St Paul's Calculation Policy

September 2022

This policy outlines our clear intention to teach children to develop conceptual understanding through the progression of ***concrete, pictorial and abstract*** methods. This calculation policy should be used to support children to develop a deep understanding and mastery of number and calculation. We support and extend children as needed, broadening, deepening and applying their calculation knowledge.

Using the concrete-pictorial-abstract approach:

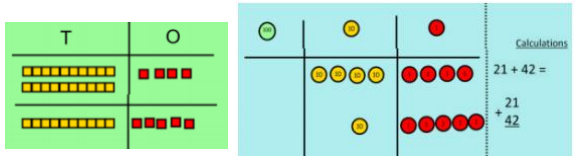
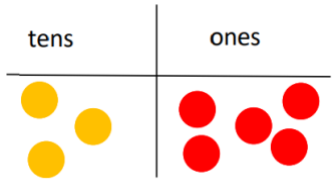
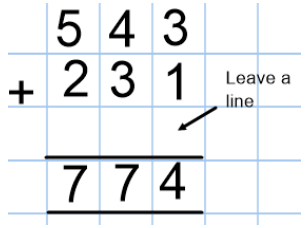
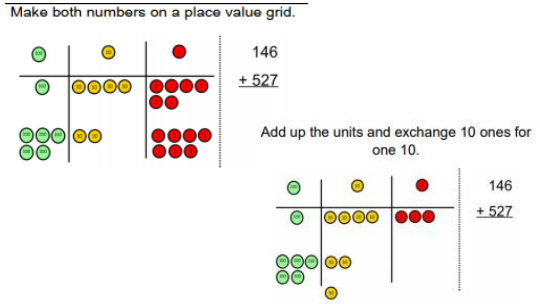
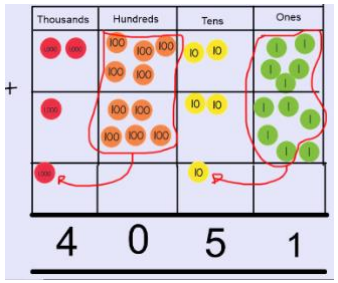
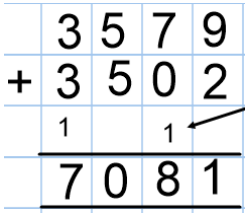
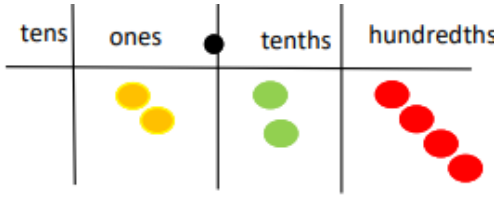
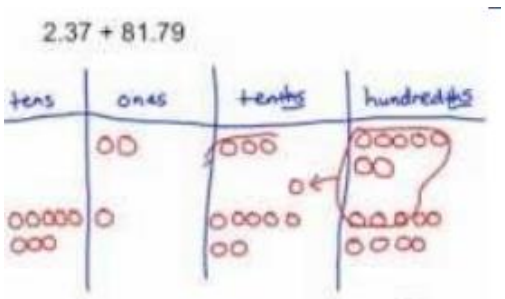
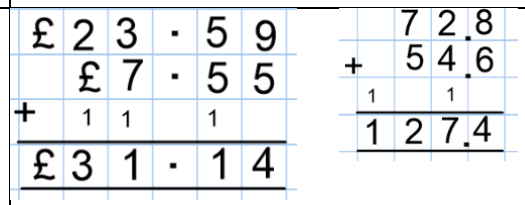
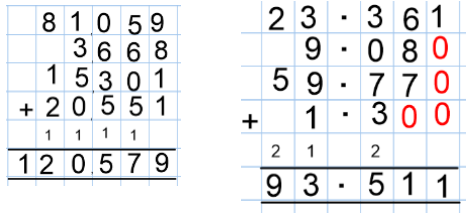
Children develop an understanding of a mathematical concept through the three steps (or representation) of concrete-pictorial-abstract approach. Reinforcement is achieved by going back and forth between these representations.

Concrete representation: The enactive stage - a pupil is first introduced to an idea or a skill by acting it out with real objects. This is a 'hands on' component using real objects and it is the foundation for conceptual understanding.

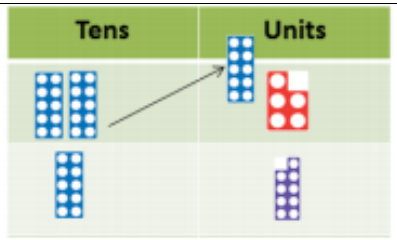
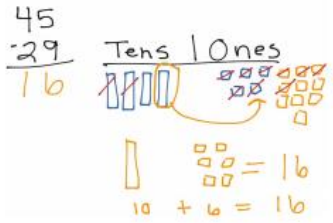
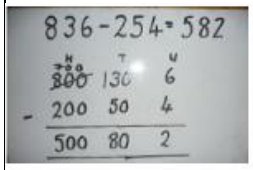
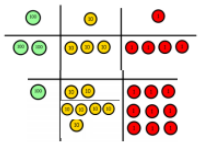
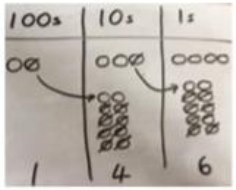
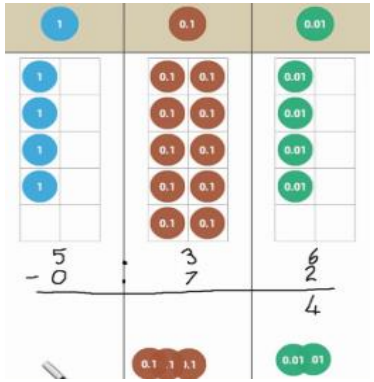
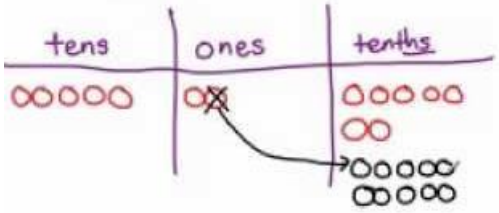
Pictorial representation: The iconic stage - a pupil has sufficiently understood the hands-on experiences performed and can now relate them to representations, such as a diagram or picture of the problem.

Abstract representation: The symbolic stage - a pupil is now capable of representing problems by using mathematical notation, for example: 12 ÷ 2 = 6 .

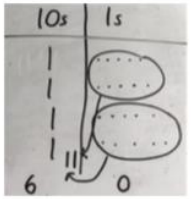
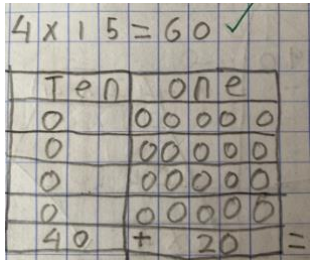
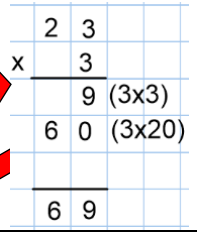
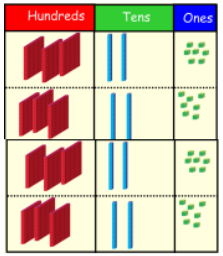
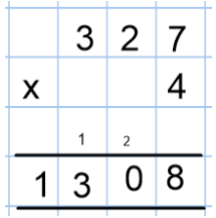
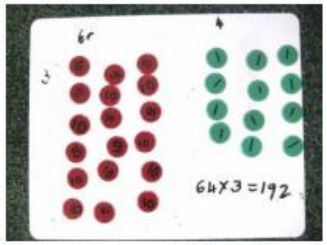
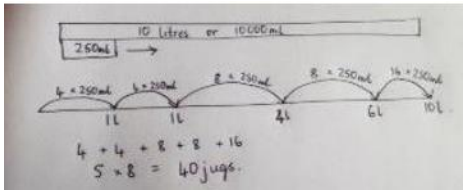
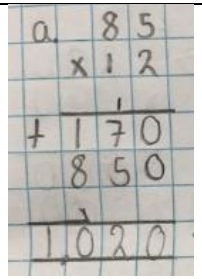
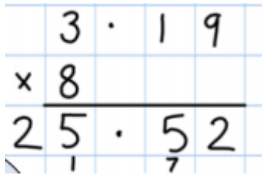
+ Addition

Year	Objective	Concrete	Pictorial	Abstract
3	Add 2 and 3 digit numbers	Modelled with and children using dienes and place value counters 	Drawing of dienes and place value counter. 	
4	Add any 4 digit number to any 4 digit number.	Exchanging. 	 Pictorial representations of columns and place value counters demonstrating regrouping.	 Exchanging
5	Add numbers with more than 4 digits. Add decimals with 2 decimal places, including money.	 Introduce decimal place value counters and model exchange for addition.		
6	Add several numbers of increasing complexity including adding money, measure and decimals with different decimal points.			

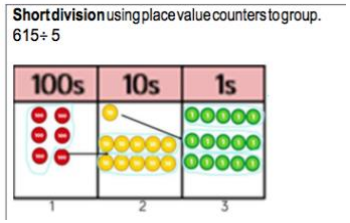
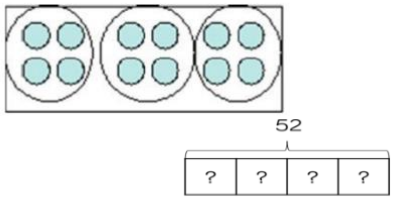
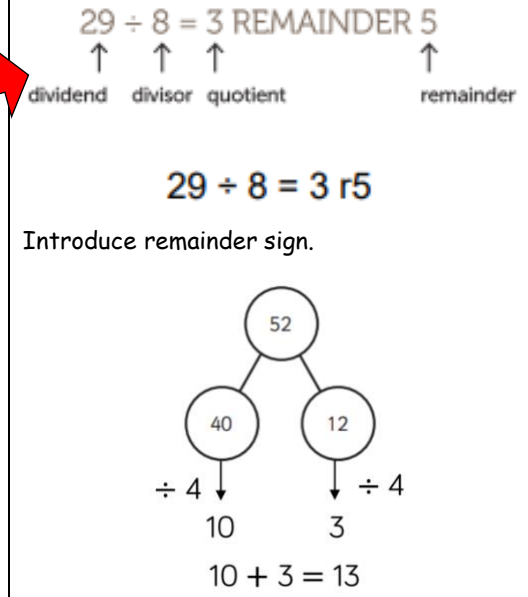
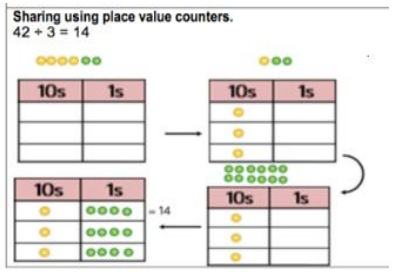
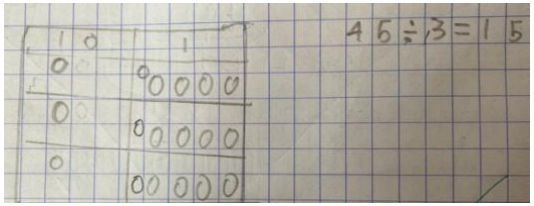
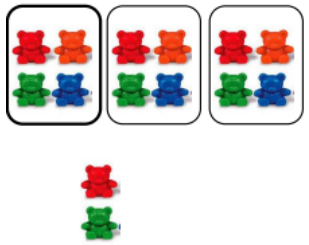
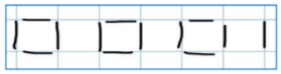
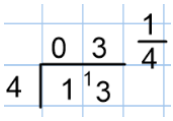
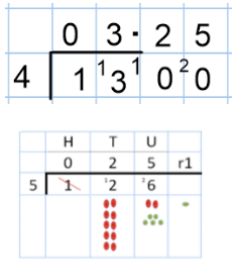
- Subtraction

Year	Objective	Concrete	Pictorial	Abstract
3	Up to 3 digit subtraction with exchanging		 Drawing of base ten or PV counters with exchanging.	 First with partitioning. Then formal method. 6 12 7 2 8 - 5 8 2 1 4 6
4	Subtract 4 digit numbers.	234 - 179  Model process of exchange using Numicon, base ten and then move to PV counters.	Represent the place value counters pictorially; remembering to show what has been exchanged. 	6 15 2 7 5 4 - 1 5 6 2 1 1 9 2
5	Subtract with at least 4 digits, including money and measures. Subtract with decimal values.		52.7 - 27.9 	10 6 0 16 8 10 7 1 6 9.0 - 3 7 2.5 6 7 9 6.5 7169-372.5 Using zeros as place holders
6	Subtract with increasingly large and more complex numbers and decimal values.			14 9 0 1 10 16 1 5 0, 6 9 9 - 8 9, 9 4 9 6 0, 7 5 0

X Multiplication

Year	Objective	Concrete	Pictorial	Abstract
3	Multiply 2 digit by 1 digit.	23x3 T | 0 With place value counters	Children to represent the concrete manipulatives pictorially.  	Progression to formal written method.  
4	Multiply 2 digit numbers by one digit using formal written method.	 Abstract methods from year 3 modelled alongside concrete manipulatives.		327 x 4 28 80 1200 1308 Expanded method leading to compact method. 
5	Multiply 4 digit x 2 digit using long multiplication for 2 digit numbers.	Children can continue to be supported by place value counters at the stage of multiplication. 	Pictorial representations (including bar modelling) to support problem solving. 	
6	Multiply 4 digit x 2 digit. Multiplying decimals up to 2 decimal places.			

÷ Division

Year	Objective	Concrete	Pictorial	Abstract
3	Divide 2 digit by 1 digit.		Children can continue to use drawn diagrams with dots or circles to help them divide numbers into equal groups: 	
4	Divide 3 digit by 1 digit.			
5	Divide 4 digit by 1 digit with remainders.	Divide objects between groups and see how much is left over 	Children to represent the lollipop sticks pictorially:  There are 3 whole squares, with 1 left over.	Remainders shown as fractions or decimals.  
6	Divide 4 digit by 2 digit. (Long division.)