	St Elizabeth's Catholic Voluntary Academy Calculation Policy	September 2023

Introduction

This policy outlines the strategies used for calculations taught and learnt at St Elizabeth's Voluntary Catholic Academy.

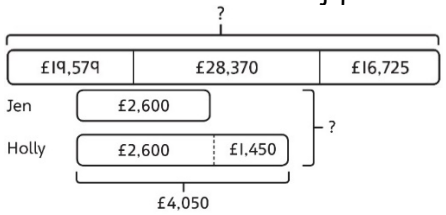
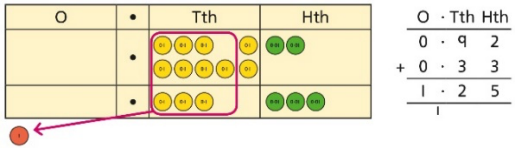
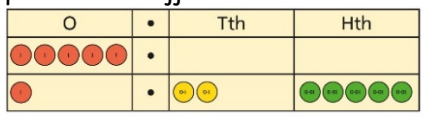
Within key stage 1 pupils develop confidence and mental fluency with whole numbers, counting and place value. This should involve working with numerals, words and the four operations, including with practical resources [for example, concrete objects and measuring tools]. By the end of year 2, pupils should know the number bonds to 20 and be precise in using and understanding place value. An emphasis on practice at this early stage will aid fluency.

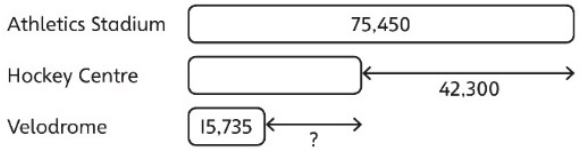
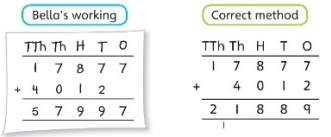
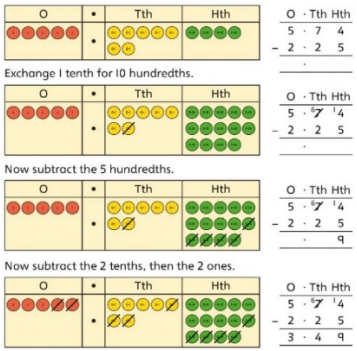
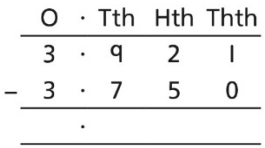
The principal focus of mathematics teaching in lower key stage 2 is to ensure that pupils become increasingly fluent with whole numbers and the four operations, including number facts and the concept of place value. This should ensure that pupils develop efficient written and mental methods and perform calculations accurately with increasingly large whole numbers. By the end of year 4, pupils should have memorised their multiplication tables up to and including the 12-multiplication table and show precision and fluency in their work.

The principal focus of mathematics teaching in upper key stage 2 is to ensure that pupils extend their understanding of the number system and place value to include larger integers. This should develop the connections that pupils make between multiplication and division with fractions, decimals, percentages and ratio. At this stage, pupils should develop their ability to solve a wider range of problems, including increasingly complex properties of numbers and arithmetic, and problems demanding efficient written and mental methods of calculation. With this foundation in arithmetic, pupils are introduced to the language of algebra as a means for solving a variety of problems. By the end of year 6, pupils should be fluent in written methods for all four operations, including long multiplication and division, and in working with fractions, decimals and percentages.

CPA approach

To support children with their calculating, the CPA approach will be adopted in all year groups. C stands for concrete, meaning children have access to manipulatives to support their working out, such as place value counters or numicon. P stands for pictorial, so children start to use visual representations such as bar models. A is abstract where children can confidently calculate without the use of concrete or visuals to support.

Year 5	Children build on their column methods to add and subtract numbers with up to seven digits, and they adapt the methods to calculate efficiently and effectively with decimals, ensuring understanding of place value at every stage. Children compare and contrast methods, and they select mental methods or jottings where appropriate and where these are more likely to be efficient or accurate when compared with formal column methods. Bar models are used to represent the calculations required to solve problems and may indicate where efficient methods can be chosen.		
Addition	**Concrete**	**Pictorial**	**Abstract**
Representing additions		Bar models represent addition of two or more numbers in the context of problem solving.  Th H T O 2 6 0 0 + 1 4 5 0 4 0 5 0 Th H T O 2 6 0 0 + 4 0 5 0 6 6 5 0	Use approximation to check whether answers are reasonable. TTh Th H T O 2 3 4 0 5 + 7 8 9 2 2 0 2 9 7 TTh Th H T O 2 3 4 0 5 + 7 8 9 2 3 1 2 9 7 I will use 23,000 + 8,000 to check.
Adding decimals using column addition	Use place value equipment to represent additions. Show 0·23 + 0·45 using place value counters.	Use place value equipment on a place value grid to represent additions. Represent exchange where necessary.  O · Tth Hth 0 · 9 2 + 0 · 3 3 1 · 2 5 Include examples where the numbers of decimal places are different.  O · Tth Hth 5 · 0 0 + 1 · 2 5 6 · 2 5	Add using a column method, ensuring that children understand the link with place value. O · Tth Hth 0 · 2 3 + 0 · 4 5 0 · 6 8 Include exchange where required, alongside an understanding of place value. O · Tth Hth 0 · 9 2 + 0 · 3 3 1 · 2 5 Include additions where the numbers of decimal places are different. 3.4 + 0.65 = ? O · Tth Hth 3 · 4 0 + 0 · 6 5 ·

Subtraction	Concrete	Pictorial	Abstract
Checking strategies and representing subtractions		Bar models represent subtractions in problem contexts, including 'find the difference'. 	Children can explain the mistake made when the columns have not been ordered correctly.  Use approximation to check calculations. I calculated 18,000 + 4,000 mentally to check my subtraction.
Subtracting decimals	Explore complements to a whole number by working in the context of length.  1 m – ☐ m = ☐ m 1 – 0·49 = ?	Use a place value grid to represent the stages of column subtraction, including exchanges where required. 5·74 – 2·25 = ? 	Use column subtraction, with an understanding of place value, including subtracting numbers with different numbers of decimal places. 3·921 – 3·75 = ? 

Reasoning

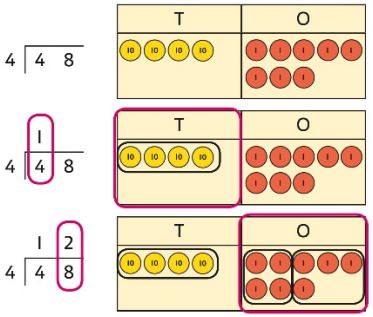
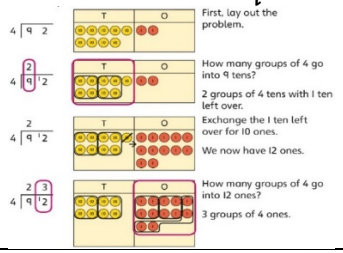
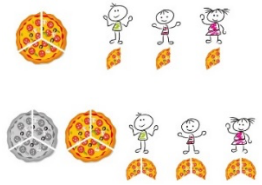
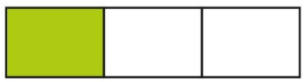
Add and subtract whole numbers with more than 4 digits, including using formal written methods (columnar addition and subtraction)

Convince me

☐ + 1475 = 6 ☐ 24

What numbers go in the boxes?
What different answers are there?

Year 5	Building on their understanding, children develop methods to multiply up to 4-digit numbers by single-digit and 2-digit numbers. Children develop column methods with an understanding of place value, and they continue to use the key skill of unitising to multiply and divide by 10, 100 and 1,000. Written division methods are introduced and adapted for division by single-digit and 2-digit numbers and are understood alongside the area model and place value.		
Multiplication	**Concrete**	**Pictorial**	**Abstract**
Multiplying 2-digit numbers by 2-digit numbers	Partition one number into 10s and 1s, then add the parts. 23 × 15 = ?  10 × 15 = 150 10 × 15 = 150  3 × 15 = 45 There are 345 bottles of milk in total. 23 × 15 = 345 H T O 1 5 0 1 5 0 + 4 5 3 4 5 1	Use an area model and add the parts. 28 × 15 = ? 20 m 8 m 10 m: 20 × 10 = 200 m² | 8 × 10 = 80 m² 5 m: 20 × 5 = 100 m² | 8 × 5 = 40 m² H T O 2 0 0 1 0 0 8 0 + 4 0 4 2 0 1 28 × 15 = 420	Use column multiplication, ensuring understanding of place value at each stage. 3 4 × 2 7 2 3 8 34 × 7 2 3 4 × 2 7 2 3 8 34 × 7 2 6 8 0 34 × 20 3 4 × 2 7 2 3 8 34 × 7 2 + 6 8 0 34 × 20 9 1 8 34 × 27 1

Division	Concrete	Pictorial	Abstract
Dividing up to four digits by a single digit using short division	Explore grouping using place value equipment. 268 ÷ 2 = ? There is 1 group of 2 hundreds. There are 3 groups of 2 tens. There are 4 groups of 2 ones. 264 ÷ 2 = 134	Use place value equipment on a place value grid alongside short division. The model uses grouping. A sharing model can also be used, although the model would need adapting.  Lay out the problem as a short division. There is 1 group of 4 in 4 tens. There are 2 groups of 4 in 8 ones. Work with divisions that require exchange.  	Use short division for up to 4-digit numbers divided by a single digit. $$7 \overline{)\,3\,{}^{3}8\,{}^{3}9\,{}^{4}2} \quad 0\;5\;5\;6$$ 3,892 ÷ 7 = 556 Use multiplication to check. 556 × 7 = ? 6 × 7 = 42 50 × 7 = 350 500 × 7 = 3500 3,500 + 350 + 42 = 3,892
Understanding the relationship between fractions and division	Use sharing to explore the link between fractions and division. 1 whole shared between 3 people. Each person receives one-third. 	Use a bar model and other fraction representations to show the link between fractions and division.  $1 \div 3 = \frac{1}{3}$	Use the link between division and fractions to calculate divisions. $5 \div 4 = \frac{5}{4} = 1\frac{1}{4}$ $11 \div 4 = \frac{11}{4} = 2\frac{3}{4}$

<table>
<tr><th colspan="3">Reasoning</th></tr>
<tr><td>Multiply numbers up to 4 digits by a one- or two-digit number using a formal written method, including long multiplication for two-digit numbers</td><td rowspan="2">Prove It
What goes in the missing box?

12 ☐ 3 ÷ 6 = 212

12 ☐ 3 ÷ 7 = 212

22 ☐ 3 ÷ 7 = 321 r 6

323 x ☐ 1 = 13243</td><td rowspan="2"></td></tr>
<tr><td>Divide numbers up to 4 digits by a one-digit number using the formal written method of short division and interpret remainders appropriately for the context</td></tr>
<tr><td>Recognise and use thousandths and relate them to tenths, hundredths and decimal equivalents.</td><td>What do you notice?
One tenth of £41
One hundredth of £41
One thousandth of £41

Continue the pattern
What do you notice?
0.085 + 0.015 = 0.1
0.075 + 0.025 = 0.1
0.065 + 0.035 = 0.1
Continue the pattern for the next five number sentences.</td><td>True or false?
0.1 of a kilometre is 1m.
0.2 of 2 kilometres is 2m.
0.3 of 3 Kilometres is 3m
0.25 of 3m is 500cm.

2/5 of £2 is 20p</td></tr>
</table>