ST. NICHOLAS SCHOOL

CALCULATION POLICY

DEFINITION

This Calculation policy contains the key mental and pencil and paper procedures that are to be taught and the order in which they should be taught. It has been written to ensure consistency and progression throughout the school. (appendices A and B.)

Although the main focus of this policy is on pencil and paper procedures, it is important to recognise that the ability to calculate mentally lies at the heart of numeracy. Mental calculation is not at the exclusion of written recording and should be seen as complementary to and not separate from it. In every written method there should be an element of mental processing.

At whatever stage in their learning, and whatever method is being used, children's strategies must still be underpinned by a secure and appropriate knowledge of number facts, along with those mental skills that are needed to carry out the process and judge if it was successful.

Policy into practice

Written recordings help the children to clarify their thinking and support and extend the development of more fluent and sophisticated mental strategies.

Given the nature of our provision, we have deliberately not attributed year groups to the progression as children should work through the process at their own pace, only moving on when they are confident. Teachers will need to use their judgement to decide on the stage of progression of the child and they should differentiate appropriately.

Teachers should also be aware that some of our students may have a skill that is significantly above their overall functioning (in areas other than in their learning disability area) - a 'splinter skill'. Their learning and progression in numeracy and calculation should be tailored accordingly.

AIMS

The long term aim for students is to be able to select an efficient method of their choice that is appropriate for a given task. They should do this by asking themselves:

- Can I do this in my head?
- Can I do this in my head using jottings or drawings?
- Do I need to use a written method?

It is important that all teachers are aware of **all** of the stages of progression in written calculations – where have students come from, what is the next stage they are aiming to progress to? Pupils will be given appropriate methods of recording according to their need and communication system.

PLANNING
Planning is on a very individual basis:

In the Early Years there is focus on mathematics and pupils are given experiences within the EYFS curriculum.

In KS1 pupils are still working within the EYFS in combination at Year 2 with the National Numeracy Curriculum guidance. They use the Numicon Programme where appropriate. The ethos is child based learning.

KS2 planning is based on the Whole School Long Term Planning Document and the National Curriculum, supplemented by use of Active Learn Abacus, where appropriate. Planning encompasses the topics across the curriculum.

At Key Stage 3, reference is made to the Whole School Long Term Planning Document and the National Curriculum when planning. Active Learn Abacus is also used by all teachers, although the use will vary according to the abilities and needs of the students. Students in the satellite classes, where appropriate will access mainstream classes that are relevant to their level of ability.

At Key Stage 4, as well as referring to the National Curriculum and Active Learn Abacus, planning is based around Functional Skills Entry Level 1. In 2013/14, an OCR Entry Level Course has been introduced and planning will reflect this. The satellite class will take planning from whichever system is appropriate from the individual pupil.

At KS5, planning is based on the Whole School Long Term Planning Document, Active Learn Abacus and the National Curriculum. It focuses on functional maths for independent living.

ASSESSMENT AND RECORDING
Students within the Foundation Stage (and into Year 1) are assessed using The Early Years Foundation Stage Profile and this summarises each child's development and learning attainment at the end of the Early Years Foundation Stage. This is tracked through the EYFS tracking tool supplied by the Kent authority.. Assessment starts at the nursery stage to reflect the entry point of the pupils.

Students within Key Stages 1, 2, 3, 4 and 5 are assessed using PUPIL ASSET. Although pupils in Year 1 are assessed using PUPIL ASSET, this is in combination with the EYFS tracker/profile to ensure continuity of progress.
External assessment is also introduced at Key Stage 4 in the form of OCR exams and exams in entry 1, 2 and or 3 in functional skills at Year 11 for individual pupils.

The school uses the PUPIL ASSET programme of assessment in combination with professional judgement, therapy goals and individual programmes. This can assist in 'next steps' in conjunction with the holistic approach.

MODERATION
St Nicholas school regularly moderates pupils work at teacher, department, whole school and external moderation meetings. Teachers attend external moderation meetings and the Senior Leadership Team feedback to mainstream schools and ensure assessment is universal.

MONITORING AND REVIEW

The policy will be reviewed annually by the Mathematics Co-ordinator and the Curriculum Team which incorporates teachers at all key stages, to ensure continuity and reflect changes in Statutory Guidance. Any changes will be reviewed by staff the Governing Body.

EQUALITY, SAFEGUARDING AND EQUAL OPPORTUNITIES STATEMENT

St Nicholas School, in all policies and procedures, will promote equality of opportunity for students and staff from all social, cultural and economic backgrounds and ensure freedom from discrimination on the basis of membership of any group, including gender, sexual orientation, family circumstances, ethnic or national origin, disability (physical or mental), religious or political beliefs.

St Nicholas School aims to:

- Provide equal opportunity for all
- To foster good relations, and create effective partnership with all sections of the community
- To take no action which discriminates unlawfully in service delivery, commissioning and employment
- To provide an environment free from fear and discrimination, where diversity, respect and dignity are valued.

All aspects of Safeguarding will be embedded into the life of the school and be adhered to and be the responsibility of all staff.

LINKS TO OTHER POLICIES:

Maths Policy Early Years Policy Safeguarding Post 16 curriculum policies Curriculum policies Computing Teaching and learning Planning and Assessment Monitoring and Evaluation

WRITTEN BY TRACY BALDWIN REVIEWED TERM 2 2017 RATIFIED BY THE LCS COMMITTEE – NOVEMBER 2017

APPENDIX A

MENTAL METHODS OF CALCULATION

Oral and mental work in mathematics is essential, particularly so in calculation. Early practical, oral and mental work must lay the foundations by providing children with a good understanding of how the four operations build on efficient counting strategies and a secure knowledge of place value and number facts. Later work must ensure that children recognise how the operations relate to one another and how the rules and laws of arithmetic are to be used and applied. On-going oral and mental work provides practice and consolidation of these ideas.

The ability to calculate mentally forms the basis of all methods of calculation and has to be maintained and refined. A good knowledge of numbers or a 'feel' for numbers is the product of structured practice and repetition. It requires an understanding of number patterns and relationships developed through directed enquiry, use of models and images and the application of acquired number knowledge and skills.

Secure mental calculation requires the ability to:

• recall key number facts instantly – for example, all addition and subtraction facts for each number to at least 10; sums and differences of multiples of 10; and multiplication and division facts up to 10 × 10;

• use taught strategies to work out the calculation – for example, recognise that addition can be done in any order and use this to add mentally a one-digit number or a multiple of 10 to a one-digit or two-digit number; partition two-digit numbers in different ways including into multiples of ten and one and add the tens and ones separately and then recombine;

• understand how the rules and laws of arithmetic are used and applied – for example, to add or subtract mentally combinations of one-digit and two-digit numbers; and to calculate mentally with whole numbers and decimals.

APPENDIX B

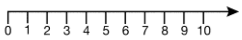
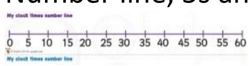
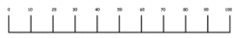
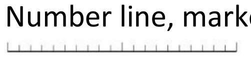
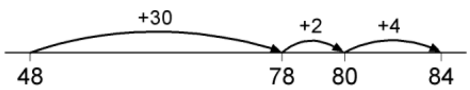
WRITTEN METHODS OF CALCULATION

The aim is that children should be able to use an efficient method for each operation with confidence and understanding. The challenge for teachers is determining when their children should move on to a refinement in the method and become confident and more efficient at written calculation.
Children should be equipped to decide when it is best to use a mental, written or calculator method based on the knowledge that they are in control of this choice as they are able to carry out all three methods with confidence.

Written methods for addition of whole numbers

The aim is that children use mental methods when appropriate but, for calculations that they cannot do in their heads, they use an efficient written method accurately and with confidence. Children are entitled to be taught and to acquire secure mental methods of calculation and **one** efficient written method of calculation for addition which they know they can rely on when mental methods are not appropriate. These notes show the stages in building up to using an efficient written method for addition of whole numbers.

To add successfully, children need to be able to:
• recall all addition pairs to 9 + 9 and complements in 10, (such as □ + 3 =10);
• add mentally a series of one-digit numbers, (such as 5 + 8 + 4);
• add multiples of 10 (such as 60 + 70) or of 100, (such as 600 + 700) using the related addition fact 6 + 7, and their knowledge of place value;
• partition two-digit and three-digit numbers into multiples of 100, 10 and 1 in different ways.
It is important that children's mental methods of calculation are practised and secured alongside their learning and use of an efficient written method for addition.

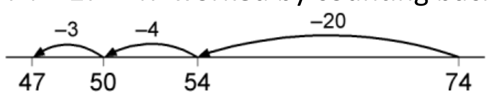
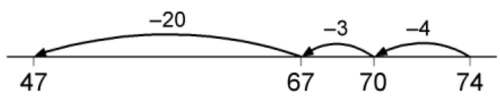
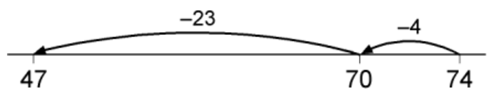
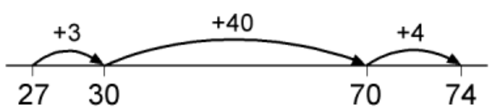
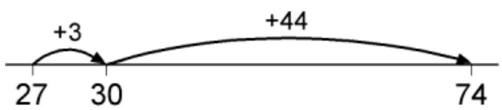
Progression in use of number line To help children develop a sound understanding of numbers and to be able to use them confidently in calculation, there needs to progression in their use of number tracks and number lines. These, along with other resources such as digit cards, 100 squares and place value cards, will be used <u>continually</u> throughout the school to support the children's thinking.	Number track  Number line all numbers marked  Number line, 5s and 10s marked  Number line, 10s marked  Number line, marked  Empty number line ____________________
Stage 1: The empty number line • The mental methods that lead to column addition generally involve partitioning. Children need to be able to partition numbers in ways other than into tens and units to help them make multiples of ten by adding in steps. • The empty number line helps to record the steps on the way to calculating the total.	**Stage 1** Steps in addition can be recorded on a number line. The steps often bridge through a multiple of 10. 8 + 7 = 15  48 + 36 = 84  or 

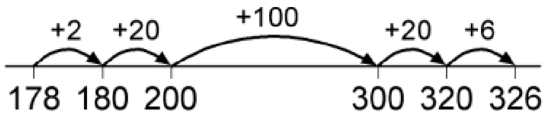
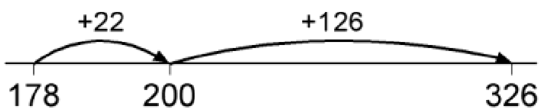
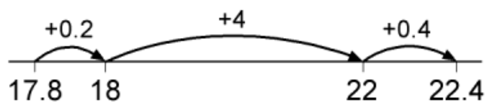
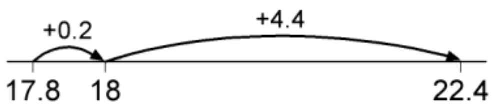
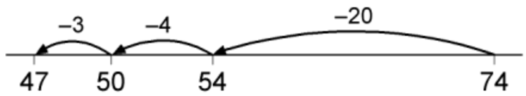
Stage 2: Partitioning • The next stage is to record mental methods using partitioning into tens and units separately. Add the tens and then the units to form partial sums and then add these together • Partitioning both numbers into tens and units mirrors the column method where units are placed under units and tens under tens. This also links to mental methods.	**Stage 2** Record steps in addition using partitioning: 47 + 76 47 + 70 + 6 = 117 117+ 6 = 123 or 47 + 76 40 + 70 = 110 7 + 6 = 13 110 + 13 = 123 Partitioned numbers are then written under one another, for example: 47 = 40 + 7 +76 70 + 6 110 + 13 = 123
Stage 3: Expanded method in columns • Move on to a layout showing the addition of the tens to the tens and the units to the units separately. To find the partial sums initially the tens, not the units, are added first, following mental methods. The total of the partial sums can be found by adding them together. • The addition of the tens in the calculation 47 + 76 is described in the words 'forty plus seventy equals one hundred and ten', stressing the link to the related fact 'four plus seven equals eleven'. As children gain confidence, ask them to start by adding the units first every time. • The expanded method leads children to the more compact method so that they understand its structure and efficiency. The amount of time that should be spent teaching and practising the expanded method will depend on how secure the children are in their recall of number facts and in their understanding of place value.	**Stage 3** Write the numbers in columns. Adding the tens first: 47 + 76 110 13 123 Adding the units first: 47 + 76 13 110 123 Discuss how adding the units first gives the same answer as adding the tens first. Refine over time to adding the units first consistently.
Stage 4: Compact column method • In this method, recording is reduced further. Carry digits are recorded below the line, using the words 'carry ten' or 'carry one hundred', not 'carry one'. • Later, extend to adding three two-digit numbers, two three-digit numbers and numbers with different numbers of digits.	**Stage 4** 258 366 + 87 + 458 345 824 1 1 1 1 Column addition remains efficient when used with larger whole numbers and decimals. Once learned, the method is quick and reliable.

Written methods for subtraction of whole numbers

The aim is that children use mental methods when appropriate but, for calculations that they cannot do in their heads they use an efficient written method accurately and with confidence. Children are entitled to be taught and to acquire secure mental methods of calculation and **one** efficient written method of calculation for subtraction which they know they can rely on when mental methods are not appropriate.
These notes show the stages in building up to using an efficient method for subtraction of two-digit and three-digit whole numbers.

To subtract successfully, children need to be able to:
• recall all addition and subtraction facts to 20;
• subtract multiples of 10 (such as 160 – 70) using the related subtraction fact 16 – 7, and their knowledge of place value;
• partition two-digit and three-digit numbers into multiples of one hundred, ten and one in different ways (e.g. partition 74 into 70 + 4 or 60 + 14).
It is important that children's mental methods of calculation are practised and secured alongside their learning and use of an efficient written method for subtraction.

Stage 1: Using the empty number line **Finding an answer by counting back** • Begin 'taking away' by linking their practical work to recording using number lines to count back • A calculation like 74 – 27 can be recorded by counting back 27 from 74 to reach 47. The empty number line is a useful way of modelling processes such as bridging through a multiple of ten.	**Stage 1** Steps in subtraction can be recorded on a number line. The steps often bridge through a multiple of 10. 15 – 7 = 8  74 – 27 = 47 worked by counting back:  The steps may be recorded in a different order:  or combined: 
Stage 1: Using an empty number line **Finding an answer by counting up** • The steps can also be recorded by counting up from the smaller to larger number to find the difference E.G. counting up from 27 to 74 in steps totalling 47 (shopkeeper's method). • **With practice, children will need to record less information and decide whether to count back or forward. It is useful to ask children whether counting**	74 – 27 =  or: 

up or back is the more efficient for calculations such as 57 – 12, 86 – 77 or 43 – 28.	
• With three-digit numbers the number of steps can again be reduced, enabling children to work out answers to calculations such as 326 – 178 first in small steps and then more compact by using knowledge of complements to 100 • The most compact form of recording becomes reasonably efficient.	326 – 178 =  or: 
• The method can successfully be used with decimal numbers. **• This method can be a useful alternative for children whose progress is slow, whose mental and written calculation skills are weak and whose projected attainment at the end of Key Stage 2 is towards the lower end of level 4 or below.**	22.4 – 17.8 =  or: 
Stage 2: Partitioning • Subtraction can be recorded using partitioning to write equivalent calculations that can be carried out mentally. For 74 – 27 this involves partitioning the 27 into 20 and 7, and then subtracting from 74 the 20 and the 7 in turn. **This use of partitioning is a useful step towards the most commonly used column method, decomposition**	**Stage 2** Subtraction can be recorded using partitioning: 74 – 27 74 – 20 = 54 54 – 7 = 47 This requires children to subtract a single-digit number or a multiple of 10 from a two-digit number mentally. The method of recording links to counting back on the number line. 
Stage 3: Expanded layout, leading to column method (Decomposition) • Partitioning the numbers into tens and ones and writing one under the other mirrors the column method, where ones are placed under ones and tens under tens. • This does not link directly to mental	Example: 563 − 241, no adjustment or decomposition needed Expanded method 500 + 60 + 3 - 200 + 40 + 1 300 + 20 + 2 Start by subtracting the ones, then the tens,

methods of counting back or up but parallels the partitioning method for addition. It also relies on secure mental skills. **• The expanded method leads children to the more compact method so that they understand its structure and efficiency. The amount of time that should be spent teaching and practising the expanded method will depend on how secure the children are in their recall of number facts and with partitioning.**	then the hundreds. Refer to subtracting the tens, for example, by saying ‘sixty take away forty’, not ‘six take away four’.
Example: 563 – 271, adjustment from the hundreds to the tens, or partitioning the hundreds Begin by reading aloud the number from which we are subtracting: ‘five hundred and sixty-three’. Then discuss the hundreds, tens and ones components of the number, how there is a “snag” with the tens and the need to exchange a hundred to release needed tens. 500 + 60 can be partitioned into 400 + 160. The subtraction of the tens becomes ‘160 minus 70’.	563 – 271 400 160 ~~500~~ + ~~60~~ + 3 - 200 + 70 + 1 200 + 90 + 2 = 292
Example: 563 − 278, adjustment from the hundreds to the tens and the tens to the ones Here both the tens and the ones digits to be subtracted are bigger than both the tens and the ones digits you are subtracting from. Discuss how 60 + 3 is partitioned into 50 + 13, and then how 500 + 50 can be partitioned into 400 + 150, and how this helps when subtracting.	563 – 278 400 150 ~~50~~ 13 500 + ~~60~~ + ~~3~~ - 200 + 70 + 8 200 + 80 + 5 = 285
Example: 503 − 278, dealing with zeros when adjusting Here 0 acts as a place holder for the tens. The adjustment has to be done in two stages. First the 500 + 0 is partitioned into 400 + 100 and then the 100 + 3 is partitioned into 90 + 13. **Please note that, when calculating with numbers close to a multiple of 100 or 1000, it would probably be more efficient to use a mental method or a number line**	503 – 278 400 90 13 ~~100~~ ~~500~~ + ~~0~~ + 3 - 200 + 70 + 8 200 + 20 + 5 = 225
Stage 4: Compact method for three-digit numbers **NB Expanded method needs to be shown**	Example: 563 − 241, no adjustment or decomposition needed

alongside compact method	500 + 60 + 3 563 - 200 + 40 + 1 -241 300 + 20 + 2 = 322 322 Start by subtracting the ones, then the tens, then the hundreds. Refer to subtracting the tens, for example, by saying 'sixty take away forty', not 'six take away four'.
Example: 563 − 246, adjustment from the tens to the units 50 13 5 1 500 + ~~60~~ + ~~3~~ 5~~63~~ - 200 + 40 + 6 -246	50 13 5 1 500 + ~~60~~ + ~~3~~ 5~~63~~ - 200 + 40 + 6 -246 300 + 10 + 7 = 292 292 Ensure that children can explain the compact method, referring to the real value of the digits. They need to understand that they are repartitioning the 60 + 3 as 50 +13.
Example: 563 − 271, adjustment from the hundreds to the tens, or partitioning the hundreds.	400 160 4 1 ~~500~~ + ~~60~~ + 3 ~~5~~63 - 200 + 70 + 1 -271 200 + 90 + 2 = 292 292 Begin by reading aloud the number from which we are subtracting: 'five hundred and sixty three'. Then discuss the hundreds, tens and ones components of the number, and how 500 + 60 can be partitioned into 400 and 160. The subtraction of the tens becomes '160 – 70', an application of subtraction of multiples of ten. Ensure that children are confident to explain how the numbers are repartitioned and why.

Written methods for multiplication of whole numbers

The aim is that children use mental methods when appropriate but, for calculations that they cannot do in their heads, they use an efficient written method accurately and with confidence. Children are entitled to be taught and to acquire secure mental methods of calculation and **one** efficient written method of calculation for multiplication which they know they can rely on when mental methods are not appropriate.

To multiply successfully, children need to be able to:

- recall all multiplication facts to 10x10;
- partition numbers into multiples of one hundred, ten and one;
- work out products such as 70 x 5, 70 x 50, 700 x 5 or 700 x 50 using the related fact 7 x 5 and their knowledge of place value;

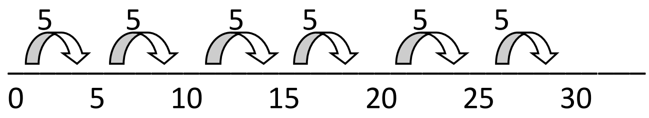
• add two or more single digit numbers mentally;
• add multiples of 10 (such as 60 + 70) or of 100 (such as 600 + 700) using the related addition fact 6 + 7, as well as their knowledge of place value;
• add combinations of whole numbers using the column method (see above).

It is important that children's mental methods of calculation are practised and secured alongside their learning and use of an efficient written method for multiplication.

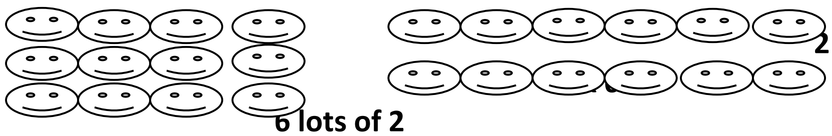
Developing the mental image of multiplication

Stage 1 - Number lines
Begin by using number lines to show the link to repeated addition
Pattern work on a 100 square helps children begin to recognise multiples and rules of divisibility

6 X 5 =



Arrays
Successful written methods depend on visualising multiplication as a rectangular array. It also helps children to understand why 3 X 4 = 4 X 3



3 lots of 4
3 x 4

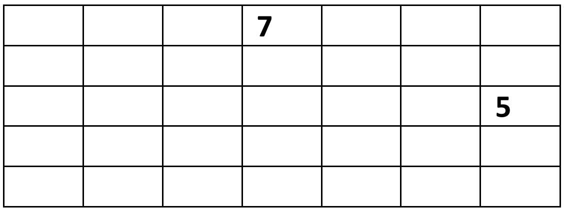
4 lots of 3
4 x 3

6 lots of 2
6 x 2

2 lots of 6

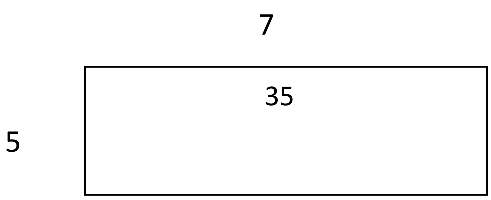
The rectangular array gives a good visual model for multiplication. The area can be found by repeated addition (in this case 7+7+7+7+7)
Children should then commit 7 X 5 to memory and know that it is the same as
5 X 7

7 X 5 = 35



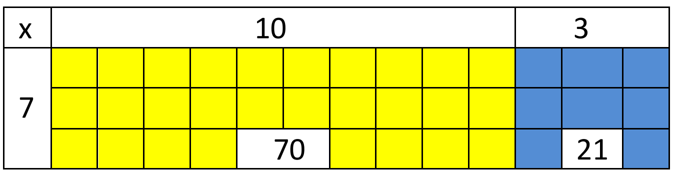
Area models like this discourage the use of repeated addition. The focus is on the multiplication facts

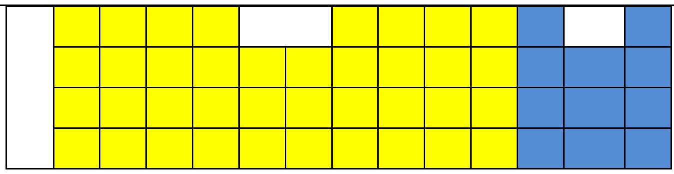
7 x 5 = 35



Stage 2 : Mental multiplication using arrays and partitioning to multiply a two-digit number by a one-digit number
An array illustrates the distributive law of multiplication i.e. 13 X 7 is the

13 x 7



same as (10 X 7) + (3 X 7) (The squares are used to ensure that children have a secure mental image of why the distributive law works)	
This can lead to the use of a “blank rectangle” to illustrate 13 X 7 = (10 X 7) + (3 X 7) (Note the rectangle is drawn to emphasise the comparative size of the numbers)	13 x 7 10 3 7 x **70** **21** = 91
Using the grid method to multiply two-digit by one-digit numbers. At first children will probably need to partition into 10s (Example A). It is important, if they are to use a more compact method, that they can multiply multiples of 10 (Example B) i.e. 38 X 7 they must be able to calculate 30 X 7 as well as 8 X 7 (Note the grid is drawn to emphasise the comparative size of the numbers)	38 X 7 is approximately 40 X 7 = 280 Example A 7 10 10 10 8 70 70 70 56 Example B 7 30 8 210 56 Leading to the layout: x 30 8 7 210 56

<table>
<tr>
<td>Stage 3: Two-digit by two-digit products using the grid method
Extend to TU × TU, asking children to estimate first.
Start by completing the grid. The partial products in each row are added, and then the two sums at the end of each row are added to find the total product
Please note that at this stage the grid is no longer drawn to reflect the respective size of the digits. If a child shows signs of insecurity return to rectangular arrays to ensure understanding</td>
<td>Stage 3
38 × 14 is approximately 40 X 15 =600.
<table><tr><td>X</td><td>30</td><td>8</td><td></td></tr><tr><td>10</td><td>300</td><td>80</td><td>380</td></tr><tr><td>4</td><td>120</td><td>32</td><td>152</td></tr><tr><td></td><td></td><td></td><td>532</td></tr></table></td>
</tr>
<tr>
<td>Three-digit by two-digit products using the grid method.
Extend to HTU × TU asking children to estimate first.
Ensure that children can explain why this method works and where the numbers and the grid come from</td>
<td>138 X 24 = is approximately 140 X 25 = 3500
<table><tr><td>X</td><td>100</td><td>30</td><td>8</td><td></td></tr><tr><td>20</td><td>2000</td><td>600</td><td>160</td><td>2760</td></tr><tr><td>4</td><td>400</td><td>120</td><td>32</td><td>552</td></tr><tr><td></td><td></td><td></td><td></td><td>3312</td></tr></table></td>
</tr>
<tr>
<td>The grid method works just as satisfactorily with decimal numbers as long as the children can apply their knowledge of multiplication facts to decimal numbers.</td>
<td>38.5 X 24 is approximately 40 X 25 = 1000
<table><tr><td>X</td><td>30</td><td>8</td><td>0.5</td><td></td></tr><tr><td>20</td><td>600</td><td>160</td><td>10</td><td>770</td></tr><tr><td>4</td><td>120</td><td>32</td><td>2</td><td>154</td></tr><tr><td></td><td></td><td></td><td>924</td><td></td></tr></table></td>
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<tr>
<td>Stage 4 : Expanded short multiplication leading to column method
• The first step is to represent the method of recording in a column format, but showing the working. Draw attention to the links with the grid method above.
• Children should describe what they do by referring to the actual values of the digits in the columns. For example, the first step in 38 × 7 is ‘thirty multiplied by seven’, not ‘three times seven’, although the</td>
<td>Stage 4
38 X 7 is approximately 40 X 7 = 280

30 + 8
x 7
210   30 X 7
56   8 X 7
266

38
X 7
210
56
266</td>
</tr>
</table>

relationship 3 × 7 should be stressed.	
Short multiplication • The recording is reduced further, with carry digits recorded below the line. **If, after practice, children cannot use the compact method without making errors, they should return to the expanded format of the grid method**	38 X 7 is approximately 40 X 7 = 280 38 X 7 266 5
• Multiplying two-digit by two-digit numbers includes the working to emphasise the link to the grid method	56 × 27 is approximately 60 × 30 = 1800. 56 X 27 1000 50x20=1000 120 6x20= 120 350 50x7 =350 42 6x7 = 42 1512
Three-digit by two-digit numbers • Continue to show working to link to the grid method. • This expanded method is cumbersome, with six multiplications and a lengthy addition of numbers with different numbers of digits to be carried out. There is plenty of incentive for more confident children to move on to a more compact method.	286 x 29 4000 200x20=4000 1600 80x20=1600 120 6x20=120 1800 200x9 =1800 720 80x9 =720 54 6x9 =54 8294 1

Written methods for division of whole numbers

The aim is that children use mental methods when appropriate but, for calculations that they cannot do in their heads, they use an efficient written method accurately and with confidence. Children are entitled to be taught and to acquire secure mental methods of calculation and
one efficient written method of calculation for division which they know they can rely on when mental methods are not appropriate.

To divide successfully in their heads, children need to be able to:
- understand and use the vocabulary of division
- partition two-digit and three-digit numbers into multiples of 100, 10 and 1 in different ways;
- recall multiplication and division facts to 10 × 10, recognise multiples of one-digit numbers and divide multiples of 10 or 100 by a single-digit number using their knowledge of division facts and place value;
- know how to find a remainder working mentally – for example, find the remainder when 48 is divided by 5;
- understand and use multiplication and division as inverse operations.

It is important that children's mental methods of calculation are practised and secured alongside their learning and use of an efficient written method for division.

To carry out written methods of division successfully, children also need to be able to:
- understand division as repeated subtraction (grouping):
- estimate how many times one number divides into another – for example, how many sixes there are in 47, or how many 23s there are in 92;
- Know subtraction facts to 20 and to use this knowledge to subtract multiples of 10 e.g. 120 - 80, 320 – 90

Stage 1 Number lines Initial focus will be on sharing and grouping practical equipment and drawing pictures/ images to help understanding, before moving on to use of number lines. • Counting on in equal steps based on adding multiples up to the number to be divided • Counting back in equal steps based on subtracting multiples from the number to be divided	15 ÷ 3 = +3 +3 +3 +3 +3 0 3 6 9 12 15 -3 -3 -3 -3 -3 0 3 6 9 12 15
Stage 2 Counting back by chunking This method is based on subtracting multiples of the divisor, or 'chunks'. Initially children subtract several chunks, but with practice they should look for the biggest multiples of the divisor that they can find to subtract. Chunking is useful for reminding children of the link between division and repeated subtraction.	100 ÷ 7 = 4X7=28 10X7=70 0 2 30 100 Answer 14 remainder 2 As you record the division, ask: 'How many

	sixes in 100?’ as well as ‘What is 100 divided by 6?’
Initially children subtract several chunks, but with practice they should look for the biggest multiples of the divisor that they can find to subtract. **Children need to recognise that chunking is inefficient if too many subtractions have to be carried out. Encourage them to reduce the number of steps and move them on quickly to finding the largest possible multiples**	200 ÷ 6 = 1x61x61x6 10x6 10x6 10x6  0 2 8 14 20 80 140 200 Answer 33 remainder 2 As you record the division, ask: ‘How many sixes in 200?’ as well as ‘What is 200 divided by 6?’ Leading to 200 ÷ 6 3x6=18 30x6=180  0 2 18 200
‘Expanded’ method for TU ÷ U recorded in columns • This method is based on subtracting multiples of the divisor from the number to be divided, the dividend. • As you record the division, ask: ‘How many sixes in 90?’ or ‘What is 90 divided by 6?’ • This method is based on subtracting multiples of the divisor, or ‘chunks’. Initially children subtract several chunks, but with practice they should look for the biggest multiples of the divisor that they can find to subtract. • Children need to recognise that chunking is inefficient if too many subtractions have to be carried out. Encourage them to reduce the number of steps as illustrated in stage 2, when using a number line	96 ÷ 6 = To find 96 ÷ 6, we start by multiplying 6 by 10, to find that 6 × 10 = 60 and 6 × 20 = 120. The multiples of 60 and 120 ‘trap’ the number 96. This tells us that the answer to 196 ÷ 6 is between 60 and 120. Start the division by first subtracting 60 leaving 36, and then subtracting the largest possible multiple of 6, which is 30, leaving no remainder. 96 - 60 10 X 6 36 30 5x6 6 6 1x6 0 16 Answer 16 **Estimation** More than 10x6=60 but less than 20x6=120

• Children who have a secure knowledge of multiplication facts and place value should be able to move on quickly to the more efficient recording on the right.	Here the child has been confident to use the largest possible multiple of 10 as the initial multiplier. Start the division by first subtracting 180 (6 X 30), leaving 16 and then subtracting the largest possible multiple of 6 (which is 12) leaving 4 **Estimation** More than 30x6=180 but less than 40x6=240 196 - 180 30 X 6 16 - 12 2x6 4 32 Answer 32 R 4 The quotient 32 (with a remainder of 4) lies between 30 and 40, as predicted.
Long division The next step is to tackle HTU ÷ TU.	How many packs of 24 can we make from 560 biscuits? Start by multiplying 24 by multiples of 10 to get an estimate. As 24 × 20 = 480 and 24 × 30 = 720, we know the answer lies between 20 and 30 packs. We start by subtracting 480 from 560 24 √560 20 - 480 24x20 80 3 72 24x3 8 Answer: 23 R 8 In effect, the recording above is the long division method, though conventionally the digits of the answer are recorded above the line as shown below. 23 24 √560 - 480 80 - 72 8 Answer: 23 R 8

Summary

- Children should always estimate first
- Always decide first whether a mental method is appropriate

- Pay attention to language - refer to the actual value of digits
- Always check the answer, preferably using a different method, for example the inverse operation
- Children who make persistent mistakes should return to the method that they can use accurately until ready to move on
- Children need to know number and multiplication facts by heart
- Discuss errors and diagnose problems and then work through problems - do not simply re-teach the method
- When revising or extending to harder numbers, refer back to expanded methods. This helps reinforce understanding and reminds children that they have an alternative to fall back on if they are having difficulties.