







With friendship, trust and kindness we fly!

(Love your neighbour as yourself,' Mark 12:31)

Swallowtail Federation Calculation Policy

This policy will be reviewed in full by the Governing Body every 3 years. This policy was last reviewed and agreed by the Governing Body May 2023. It is due for review on May 2026.

Signature N.J.Butcher Executive Headteacher Date: May 2023

Signature S.Watts Chair of Governors Date: May 2026

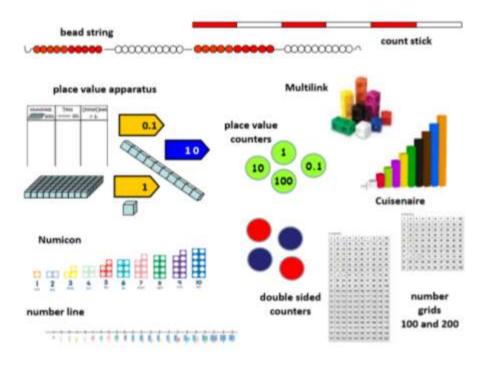
Rationale for our Calculation Policy

Our calculation policy is written progressively from where pupils start, to where it is expected that pupils finish in preparation for Key Stage 3. Pupils move onto the next stage of learning when they have developed a conceptual understanding and teachers feel they are ready for the next stage in learning.

Our calculation policy is underpinned by our distinctly Christian vision. Through its clear progression which enables calculations to be carried out efficiently, fluently and accurately with understanding, pupils are able to 'fly' reaching their true potential.

Manipulatives at Swallowtail

The diagram below shows the main indoor manipulatives used within all classes within the Swallowtail federation. Within classes these can be seen either in baskets, trugs and are readily available in every mathematics lesson.



In addition to indoor resources, as a federation we value outdoor learning opportunities and therefore the diagram below illustrates some of the many outdoor manipulatives our pupils use.



When teaching specific topics such as measure and fractions, specialised manipulatives will be used in addition to those above such as clocks, tape measures, scales and fraction walls.

As a federation, we teach mathematics through the concrete, pictorial and abstract approach (CPA) and all staff plan for opportunities to use manipulatives wherever possible. Within pupils' work, evidence of using manipulatives can be seen in photographs and underneath the learning objective, where pupils indicate what they have used during the lesson.

Mathematical Vocabulary

Accurate mathematical vocabulary is essential. Staff have high expectations of pupils to use correct mathematical language and regularly teach mathematical vocabulary as part of daily mathematics lessons. All staff regularly refer to their copy of the NCETM Mathematics Glossary to aid vocabulary teaching.

Add	Subtract	Multiply	Divide	Equals	Unequal
Plus	Minus	Times	Share	Is the same as	Is not the same value as
Make	Less than	Product of	Group	Equivalent	Not equivalent
And	Count back	Lots of	Divisor	Same value as	Unbalanced
Sum	Fewer than	Groups of	Factor	Balance	
Total	Take away	Multiply by	Remainder		
Count on	Difference between	Multiple of	Equal groups of		
Most	Least	Repeated addition	Divided by		
Put together		Array	Divided into		
Altogether			Shared equally		
Combine			Repeated subtraction		
Increase					
More than					
Total					

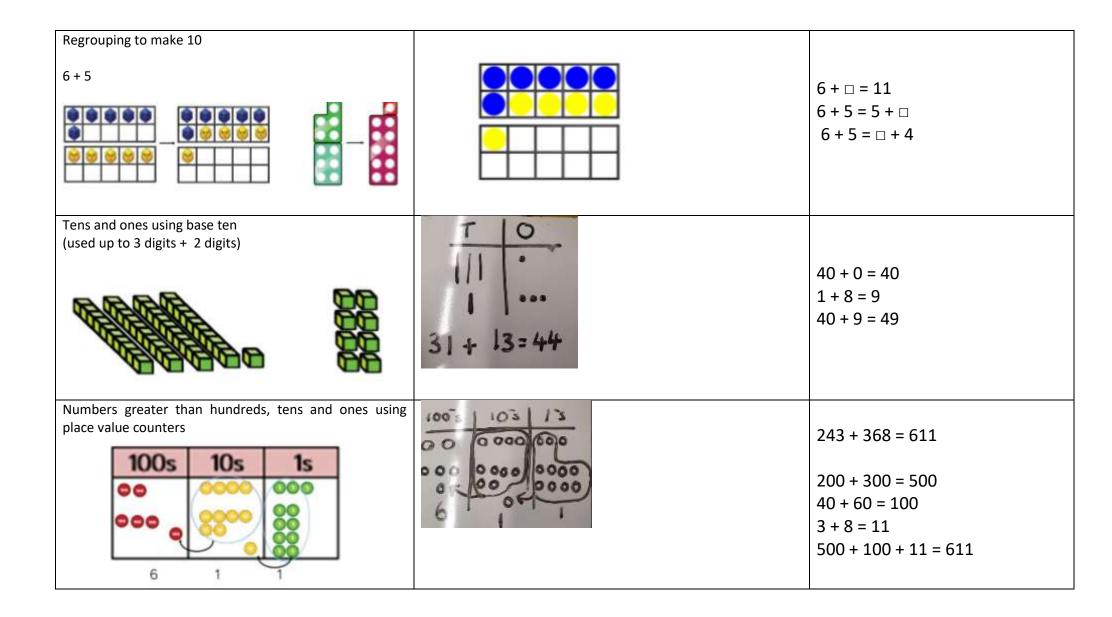
Avoiding misconceptions

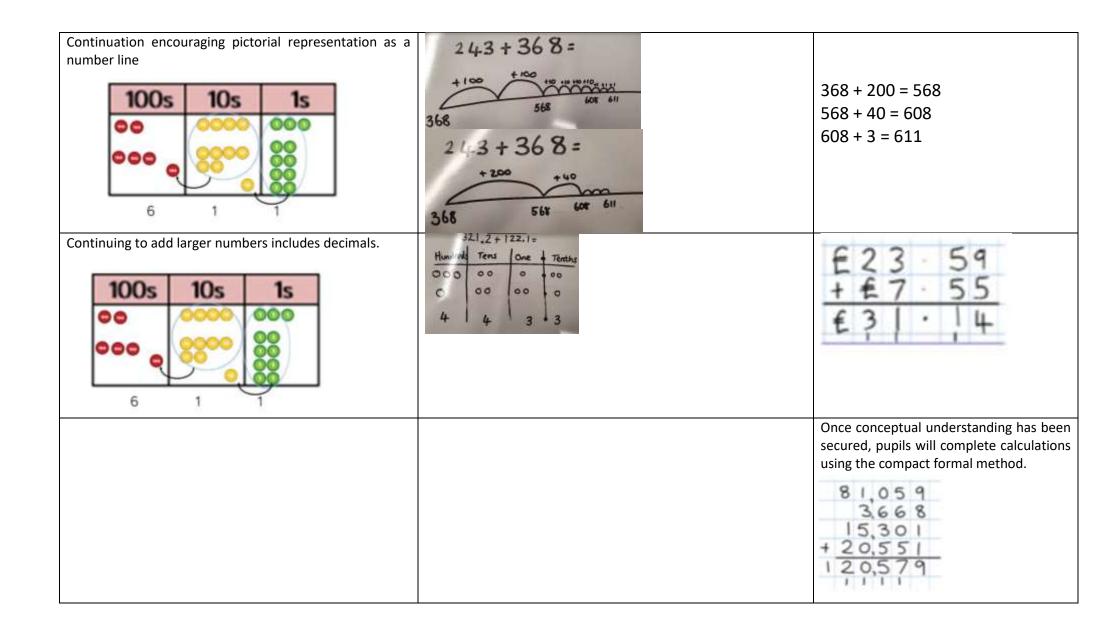
Below are examples of terminology to avoid or be mindful of using to reduce children's mathematical misconceptions:

- Sum (for anything other than addition calculations)
- Stealing/borrowing (using exchange would be better)
- If using equals ensure children understand that they are talking about a value that is the same rather than 'the answer'.
- Calculation and equation are more acceptable terms to use than number sentence.

Addition

Concrete	Pictorial	Abstract
Combine two parts to make a whole $\left[\begin{array}{c} \hline \\ \hline $	0000 + 000 = 0000	
Counting on using number tracks (starting with the biggest number) Beadstring	4+3=7 Number track using fingers or counters to add on.	



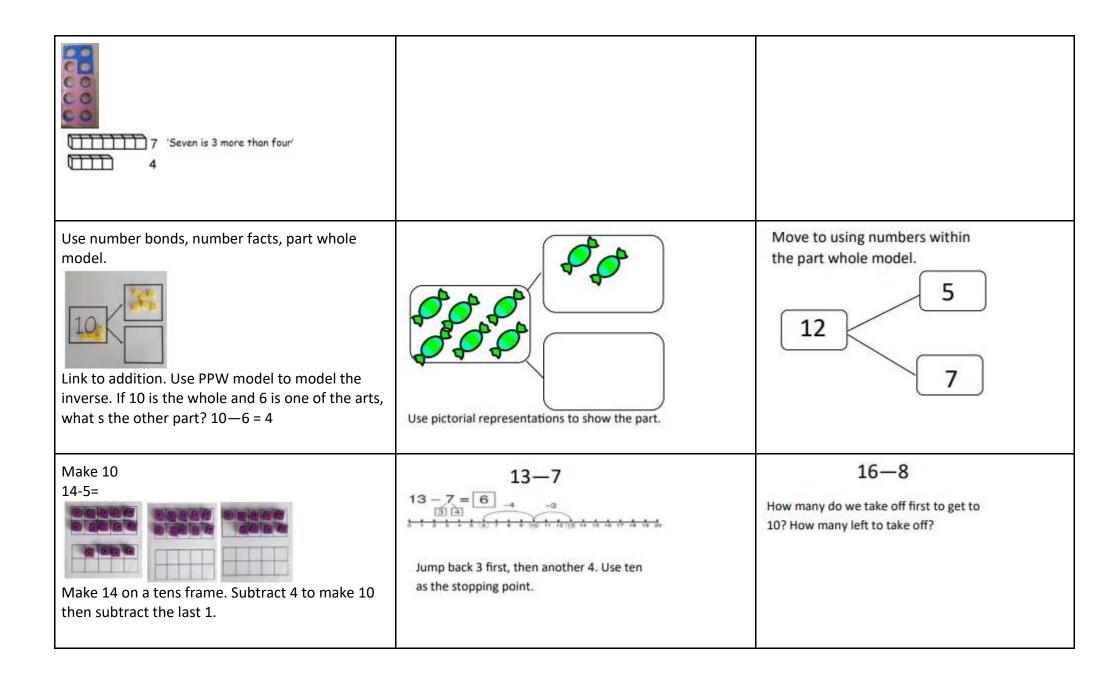


		Insert zeros for place holders. $23 \cdot 361$ 9 · 080 59 · 770 + 1 · 300 93 · 511 2 · 2
Recognising simple fractions of shapes	Pictorial representation 1/2 1/2	If I split my bar into two equal parts, what does each part show? 1/2
Fractions of amounts ¼ of 16=		¼ of 16 = 4

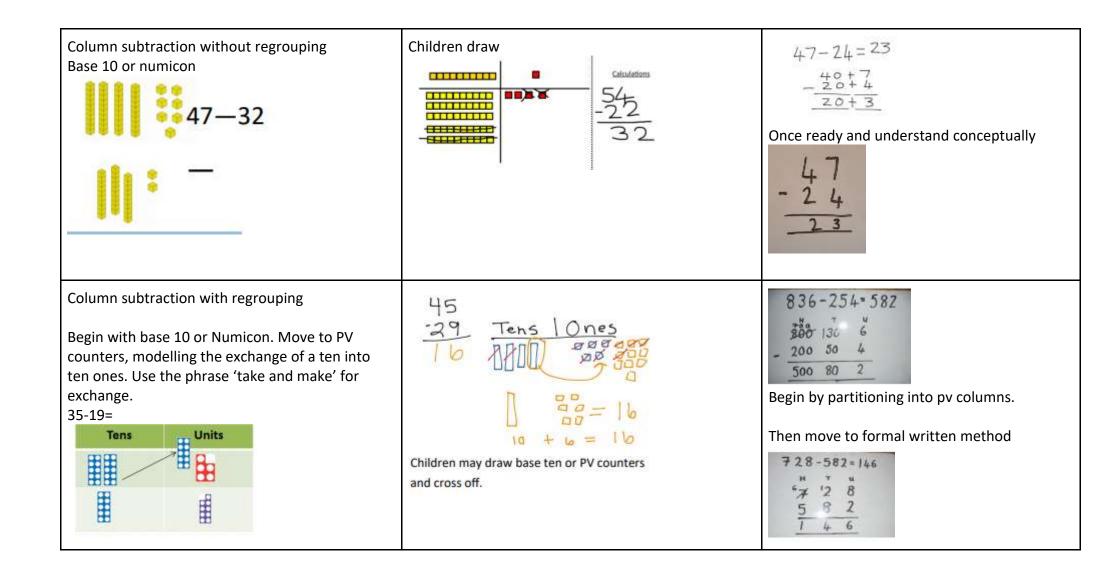
Finding fractions of an amount ¼ of 16	000000000000000000000000000000000000000	¼ of 16 = 4 16 divided by 4 = 4
Addition of fractions with the same denominator	Bar model	
Eg :	1/10 1/10 1/10 1/10 1/10 1/10 1/10	3/10 + 4/10 = 7/10
Addition of fractions with different denominators		
	1/5 $1/5$ $1/5$ $1/5$ $1/10$ <	3/10 + 4/10 = 7/10

Subtraction

Concrete	Pictorial	Abstract
Physically take objects away from a group.	ØØØ00 5-3= []	5-3= 2 20-8=12
Moving objects away from a group counting backwards	5 - 3 = 2	Starting at 13, count back 4. What number are you at?
Find the difference		Sophie has 12 sweets and her sister has 5. How many more does Sophie have than her sister. 3=5-2 2=5-3 5-2=3 5-3=2



Regroup a ten into ten ones Use a PV chart to show how to change a ten into ten ones, use the term 'take and make		20-4=16
Partitioning to subtract without regrouping 34-13=21	Children draw representations of base 10 and cross off. 34-13=21 11/4	34-13=21
Make ten strategy Progression should be crossing one ten, crossing more than one ten, crossing the hundreds.	34-28=6 $34-28=6$ $34-28=6$ 90 93 93 93 93 93 93 93 93 93 93 93 93 93	34-28=6 6+28=34 34=28+6 76+17 =93 93-17=76



Subtracting tens and ones up to 4 digits. Introduce decimal subtraction through context of money 234 - 179 000000000000000000000000000000000000	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	2 x 5 4 - <u>1562</u> 1192
Subtract with decimal values, including mixtures of integers and decimals and aligning the decimal 234 - 179	278.4-182.4 hundred tens Ones Lenths Ø @ 000 000 000 000 000 Ø @ 000 000 000 000 000 Ø @ 000 000 000 000 000 Ø @ 000 000 000 000 000 000 000 000 000	3'' 10' 3'6 -2128 28,928 7'' 16' 3' 0 $-372 \cdot 5$ $6796 \cdot 5$
Subtract with increasingly large and more complex numbers and decimal values.		$\frac{1}{10} \frac{1}{5} \cdot \frac{3}{4} \frac{1}{1} \frac{9}{8} \frac{1}{9} \frac{1}{8} \frac{1}{1} \frac{9}{1} \frac{1}{1} \frac{9}{1} \frac{1}{1} \frac$

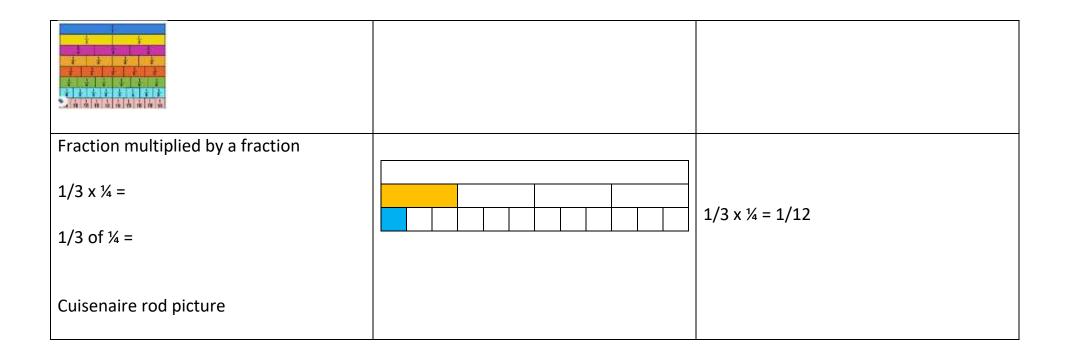
		932 – 457 becomes 8 12 1 9 3 2 - 4 5 7 4 7 5
Subtract fractions with the same denominator and denominators that are multiples of the same number use of a beadstring	³ / ₄ - ⁵ / ₈ = ¹ / ₈	³ / ₄ - ⁵ / ₈ = ¹ / ₈
Subtract fractions with different denominators and mixed numbers, using the concept of equivalent fractions	 4/3-⅓ (Re-write so they have the same denominator-finding lowest possible multiple) For example 20/15 - 3/15 =17/15 (Mixed number 1 2/15) You could draw a bar model to support 	4/3-⅓ (Re-write so they have the same denominator- finding lowest possible multiple) For example 20/15 - 3/15 =17/15 (Mixed number 1 2/15)

Multiplication

Concrete	Pictorial	Abstract
counting in groups of/ repeated addition/skip counting		Count in multiples of a number aloud. Write sequences with multiples of numbers. 0, 2, 4, 6, 8, 10 0, 3, 6, 9, 12, 15 0, 5, 10, 15, 20, 25, 30 4x3=
multiplication is commutative		Use an array to support writing repeated addition.

using the inverse		2 = [] = [] = [] = []		2 x 4 = 8 4 x 2 = 8 8 ÷ 2 = 4 8 ÷ 4 = 2 8 = 2 x 4 8 = 4 x 2 2 = 8 ÷ 4 4 = 8 ÷ 2 Show all family facts
Grid multiplication using arrays place value counters 13 x 4	4	10 (drawing PV counters or base 10)	3	$13 \times 4 = 52$ $10 \times 4 = 40$ $3 \times 4 = 12$ 40 + 12 = 52

Multiplication using base 10 or place	$24 \times 3 = 72$	
value counters	× 1 and 1	× 300 20 7
Image: state stat	$ \begin{array}{c cccccccccccccccccccccccccccccccc$	4 1200 80 28
Grid multiplication is continued until		
pupils are ready to move onto column multiplication.		$ \begin{array}{c} 1 & 2 & 3 & 4 \\ $
Fraction multiplied by a whole number		
e.g ¾ x 3		
30 80 81 81 81 80 2 4 3 4 4 4	1/4 1/4 1/4 1/4	$\frac{1}{4} \times 3 = \frac{3}{4}$ $\frac{1}{4} + \frac{1}{4} + \frac{1}{4} = \frac{3}{4}$



Division

Concrete	Pictorial	Abstract
division by equal sharing	Sharing: Sharing: 4 4 4 4 4 4 4 4	12÷ 3=4
Division as grouping (no remainders) Overlay on top of the numicon. Counting in equal groups (no remainders) 8÷2=	number line counting in groups of	Counting in groups of using fingers until you get to the number being shared/grouped. 12 ÷3=4 10 ÷2=5

Division as grouping Continue to use counters, objects or place value counters to aid learning. 24 divided into groups of $6 = 4$ 96 + 3 = 32	Develop bar modelling 20 $20 \div 5 = ?$ $5 \times ? = 20$	How many groups of 6 in 24? 24÷6= 4 6x⊇=24 24=6x4 4=24÷6

link division to multiplication and the number sentences that can be created.		
division with remainders 14÷3 = Divide objects between groups and see how much is left over	$14 \div 3 \div 4 \div 2$ $3 \times 6 \times 9 \times 12 \times 19$ 14 14 14 $3 \times 3 \times 3 \times 2$	14÷3=4r3

Short division to share Short division to share including exchage	8888 , 8888 80 10s 1s	42 ÷ 3 42 = 30 + 12
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	0 0000 0 0000 0 0000	$30 \div 3 = 10$ $12 \div 3 = 4$ 10 + 4 = 14
Short division using place value counters to group	100s 10s 1s 000 000 1 2 3	Using known number facts to help when partitioning and dividing $600 \div 5 = 120$ $15 \div 5 = 3$ 120 + 3 = 123
 Make 615 with place value counters. How many groups of 5 hundreds can you make with 6 hundred counters? Exchange 1 hundred for 10 tens. How many groups of 5 tens can you make with 11 ten counters? Exchange 1 ten for 10 ones. How many groups of 5 ones can you make with 15 ones? 	7 x 10 = 70 7 x 5 = 35 7 x 2 = 14 10 10 70 54 98	When pupils have developed a conceptual understanding, they are taught formal short division.

		98 ÷ 7 becomes 1 4 7 9 8 Answer: 14
Formal written method with remainders https://www.youtube.com/watch?v=FWq9mF9ibxl	$2 \times 15 = 30$ $5 \times 15 = 75$ $10 \times 15 = 150$ $20 \times 15 = 300$ 20 300 375 405 432 $28 r 2$	432 ÷ 5 becomes 496 ÷ 11 becomes 8 6 r 2 5 4 3 5 4 3 Answer: 86 remainder 2 Answer: 45 $\frac{1}{11}$
formal written method beyond tables facts 573÷17		$\begin{array}{c ccccccccccccccccccccccccccccccccccc$
Division of a fraction by a whole number 2/5 ÷ 3	Whole 1/5 1/1 </td <td>Two fifths split into three equal parts is 2/15.</td>	Two fifths split into three equal parts is 2/15.