}$ | 16 | 24 | 32 | 40 | 48 | 56 | 64 |  |
| $\mathbf{9}$ | 18 | 27 | 36 | 45 | 54 | 63 | 72 | 81 |

## Teaching Learn-Its,

## Times Tables and other teaching

## ideas

Core to teaching mathematics at Fosse Mead is making the learning engaging, active and fun.

Times-Table Tennis- children work in pairs and chant through a times table 'hitting' the answer across to their partner.

Multiple dance off! - Similar to traditional chanting of times tables, however children are stood and will do a dance move as they chant through. This encourages the children to be active and makes the chanting more fun.

BUZZ-encouraging counting and knowledge of times tables, children stand in a circle and count along in ones. The teacher names a times table and the multiples of that number must be missed and replaced with the word BUZZ! To extend this game you can add a second Times table where children will FIZZ on the number, and if the number is a multiple of both FIZZ-BUZZ!

Fact famities- within learn its the children are shown the inverse operation referred to as the switcher. They learn that these live in families called fact families. Once you know one fact, you actually know 4!
$3+2=5$
$2+3=5$
$5-3=2$
$5-2=3$


Beat the Teacher-competition is a wonderfult tool for teaching and challenging the teacher is fun for all of the children. Learn-it facts are used in the challenge, with a single fact or group of facts being uncovered. The children then race against the teacher to answer the facts faster than the teacher can.

Times-Table Rockstars- to continue to develop learning into a game the platform TT Rockstars is used. Children use this platform to practise their multiples, as well as their division facts. As they practise they will see their 'rock-speed' improve and can earn 'coins' to spend on outfits and accessories for their characters. We then use regular 'Rockstar' assemblies where children compete live to encourage them to keep practising.

## Teaching Learn-Its,

## Times Tables and other teaching

## ideas

## Misconception Alert!

These are used as a teaching tool where a misconception children may have is ident fied before teaching the unit. Teachers then pose these misconceptions for children to discuss. These can be used as part of a lesson (a starter or plenary) or as a challenge offered in books, where children have the opportunity to show a deep understanding of a concept by explaining the misconception.

## Example:

0.25 is bigger than 0.8 because it has more digits.

## Error Analysis

Like misconception alerts these are a teaching tool where the children are motivated to analyse errors within mathematics. Here questions are given with intentional incorrect answers. Children work through these and find where the error is in order to ident fy where the common errors occur within a particular area.

```
Example:
\(2+5 \times 3=21\)
Using BODMAS shows that the multiplication should be finished fürst so \(5 \times 3=15+2=17\)
```


## APE

APE is a method for approaching explanation and
 reasoning questions within mathematics. It encourages children to approach these questions in a logical way ensuring they have used their mathematical skills and knowledge in answering.
$A$ - Answer; here children answer the initial question.

P - Prove-it, at this point the children use their mathematical knowledge to prove their answer. This could be in the form of a number sentence, diagram or longer calculation.
$E$ - Explain; the final stage of APE questions is where the children explain how their mathematical proof explains the answer.

## Example:

Adam says 0.25 is smaller than $2 / 5$
Explain if he is correct.
A-Adam is correct.
$P-2 / 5$ as a decimat is $2 \div 5=5 \begin{aligned} & 0 \cdot 4 \\ & 0\end{aligned}$
E- Once you convert the fraction to a decimal you can then order the two numbers using place value proving that 0.25 is smaller.

