MATHEMATICS POLICY

AIMS

The aims for teaching mathematics are:

- To engender a confident and positive attitude to mathematics
- To encourage a logical and reasoned approach to solving problems
- To appreciate that numbers have significance and that they can be manipulated according to specific rules.
- To appreciate that mathematics has influence on all areas of the curriculum and in all areas of everyday life
- To provide an atmosphere where mathematical investigations are encouraged.

By the end of their time at Roach Vale School all pupils will have been:

- Equipped with the mental and written skills required to calculate.
- Equipped with the skills and techniques for handling data and using measuring apparatus.
- Enabled to make suitable comparisons and use appropriate calculus on weight, length, time and capacity.
- Made aware of shape and space and the relationships between them.
- Encouraged to look at problems logically, seeking patterns and interrelationships, which will lead to solutions.
- Encouraged to show mastery through careful explanation to peers and by deeper exploration and investigation in their own learning.

IMPLEMENTATION

All teaching staff are responsible for delivering mathematics. In order to do so a number of teaching styles and strategies will be used (whole class teaching, group work, and individually based work) depending on the needs of the pupil(s) in question. The teaching assistants will be an integral part of the process when the strategy in use is group or individual. Teaching and learning will be both practical and theoretical and will, where possible, be cross-curricular.

The school follows the 2014 National Curriculum. In the Early Years maths is child initiated and adult led in line with Development Matters. Activities cover the range of characteristics of learning – allowing children to Play and Explore, engage in Active Learning and Create and Think Critically.

MEGA MATHS

Currently all KS1 and KS2 classes partake in an extra 20 minutes per day of Maths. This has been titled “Mega Maths” and is designed to give discrete skill teaching across a week. Planned activities aim to provide mastery of pupil’s targets and are assessed against these. The emphasis is on practical work and giving children further time to explore ideas and concepts as well as supporting their current knowledge.

PROGRESSION AND CONTINUITY:

The following information in Appendix 1 details the developmental progression of the four main number operations as listed by the National Curriculum for mathematics. It includes the Roach Vale calculation policy for the teaching of the four number operations and is an invaluable guidance to ensure continuity of skills and understandings. All other aspects of maths are covered in the 2014 National curriculum. It is the class teacher’s duty to know these and to follow them.

ROLE OF THE MATHS TEAM

The team is responsible for regular monitoring of planning and teaching, checking samples of children's work and analysing test results to aid evaluation of progress, evaluation of quality of learning and assist future planning by highlighting areas of weakness.

The team is also responsible for keeping abreast of new trends and disseminating these to staff where necessary, and delivering any inset required for the maintenance of the Framework and the quality of teaching and learning within the school.

The current team is Mrs J Macpherson, Mr D Harvey and Mrs S Churchman.

EQUAL OPPORTUNITIES

All children in our care regardless of sex, race, religious background or ability are entitled to the maths curriculum.

DIFFERENTATION

At Roach Vale Primary School we have adopted the philosophy of having a 'Growth Mind-set'. In response to this it is recognised that all pupils are entitled to the expectations of the National Curriculum for maths through different levels of support. In all KS2 classes pupils are provided with activities containing differing levels of challenge (Chilli Challenges). They are encouraged to choose their challenge which can be carried out independently, with another pupil or with adult support. This method of working also encourages mastery in maths as children support each other in their understanding of concepts and skills. In KS1 some activities are carried out in this way

ASSESSMENT AND RECORDS

Teacher assessment is ongoing throughout the year and is used to regularly update Target Tracker. Teachers are encouraged to use questioning and challenge to inform and adapt planned teaching when appropriate.

Assessment in EYFS is largely through observation. Evidence of progress is recorded on Tapestry. Activities are tailored towards achieving the Early Learning Goals for Mathematics.

Target Tracker is completed half termly by all teachers to track children's progress. Progress is then analysed and evaluated and when appropriate extra support given. Support is available for those at less than ARE and those exceeding ARE.

RESOURCES

Abacus is offered as a planning support alongside other interactive resources including My Maths. 10 ticks provides an additional photocopiable resource. Websites including NCETM and Nrich are also consulted for activities to use with more able pupils. A wide range of concrete apparatus is available in classes from which children can select. All KS1 and KS2 classes also have age appropriate maths dictionaries.

MONITORING AND EVALUATION

Maths in the school is monitored by the Maths team and by the Headteacher. The following are monitored on a regular basis:

- Plans

- Assessments
- Outcomes of assessments
- Target Tracker
- Children's work
- Quality of teaching – classroom observations
- Quality of learning

The team reports back to the Headteacher, and the Head reports back to the Curriculum Committee of the Governing Body. Evaluations are made at each stage of reporting back.

Appendix 1 – progression of teaching for four rules

EYFS – based upon Development Matters

Maths	Numbers
30 – 50 months	• Uses some number names and number language spontaneously. • Uses some number names accurately in play. • Recites numbers in order to 10. • Knows that numbers identify how many objects are in a set. • Beginning to represent numbers using fingers, marks on paper or pictures. • Sometimes matches numeral and quantity correctly. • Shows curiosity about numbers by offering comments or asking questions. • Compares two groups of objects, saying when they have the same number. • Shows an interest in number problems. • Separates a group of three or four objects in different ways, beginning to recognise that the total is still the same. • Shows an interest in numerals in the environment. • Shows an interest in representing numbers. • Realises not only objects, but anything can be counted, including steps, claps or jumps.
40 – 60+ months	• Recognise some numerals of personal significance. • Recognises numerals 1 to 5. • Counts up to three or four objects by saying one number name for each item. • Counts actions or objects which cannot be moved. • Counts objects to 10, and beginning to count beyond 10. • Counts out up to six objects from a larger group. • Selects the correct numeral to represent 1 to 5, then 1 to 10 objects. • Counts an irregular arrangement of up to ten objects. • Estimates how many objects they can see and checks by counting them. • Uses the language of 'more' and 'fewer' to compare two sets of objects. • Finds the total number of items in two groups by counting all of them. • Says the number that is one more than a given number. • Finds one more or one less from a group of up to five objects, then ten objects. • In practical activities and discussion, beginning to use the vocabulary involved in adding and subtracting. • Records, using marks that they can interpret and explain. • Begins to identify own mathematical problems based on own interests and fascinations. **Early Learning Goal** **Children count reliably with numbers from one to 20, place them in order and say which number is one more or one less than a given number. Using quantities and objects, they add and subtract two single-digit numbers and count on or back to find the answer. They solve problems, including doubling, halving and sharing.**

Year 1

Addition and subtraction

Pupils should be taught to:
Read, interpret and practise writing mathematical statements involving addition (+), subtraction (-) and equals (=) signs accurately
Add and subtract 1-digit and 2-digit numbers to 20 (9 + 9, 18 - 9), including zero
Add three 1-digit numbers
Recall and use number bonds and related subtraction facts within 20
Solve simple word problems that involve addition and subtraction.
Ensure pupils practise reading and writing mathematical statements regularly so that they become fluent.
Ensure pupils practise so that they memorise their number bonds to 20 in the three forms (e.g. 9 + 7 = 16; 16 – 7 = 9; 16 – 9 = 7), and that they can record their answers. This will prepare them for Year 2 when they are taught how to add and subtract two 2-digit numbers.

Multiplication and division

Pupils should be taught to:
Recognise and write the multiplication symbol (x) and the division symbol (÷) in mathematical statements, calculating the answer with the teacher using concrete objects
Solve word problems involving simple multiplication and division, with teacher support.
Ensure pupils are introduced to the multiplication (x) and division (÷) symbols so that they can recognise and write them accurately. They should distinguish them from addition and subtraction. This prepares them
For Year 2 when they are taught how to multiply and divide using two 1-digit numbers with concrete objects and then using numbers within the multiplication tables.

YEAR 2

Addition and subtraction

Pupils should be taught to:
Rapidly recall and use addition and subtraction facts to 20
Add and subtract numbers with up to two 2-digits including using column addition without carrying and column subtraction without borrowing
Add and subtract numbers mentally including:
- a 2-digit number and ones
- a 2-digit number and tens
- two 2-digit numbers
use subtraction in ‘take away’ and ‘find the difference’ problems
recognise and show that addition can be done in any order (commutative) and subtraction cannot recognise and use addition and subtraction as inverse operations including checking calculations
solve word problems with addition and subtraction of numbers with up to 2-digits.
Ensure pupils practise addition and subtraction of number bonds to 20 so that they become fluent in recalling them. This includes using related facts to perform calculations (e.g. using 3 + 7 = 10, 10 - 7 = 3 and 10 – 3 = 7 to calculate 30 + 70 = 100, 100 - 70 = 30 and 100 – 30 = 70).
Ensure pupils practise column addition and subtraction to write numbers with precision to calculate answers. This also reinforces the concept of place value. Horizontal written methods should progress rapidly to more efficient column methods to help prepare pupils in Year 3 when they are taught column addition with carrying and subtraction with borrowing.

Ensure pupils practise mental addition and subtraction of two numbers of up to 2-digits, with answers not exceeding 100. They should know how to check calculations, including by adding to check subtraction and adding numbers in a different order to check addition; for example 5 + 2 + 1 = 1 +
5 + 2 = 1 + 2 + 5.
Ensure pupils regularly practise how to interpret word problems to ensure addition and subtraction are firmly understood.

Multiplication and division
Pupils should be taught to:
recall multiplication and division facts for the 2, 5 and 10 multiplication tables
use the multiplication (x), division (÷) and equals (=) signs to read and write mathematical statements
write and calculate mathematical statements for multiplication and division within the multiplication tables
recognise and use the inverse relationship between multiplication and division to check calculations
ensure pupils can recognise and show that multiplication can be done in any order (commutative) and division cannot solve word problems involving multiplication and division.
Ensure pupils are taught multiplication and division through sharing out quantities; finding simple fractions of objects, numbers and quantities; doubling numbers and quantities; and find related halves. This also links to recognition of division as sharing and grouping.
Pupils are introduced to the multiplication tables in Year 2. Ensure pupils practise 2, 5 and 10 multiplication tables up to x12 so they are fluent in recalling them. This includes using related division facts to perform written and mental calculations.

YEAR 3

Addition and subtraction

Pupils should be taught to:
add and subtract numbers with up to 3 digits, including using column addition and subtraction accurately
add and subtract numbers mentally including: pairs of one- and 2-digit numbers; 3-digit numbers and ones; 3-digit numbers and tens; 3-digit numbers and hundreds
solve word problems including missing number problems, using number facts, place value, and more complex addition and subtraction.
Ensure pupils continue to practise the use of column addition and subtraction with increasingly large numbers, using carrying for addition and borrowing for subtraction.
For mental calculations with 2-digit numbers, answers should exceed 100.

Multiplication and division

Pupils should be taught to:
recall and use multiplication and division facts for the 2, 3, 4, 5, 8 and 10 multiplication tables
write and calculate mathematical statements for multiplication and division within the multiplication tables; and for 2-digit numbers x 1-digit numbers, using mental and written methods
solve word problems involving the four operations, including missing number problems.
Ensure pupils continue to practise regularly the mental recall of multiplication tables when they are calculating mathematical statements until they are confident to use them.
Ensure pupils develop efficient mental methods. For example, pupils should use commutativity (e.g. 4 x 12 x 5 = 4 x 5 x 12 = 20 x 12 = 240) and multiplication and division facts (e.g. using 3 x 2 = 6, 6 ÷ 3 = 2 and 2 = 6 ÷ 3 to calculate 30 x 2 = 60, 60 ÷ 3 = 20 and 20 = 60 ÷ 3).
Ensure pupils develop reliable written methods for multiplication and division, starting with calculations with 2-digit by 1-digit numbers and progressing to formal written methods. This helps prepare pupils for long multiplication from Year 4 and short and long division in Years 5 and 6.

YEAR 4

Addition and subtraction

Pupils should be taught to:
add and subtract numbers using formal written methods with up to 4 digits
accurately add and subtract numbers mentally including two 2-digit numbers
estimate, within a range, the answer to a calculation and use inverse operations to check answers. [15
Ensure pupils continue practising formal written methods and mental methods with increasingly large numbers, and include the terms 'sum' and 'difference'. For mental calculations, include increasingly large numbers, for example, 12,462 - 2,400 = 10,062 or 12,462 + 600 = 13,062. [151]
Ensure pupils say and write the numbers correctly and with precision, so that they are clear about place value and confident when working with mental calculations. This will prepare them for Year 5, when pupils are taught to calculate the sum and difference of two decimal numbers (up to 2 decimal places).
find the effect of dividing a 2-digit number by 10 and 100,

Multiplication and division
Pupils should be taught to:
recall multiplication and division facts for multiplication tables up to 12 x 12
mentally perform multiplication and division calculations quickly and accurately, including multiplying by 0 and dividing by 1
multiply or divide 2-digit and 3-digit numbers by a 1-digit number using formal written methods; interpret remainders appropriately as integers
recognise and use factor pairs within 144
solve word problems involving the four operations.
Ensure pupils continue to practise recalling and using multiplication tables and related division facts on a regular basis until they are confident using them mentally.
Ensure pupils continue to practise mental methods and extend this to 3-digit numbers to derive facts, for example 300 x 2 = 600 into 600 ÷ 3 =200. Pupils should also use the distributive law to derive facts, for example, 30 x 7 + 9 x 7= 39 x 7.

YEAR 5

Addition and subtraction
Pupils should be taught to:
add and subtract whole numbers with up to 5 digits, including using formal written methods
add and subtract numbers mentally with increasingly large numbers.
Ensure pupils continue practising formal written methods with increasingly large numbers so they are fluent and precise. This will aid the introduction of adding and subtracting with decimals in this year.
Ensure pupils continue to practise fast responses for mental calculations with increasingly large numbers, for example: 12,462 – 2,300 = 10,162.
add and subtract numbers with up to three decimal places.
Ensure pupils practise adding and subtracting decimals, initially calculating with the same number of decimal places, moving on to a mix of whole numbers and decimals with different numbers of decimal places.
Ensure pupils recognise and use complements of 1 using addition and subtraction facts and place value, e.g. 0.83 + 0.17 = 1.

Multiplication and division
Pupils should be taught to:
multiply numbers up to 4-digits by a 1 or 2-digit number using a formal written method, including long multiplication

accurately multiply and divide numbers mentally drawing upon known facts

divide numbers up to 4 digits by a 1-digit number and 10 and interpret
remainders appropriately
multiply and divide numbers by 10, 100 and 1000
Solve word problems involving addition and subtraction, multiplication and division.
Ensure pupils extend their use of written methods for multiplication to practise long multiplication. Also, ensure pupils continue to practise and apply all the multiplication tables and related division facts as often as possible to ensure they are committed to memory and can be used confidently to make larger calculations.

YEAR 6

Addition, subtraction, multiplication and division

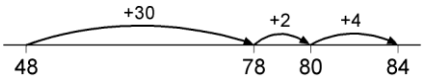
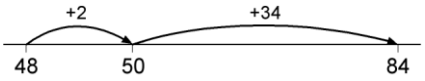
Pupils should be taught to:
Add and subtract negative integers
Multiply numbers with at least 4-digits by a 2-digit whole number using long multiplication
Divide numbers up to 4-digits by a 2-digit whole number using long division, and interpret remainders as whole number remainders, fractions, decimals or by rounding
Carry out combined operations involving the four operations accurately and state the order of operations
Solve word problems involving addition, subtraction, multiplication and division.

Ensure pupils continue to practise calculating addition, subtraction, multiplication and division using formal written methods. Extend application of written methods to larger numbers.
Ensure pupils continue to use all the multiplication tables to calculate mathematical statements to maintain fluency.
Identify the value of each digit to three decimal places and multiply and divide numbers up to three decimal places by 10, 100 and 1000
Multiply and divide numbers with up to two decimal places by 1-digit and 2-digit whole numbers.
Ensure pupils multiply decimals by whole numbers starting with the simplest cases, such as 0.4 x 2 = 0.8, and practical contexts, such as measures and money.
Ensure pupils are introduced to division of decimal numbers initially in practical contexts involving measures and money and by single digit whole numbers

ROACH VALE PRIMARY SCHOOL

Appendix 2 – skill progression

ADDITION

Stage 1: The empty number line	
• Children need to be able to partition numbers in ways other than into tens and ones 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. • This can be used at the simplest level of u + u that don't cross a boundary line, used for time and even used for decimals. • Children should be introduced to this once they are able to add concrete objects together to show them a move towards the abstract number line approach.	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. Add the tens and then the ones to form partial sums and then add these partial sums. • Partitioning both numbers into tens and ones mirrors the column method where ones are placed under ones and tens under tens. This also links to mental methods.	Record steps in addition using partitioning: 47 + 76 = 40 + 70 + 7 + 6 = 110 + 13 = 123 Partitioned numbers are then written under one another: 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 ones to the ones separately. To find the partial sums either the tens or the ones can be added first, and the total of the partial sums can be found by adding them in any order. As children gain confidence, ask them to start by adding the ones digits first always. • 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'. • 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.	Adding the units first: 47 + 76 13 110 123 Discuss how adding the ones first gives the same answer as adding the tens first. Refine over time to adding the ones digits first consistently
Stage 4: 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.	47 + 76 = 123 (11) 258 + 87 = 345 (11) 366 + 458 = 824 (11) Column addition remains efficient when used with larger whole numbers and decimals. Once learned, the method is quick and reliable.

SUBTRACTION

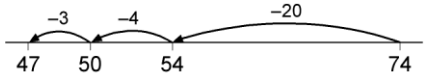
Stage 1: Using the empty number line

- The empty number line helps to record or explain the steps in mental subtraction. A calculation like 74 – 27 can be recorded by counting back 27 from 74 to reach 47. The empty number line is also a useful way of modelling processes such as bridging through a multiple of ten.
- With practice, children will need to record less information and decide the steps they take as they work their way backwards.
- This approach can be used with time, decimals and even larger numbers depending on the need of the child at that given time.

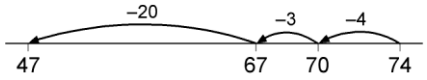
Steps in subtraction can be recorded on a number line. The steps often bridge through a multiple of 10.

15 – 7 = 8

74 – 27 = 47 worked by counting back:

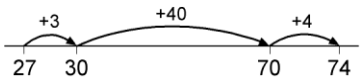


The steps may be recorded in a different order:



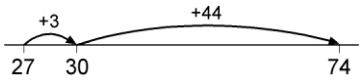
The adding on method (Difference)

- The mental method of counting up from the smaller to the larger number can be recorded using either number lines or vertically in columns. The number of rows (or steps) can be reduced by combining steps.
- The phrasing of the operation is "We are finding the difference between x and y".
- It is useful to ask children whether counting up or back is the more efficient for calculations such as 57 – 12, 86 – 77 or 43 – 28.



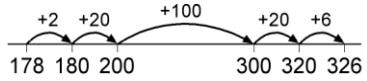
74	
– 27	
3	→ 30
40	→ 70
4	→ 74
47	

or:



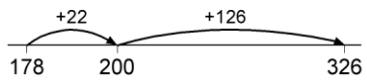
74	
– 27	
3	→ 30
44	→ 74
47	

- With three-digit numbers the number of steps can again be reduced, provided that children are able to work out answers to calculations such as 178 + ☐ = 200 and 200 + ☐ = 326 mentally.
- The most compact form of recording remains reasonably efficient.

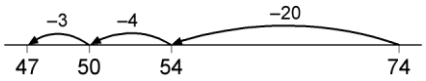


326	
–178	
2	→ 180
20	→ 200
100	→ 300
26	→ 326
148	

or:



326	
–178	
22	→ 200
126	→ 326
148	

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 4 in turn. Some children may need to partition the 74 into 70 + 4 or 60 + 14 to help them carry out the subtraction.	Subtraction can be recorded using partitioning: 74 – 27 = 74 – 20 – 7 = 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	
• 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 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.	Partitioned numbers are then written under one another: Example: 74 − 27 $\begin{array}{r} 70+4 \\ -\ 20+7 \\ \hline \end{array}$ $\begin{array}{r} {\scriptstyle 60}\ {\scriptstyle 14} \\ \cancel{70}+\cancel{4} \\ -\ 20+7 \\ \hline 40+7 \end{array}$ $\begin{array}{r} {\scriptstyle 6}\ {\scriptstyle 14} \\ \cancel{7}\ \cancel{4} \\ -\ 2\ 7 \\ \hline 4\ 7 \end{array}$ This is a possible way of showing children but it is not expected

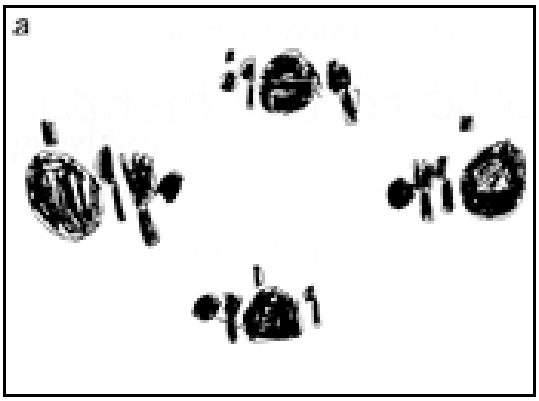
MULTIPLICATION

Stage 1 – practical introduction of repeated groups

In practical groups, discussion and through careful questioning count aloud in ones, twos, fives or tens. Count repeated groups of the same size. Observe number relationships and patterns in the environment.

Stage 2 – recording of equal groups / sets

Children will experience equal groups of objects and will count in 2s and 10s and begin to count in 5s. They will work on practical problem solving activities involving equal sets or groups.



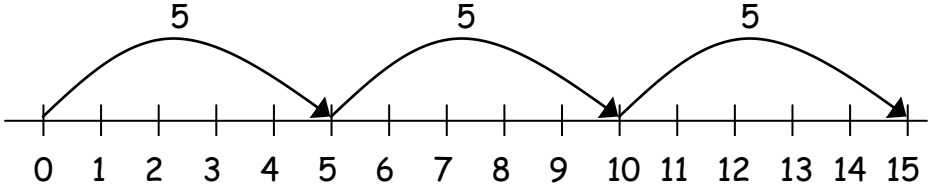
Stage 3 – linking tables to repeated addition/arrays and commutativity

Children will develop their understanding of multiplication and use jottings to support calculation:

3 times 5 is 5 + 5 + 5 = 15 or 3 lots of 5 or 5 x 3

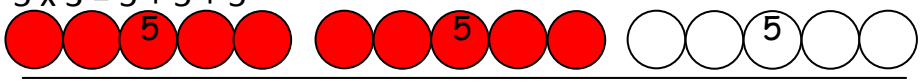
Repeated addition can be shown easily on a number line:

5 x 3 = 5 + 5 + 5



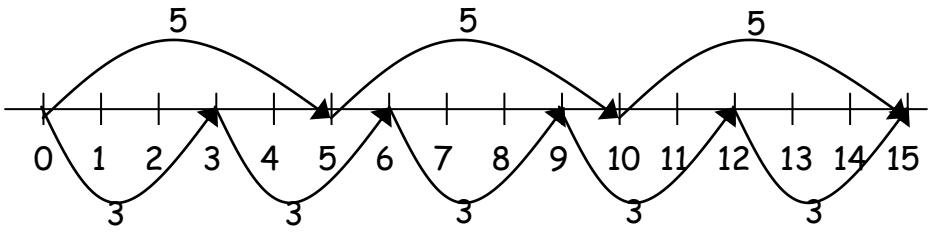
and on a bead bar:

5 x 3 = 5 + 5 + 5



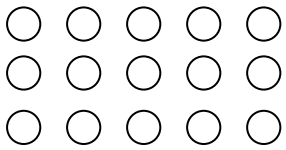
✓ **Commutativity**

Children should know that 3 x 5 has the same answer as 5 x 3. This can also be shown on the number line.



✓ **Arrays**

Children should be able to model a multiplication calculation using an array. This knowledge will support with the development of the grid method.



5 x 3 = 15

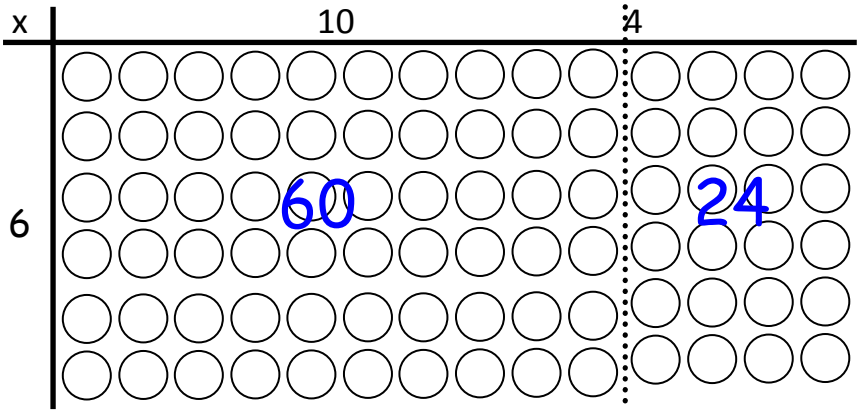
3 x 5 = 15

Stage 4 – introduction of partitioning

✓ **Partitioning – this may need to be shown practically with Numicon or appropriate resources so children understand why the digits can be separated and multiplied and then added together.**

38 x 5 = (30 x 5) + (8 x 5)
= 150 + 40
= 190

Children will continue to use arrays where appropriate leading into the grid method of multiplication.



(6 x 10) + (6 x 4)

60 + 24

84

Stage 5 – introduction of the grid method.

Grid method – once children have a solid grasp of partitioning and why it works then the next move is to begin to remove the need for concrete apparatus and pictures and begin to move to abstract numbers. Obviously depending on the level of competence with the class, the different operations listed can all be shown through this method.

TU x U

23 x 8

Children will approximate first
23 x 8 is approximately 25 x 8 = 200

x	20	3
8	160	24

160
+ 24
184

- 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 relationship 3 × 7 should be stressed.

Stage 6 – reinforcement of the grid method.

Here we begin to make the move from the grid method towards the traditional way of setting out a multiplication.

23
X 8
24 (8 x 3)

160 (8 x 20)
184

Moving on to not having the operations recorded in the brackets.

  23
X 8
  24
160
184

Once children can use the above methods on **TU x U TU x TU HTU x TU HTU x HTU U x U.t U.t x U.t etc.** then they will be ready to use whole number multiplication using the below method.

Stage 7 – traditional long multiplication method

No example shown here but this is the most efficient method once children have a firm grasp of the previous ways of multiplying.

DIVISION

Stage 1 – practical real life sharing of concrete objects

In practical activities and discussion begin to share objects into equal groups and count how many in each group.

- Set sharing and grouping activities that are imaginative and enjoyable and that follow children's interests. Provide collections of objects for children to sort, match and count.
- Share, recite and encourage joining in with number rhymes and stories using games and books involving sharing and grouping.
- Share out objects within the group, for example fruit.

Stage2 – practical sharing of concrete objects into equal groups

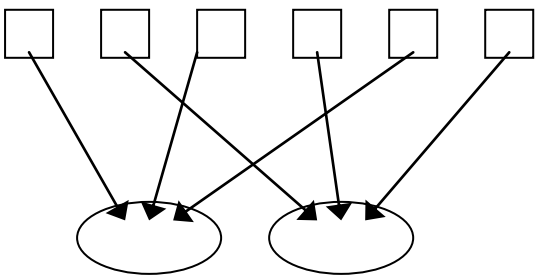
Children will understand equal groups and share items out in play and problem solving. They will count in 2s and 10s and later in 5s.

Stage3 – recording using pictures

Children will develop their understanding of division and use jottings to support calculation. They need to have opportunities to group.

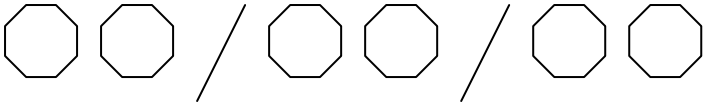
✓ **Sharing equally**

6 sweets shared between 2 people, how many do they each get?



✓ **Grouping or repeated subtraction**

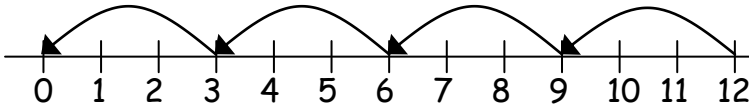
There are 6 sweets, how many people can have 2 sweets each?

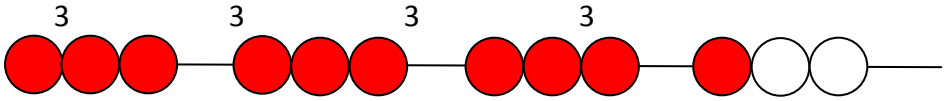


Stage 4 – linking division to repeated subtraction

Repeated subtraction using a number line or bead bar but still link to concrete apparatus to make the link explicit. Show how "sharing" becomes "subtracting".

12 ÷ 3 = 4





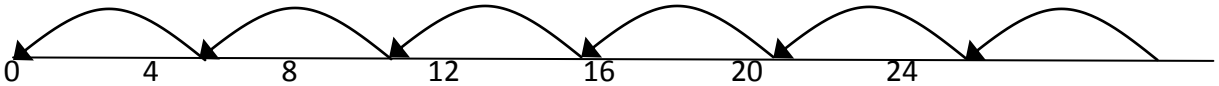
The bead bar will help children with interpreting division calculations such as 10 ÷ 5 as 'how many 5s make 10?'

Stage 5 – linking division to repeated subtraction

Ensure that the emphasis is on grouping rather than sharing.
Children will continue to use:

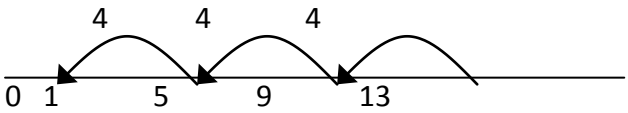
✓ **Repeated subtraction using a number line**
Children will use an empty number line to support their calculation.

24 ÷ 4 = 6 (Ask: "How many 4's are there in 24?")



Children should also move onto calculations involving remainders.

13 ÷ 4 = 3 r 1



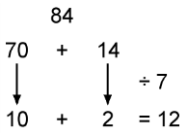
Stage 5 – pencil and paper methods

- **Step 1 Mental division using partitioning**
- **Step 2 -Short division of TU ÷ U**
- **Step 3: 'Expanded' method for HTU ÷ U**
- **Step 4: Short division of HTU ÷ U**
- **Step 5: Long division**

Step 1 Mental division using partitioning

One way to work out TU ÷ U mentally is to partition TU into a multiple of the divisor plus the remaining ones, then divide each part separately.

Informal recording for 84 ÷ 7 might be:



In this example, using knowledge of multiples, the 84 is partitioned into 70 (the highest multiple of 7 that is also a multiple of 10 and less than 84) plus 14 and then each part is divided separately using the distributive law.

Another way to record is in a grid, with links to the grid method of multiplication.

×		
7	70	14

→

×	10	2
7	70	14

10 + 2 = 12

As the mental method is recorded, ask: 'How many sevens in seventy?' and: 'How many sevens in fourteen?'

Also record mental division using partitioning:

64 ÷ 4 = (40 + 24) ÷ 4
= (40 ÷ 4) + (24 ÷ 4)
= 10 + 6 = 16

87 ÷ 3 = (60 + 27) ÷ 3
= (60 ÷ 3) + (27 ÷ 3)
= 20 + 9 = 29

Remainders after division can be recorded similarly.

96 ÷ 7 = (70 + 26) ÷ 7
= (70 ÷ 7) + (26 ÷ 7)
= 10 + 3 R 5 = 13 R 5

Step 2 -Short division of TU ÷ U

For 81 ÷ 3, the dividend of 81 is split into 60, the highest multiple of 3 that is also a multiple 10 and less than 81, to give 60 + 21. Each number is then divided by 3.

81 ÷ 3 = (60 + 21) ÷ 3
= (60 ÷ 3) + (21 ÷ 3)
= 20 + 7
= 27

Step 3: 'Chunking' or 'Extended method'

```
6)196
 − 60   6×10
  136
 − 60   6×10
   76
 − 60   6×10
   16
 − 12   6× 2
    4     32
Answer:  32 R 4
```

Here children can then begin to make decisions about the amount of "chunks" they wish to take out as larger numbers and only taking out multiples of 10 of the divisor may prove to take too long. Children should be encouraged to discuss this and identify the potential downfalls of using this method in such a way. This will hopefully begin to lead children onto making more efficient choices of 2chunk2 as demonstrated below.

$$
\begin{array}{rll}
6\overline{)196} & & \\
-\ \underline{180} & 6\times 30 & \\
16 & & \\
-\ \underline{12} & 6\times\ \underline{2} & \\
4 & 32 & \\
\text{Answer:} & 32\,\text{R}\,4 &
\end{array}
$$

Step 4: Short division of HTU ÷ U

The short division method is recorded like this:

$$3\overline{)290+1} = 3\overline{)270+21}^{\,90+\ 7}$$

This is then shortened to:

$$3\overline{)2\ 9^{2}1}^{\,9\ 7}$$

The carry digit '2' represents the 2 tens that have been exchanged for 20 ones. In the first recording above it is written in front of the 1 to show that a total of 21 ones are to be divided by 3.

The 97 written above the line represents the answer: 90 + 7, or 9 tens and 7 ones.

Step 5: Long division

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.

$$
\begin{array}{rll}
24\overline{)\ 560} & & \\
20\ -\underline{480} & 24\times 20 & \\
80 & & \\
3\quad\ \underline{72} & 24\times 3 & \\
8 & & \\
\text{Answer: 23 R 8} & &
\end{array}
$$

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.

$$
\begin{array}{r}
\ \ 23 \\
24\overline{)\ 560} \\
-\underline{480} \\
\ \ 80 \\
-\underline{72} \\
\ \ 8
\end{array}
$$

Answer: 23 R 8