"I have come in order that you might have life – life in all its fullness."
John 10:10

Calculation Policy

Policy accepted by FGB on:	16/3/2016
Next review:	Spring 2019
Signed (Chair of Governors):	
Statutory policy: Yes/No **On school website:** Yes/No	

CALCULATION POLICY

1. Introduction

This policy sets out the progression in calculation strategies to be employed at Christ Church C of E First School for both mental and written processes. It should be read in conjunction with the school Mathematics Policy.

2. Mental or written?

Children need to be taught the following:

- Can I do this in my head?
- Can I do this in my head using drawings or notes?
- Do I need to use a written method?
- Can I explain what I've done to someone else?

The teaching focus throughout will support this, ensuring that children are taught to record their mental methods and, when they have sufficient understanding, to use more formal written algorithms.

In line with the new National Curriculum, children will not be taught to use calculators instead of mental or written methods at this age.

3. Teaching strategies

Research shows that children who are most successful in Maths into KS2, have had practical hands-on experiences throughout the EYFS and KS1 alongside good development of mental methods and the opportunities to develop the correct vocabulary. Children have also been shown to learn calculation best when the inverse is introduced alongside, for example introducing subtraction alongside addition.

All children will receive a daily Maths lesson which must include a mental/oral session, which includes a daily "count" and a balance of coverage of the 6Rs. The mental/oral session is crucial in keeping recall of facts fluent and in revisiting calculation strategies previously taught in a range of different ways.

Children will be taught all calculations using process success criteria, to enable them to learn the steps needed and apply them in different situations.

Models and images should be used to illustrate all mental methods, for example, number lines, empty number lines, hundred squares and bead strings. (See Appendix 1.)

We believe that children's learning is embedded through application in problem-solving scenarios so they can apply their knowledge, skills and understanding, for example, word problems or a range of missing number equations. Therefore, we aim for problem-solving to be an integral part of each unit of work.

4. Language and vocabulary

We aim to ensure clear and consistent use of vocabulary across the school to support progress. This policy will give the key vocabulary to be introduced at each stage; children should experience a range of vocabulary throughout.

Some key language to use across the school:

- "Number sentence" or "Calculation" should be used to refer to written methods.
- "Equals" should be used throughout as meaning "the same as" or "balance" and children should experience seeing it used in a variety of positions.
- Correct terminology should be used carefully, i.e. 67 + 46 is 6 tens add 4 tens or 60 add 40 never 6 + 4.

5. Pace and support

Children will be at different stages in their move towards written methods. This process should not be rushed or hindered unnecessarily; children should access the progression at the point which is appropriate for them. Where individuals or groups encounter difficulties with a new strategy or method, we aim to deliver rapid and focused in-class intervention to support these children to develop understanding.

Appendix 1: Addition and Subtraction Progression

	Addition	Subtraction	Recall of Facts	Vocabulary
YR	♦ Find the total of two small sets of objects by counting all the objects and finding how many altogether. ♦ Add two single-digit numbers of objects, counting on to find the answer. ♦ Teacher models using + and = to record. ♦ Children make a record of the additions they have carried out practically.	♦ Find how many are left when taking away a small number of objects from a small set. ♦ Subtract a single-digit number of objects from another, counting back to find the answer. ♦ Teacher models using – and = to record. ♦ Children make a record of the subtractions they have carried out practically.	♦ one more and one less than each number to 20.	more, less, add, take away, altogether, equals, same as, answer, count on, count back, left
Y1	♦ Add a single-digit number to a two-digit number less than 20 by putting the largest first and counting on. ♦ Read, write and interpret addition number sentences using + and =.	♦ Subtract a single-digit number from a number less than 20 by counting back. ♦ Read, write and interpret subtraction number sentences using – and =.	♦ Number bonds to 10 and related subtraction facts. ♦ Number bonds within 20 and related subtraction facts, including doubles and halves to 10 + 10.	total, difference between, plus, make, subtract, minus
Y2	♦ Add a single-digit number to a two-digit number by putting the largest first and counting on. ♦ Add a multiple of ten to a two-digit number by counting on in tens. ♦ Add two two-digit numbers by partitioning the second number and counting on in tens and then units (within 100). ♦ Add three single-digit numbers by first looking for known pairs then by counting on. ♦ Use the inverse to check calculations. ♦ Show that addition is commutative. ♦ Introduce column addition of two two-digit numbers without carrying.	♦ Subtract a single-digit number from a two-digit number by counting back. ♦ Subtract a multiple of ten from a two-digit number by counting back in tens. ♦ Subtract a two-digit number from another by partitioning the second number and counting back in tens then units. ♦ Use the inverse to check calculations. ♦ Understand that subtraction is not commutative. ♦ Introduce column subtraction of two two-digit numbers without exchanging.	♦ Number bonds within 20 and related subtraction facts. ♦ Related facts to 100.	difference, sum, addition, subtraction, inverse

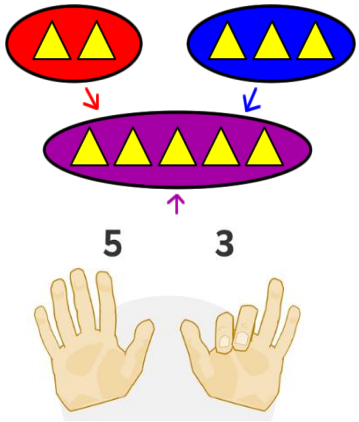
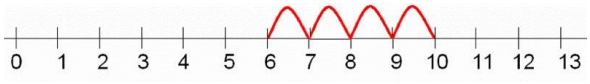
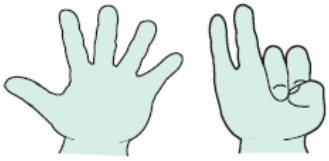
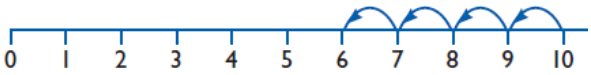
	Addition	Subtraction	Recall of Facts	Vocabulary
Y3	♦ Add two two-digit numbers by partitioning the second number and counting on in tens and then units (beyond 100). ♦ Add a single-digit number to a three-digit number by putting the largest first and counting on. ♦ Add a multiple of ten to a three-digit number by counting on in tens. ♦ Add a multiple of one hundred to a three-digit number by counting on in hundreds. ♦ Use estimation and inverses to check calculations. ♦ Use column addition to add numbers up to three digits in size including carrying where appropriate.	♦ Subtract a single-digit number from a three-digit number by counting back. ♦ Subtract a multiple of ten from a three-digit number by counting back in tens. ♦ Subtract a multiple of one hundred from a three-digit number by counting on in hundreds. ♦ Use estimation and inverses to check calculations. ♦ Use column subtraction to subtract numbers up to three digits in size including exchanging where appropriate.	♦ Number bonds for 100.	carry, exchange
Y4	♦ Continue to practice mental addition with increasingly large numbers. ♦ Use column addition to add numbers up to four digits in size including carrying where appropriate. ♦ Use estimation and inverses to check calculations.	♦ Continue to practice mental subtraction with increasingly large numbers. ♦ Use column subtraction to subtract numbers up to four digits in size including exchanging where appropriate. ♦ Use estimation and inverses to check calculations.		
Y5	♦ Develop mental addition with larger numbers, e.g. five digits add four digit multiples of 100. ♦ Use column addition to add numbers greater than four digits in size including carrying where appropriate. ♦ Use rounding to check answers and accuracy.	♦ Develop mental subtraction with larger numbers, e.g. five digits minus four digit multiples of 100. ♦ Use column subtraction to subtract numbers greater than four digits in size including exchanging where appropriate. ♦ Use rounding to check answers and accuracy.		

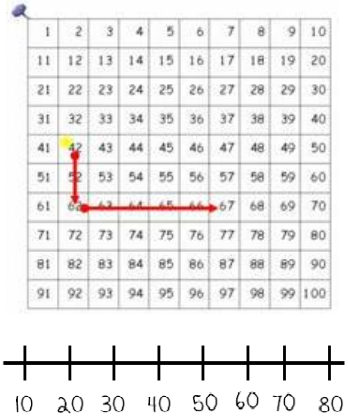
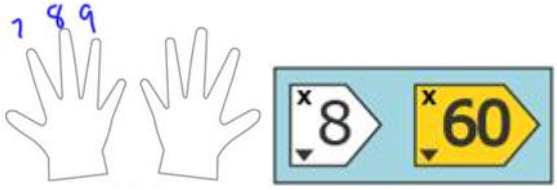
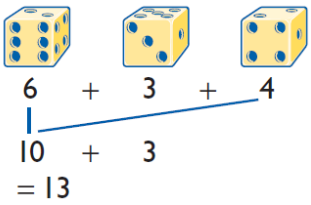
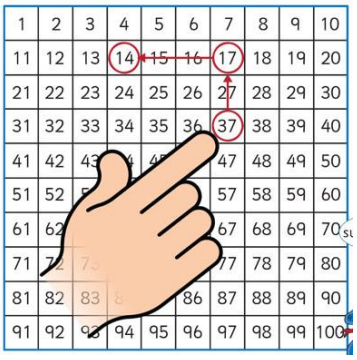
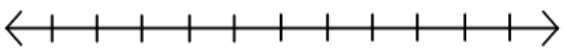
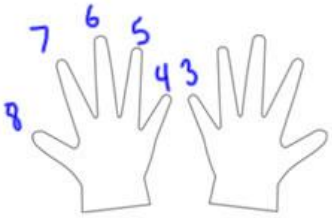
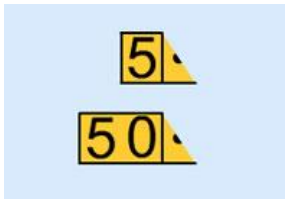
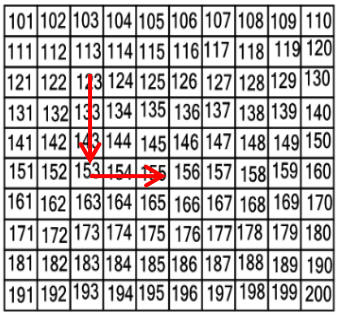
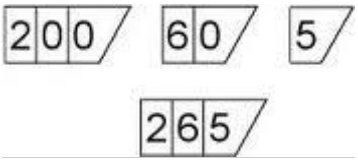
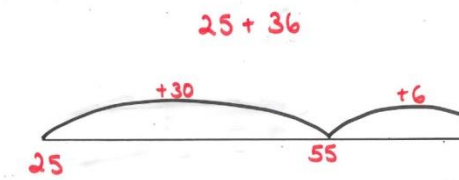
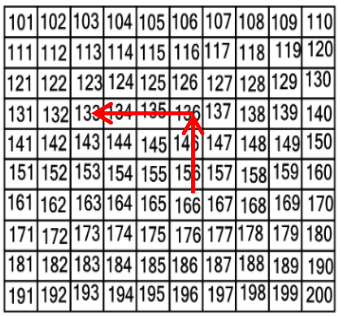
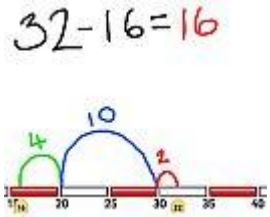
Appendix 2: Multiplication and Division Progression

	Multiplication	Division	Recall of Facts	Vocabulary
YR	♦ Begin to count in steps of 2, 5 or 10. ♦ Solve practical problems involving doubling of small numbers of objects. ♦ Count objects in repeated groups of the same size i.e. in 2s.	♦ Share objects into equal groups and count how many in each group. ♦ Solve practical problems involving halving and sharing objects.		double, half, share, groups, the same as, equal, fair
Y1	♦ Count in steps of 2, 5 and 10. ♦ Count objects and arrays in groups of 2, 5 or 10. ♦ Teacher models using x and repeated addition to record. ♦ Solve practical one-step problems involving multiplication and doubling.	♦ Understand division as both sharing and grouping. ♦ Teacher models using ÷ to record. ♦ Solve practical one step problems involving division and finding half and quarter of sets.		array, group, share, row, column, multiple
Y2	♦ Count in steps of 3. ♦ Write multiplication facts to correspond to arrays. ♦ Understand and record multiplication as repeated addition. ♦ Calculate multiplications within the times tables by counting in steps or using known facts. ♦ Record multiplication sentences using x. ♦ Show that multiplication is commutative. ♦ Use the inverse to check calculations.	♦ Solve problems involving division as both sharing and grouping. ♦ Calculate divisions within the times tables by sharing, grouping or using known facts. ♦ Find a remainder in practical situations. ♦ Record division sentences using ÷. ♦ Understand that division is not commutative. ♦ Use the inverse to check calculations.	♦ Recall multiplication and division facts for the 2, 5 and 10 times tables. ♦ Recognise odd and even numbers.	remainder, divide, times, multiply
Y3	♦ Count in steps of 4 and 8. ♦ Understand multiplication as scaling. ♦ Use known facts to support multiplications mentally: two-digit by single digit and multiplying three small numbers. ♦ Multiply a two-digit number by a single digit using the grid method. ♦ Multiply a two-digit number by a single digit using the short written method without carrying.	♦ Use known facts to divide a two-digit number by a single-digit number mentally. ♦ Divide single-digit numbers by 10. ♦ Use the short formal written method to divide a two-digit number by a single-digit number with no carrying.	♦ Recall multiplication and division facts for the 3, 4 and 8 times tables.	grid method

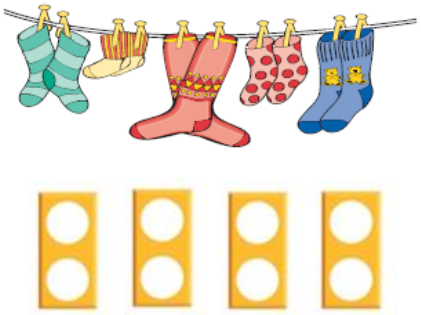
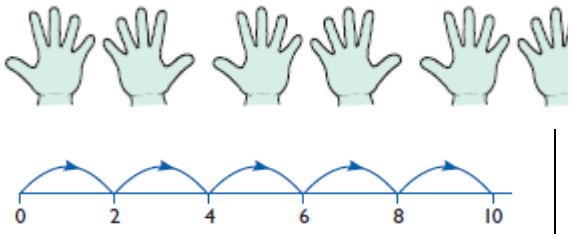
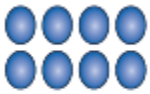
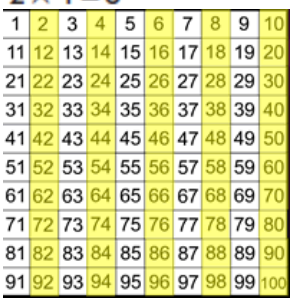
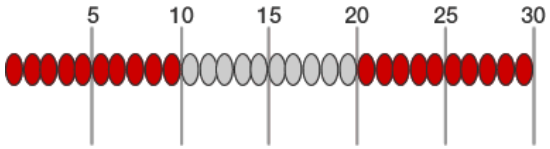
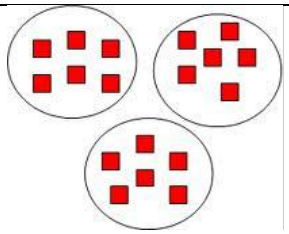
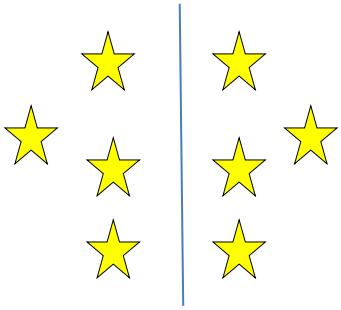
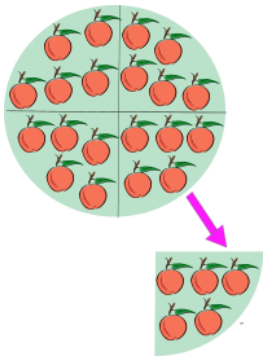
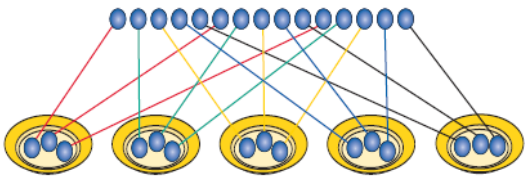
	Multiplication	Division	Recall of Facts	Vocabulary
Y4	♦ Count in steps of 6, 7 and 9. ♦ Understand the effect of multiplying by 0 and 1. ♦ Mentally multiply three different numbers. ♦ Multiply one- and two-digit numbers by 10 and 100. ♦ Use commutativity, factor pairs and place value to support mental multiplication, e.g. multiple of one hundred by small single digit. ♦ Multiply a two- or three-digit number by a single-digit number using the short written method including carrying (alongside grid method).	♦ Understand the effect of dividing by one. ♦ Use known facts and place value to support mental division, e.g. multiple of 100 by small single digit. ♦ Divide one- and two-digit numbers by 10 and 100. ♦ Divide a two- or three-digit number by a single-digit number (with exact answers) using the short written method; support using jottings, e.g. count in steps of 8.	♦ Recall multiplication and division facts up to 12 x 12.	factor
Y5	♦ Multiply whole numbers and decimals by 10, 100 and 1000 mentally by moving the numbers the appropriate number of places to the left. ♦ Multiply a four-digit number by a single-digit number using the short written method. ♦ Multiply a three- or four- digit number by a two digit using formal written long multiplication. ♦ Identify multiples of a number and common factors. ♦ Solve multiplication including scaling by a simple fraction. ♦ Understand and record using accurate notation square and cube numbers.	♦ Divide whole numbers and decimals by 10, 100 and 1000 mentally by moving the numbers the appropriate number of places to the right. ♦ Divide up to a four-digit number by a single-digit number using the short written method and interpret a remainder.	♦ Recall all the prime numbers up to 19. ♦ Recall factor pairs for times tables.	prime, square, cube

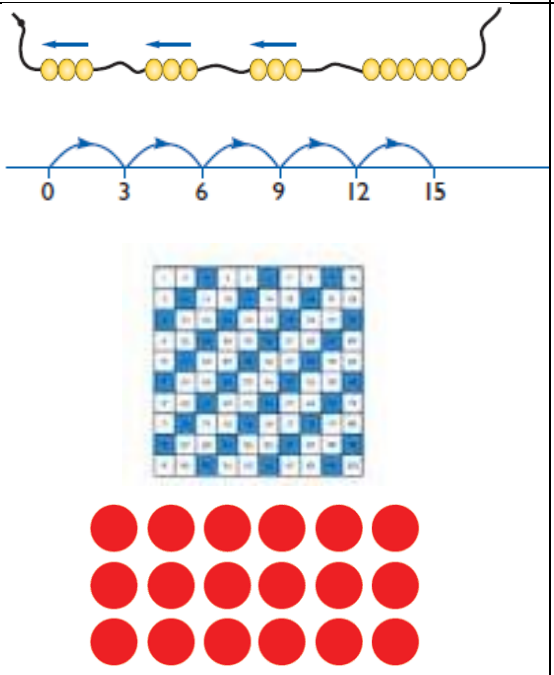
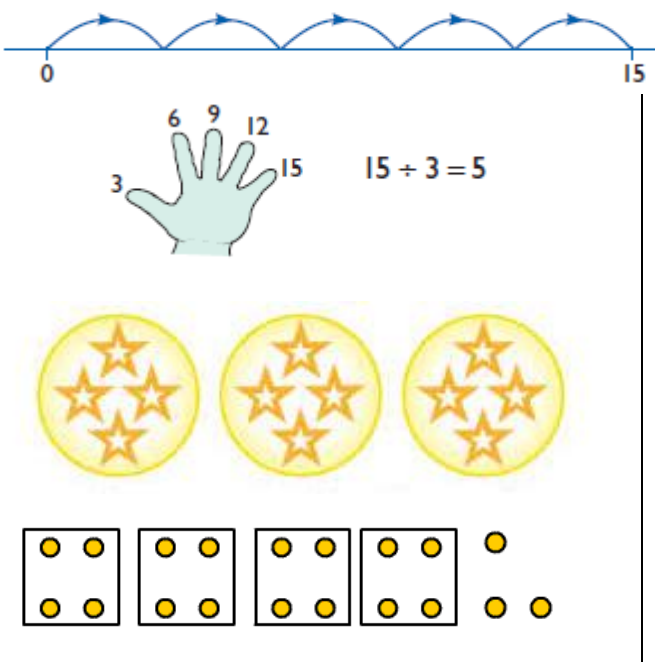
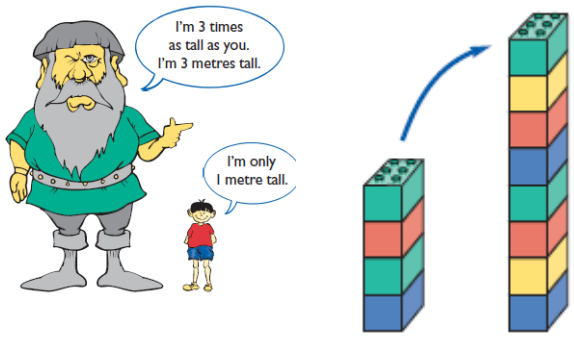
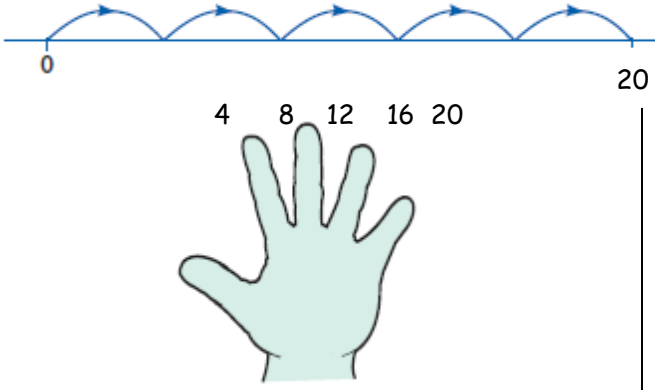
Appendix 3: Addition and Subtraction – Models and Images

	Addition	Subtraction
Year R	 	 

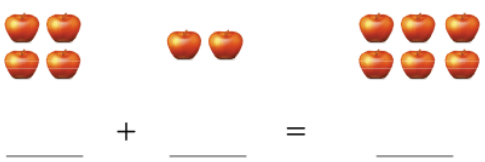
	Addition	Subtraction
Year 1	  	   
Year 2	  	 

Appendix 4: Multiplication and Division – Models and Images

	Multiplication	Division
Year R		
Year 1	  $4 \times 2 = 8$ $2 \times 4 = 8$   	   

	Multiplication	Division
Year 2		
Year 3	 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40	 H T U Tenth 6 → ÷10
Year 4	Multiplication as Year 3. H T U Tenth Hundredths Thousandths 6 → x100	Division as Year 3. H T U Tenth Hundredths Thousandths 2 6 → ÷100

Appendix 5: Addition and Subtraction – Written Methods

<table>
<tr><th></th><th>Addition</th><th>Subtraction</th></tr>
<tr><td>Year R</td><td colspan="2"> 
Labelling practical/pictorial number sentences.
Teacher modelling symbols.</td><td>
Labelling practical/pictorial number sentences.
Teacher modelling symbols.</td></tr>
<tr><td>Year 1</td><td>Children record number sentences independently:
5 + 6 = 11</td><td>Children record number sentences independently:
15 – 4 = 11</td></tr>
<tr><td>Year 2</td><td>Children record number sentences independently:
26 + 12 = 38
4 + 7 + 6 = 17
Introducing long addition:
4 7
+ 3 2
7 9</td><td>Children record number sentences independently:
26 – 12 = 14
Introducing long subtraction:
4 7
– 3 2
1 5</td></tr>
<tr><td>Year 3+</td><td>Long addition with carrying:
4 2 7
+ 3 1 4
7 4 1
1
Continuing to four-digit numbers into Year 4.</td><td>Long subtraction with exchanging:
1 1
4 ~~2~~ 7
– 3 1 8
1 0 9
Continuing to four-digit numbers into Year 4.</td></tr>
</table>

Appendix 6: Multiplication and Division – Written Methods

<table>
<tr><th></th><th>Multiplication</th><th>Division</th></tr>
<tr><td>Year 1</td><td>Teacher modelling:
5 x 2 = 10
2 + 2 + 2 + 2 + 2 = 10</td><td>Teacher modelling:
10 ÷ 5 = 2</td></tr>
<tr><td>Year 2</td><td>Children record number sentences independently:
3 x 5 = 15
5 + 5 + 5 = 15</td><td>Children record number sentences independently:
8 ÷ 4 = 2</td></tr>
<tr><td>Year 3</td><td>Recording number sentences:
3 x 2 x 6 = 36
Grid method:
23 x 4 =
<table><tr><td>x</td><td>20</td><td>3</td></tr><tr><td>4</td><td>80</td><td>12</td></tr></table> = 92

Short multiplication without carrying:
<table><tr><td></td><td>4</td><td>4</td></tr><tr><td>x</td><td></td><td>2</td></tr><tr><td></td><td>8</td><td>8</td></tr></table></td><td>Short division without exchanging:
<table><tr><td></td><td>2</td><td>1</td></tr><tr><td>3</td><td>6</td><td>3</td></tr></table></td></tr>
<tr><td>Year 4</td><td>Grid method:
267 x 7 =
<table><tr><td>x</td><td>200</td><td>60</td><td>7</td></tr><tr><td>7</td><td>1400</td><td>420</td><td>49</td></tr></table> = 1869
Short multiplication with carrying:
<table><tr><td></td><td>4</td><td>4</td></tr><tr><td>x</td><td></td><td>8</td></tr><tr><td>3</td><td>5</td><td>2</td></tr><tr><td></td><td>3</td><td></td></tr></table></td><td>Short division with jottings:
<table><tr><td></td><td></td><td>8</td><td>1</td></tr><tr><td>8</td><td>6</td><td>4</td><td>8</td></tr></table>
8, 16, 24, 32, 40, 48, 56, 64</td></tr>
</table>

	Multiplication	**Division**
Year 5	Short multiplication with carrying: 4 2 4 x 8 3 3 9 2 1 3 Long multiplication: 3 7 6 x 2 3 1 1 2 8 2 1 x 7 5 2 0 1 1 8 6 4 8 Recording Squares and Cubes: $4^2 = 16$, $5^3 = 125$	Short division with jottings: 9 3 r 1 8 | 7 4 $^{2}5$