

Shropshire Hills Federation

Calculation Policy - 14.8.2018

Keys Aims of the Policy

- To ensure that all adults working with children, do so using language and methods which will enable them to build successfully upon their prior learning?
- To ensure that all aspects of the National Curriculum (2014) are taught to a high standard and that all adults (teachers and support staff) are confident in teaching and supporting *all* children to the highest standards in all aspects of mathematics, including the highest attaining pupils.
- To develop confident, independent and numerate children who understand that success in maths is not demonstrated by a page of calculations which are all correctly performed and acknowledged by the class teacher with a row of red ticks. Instead children will understand that it is a continuous process of development, using known facts to trial solutions to new problems, where it is highly probable that many incorrect answers may be *achieved* before a final solution is concluded.
- To develop outstanding progression through consistent teaching of calculation methods from Nursery to KS3.
- To ensure that all children have a secure knowledge of the number system, before progressing to formal written algorithms, to secure excellent mathematical understanding and the ability to calculate to a high standard mentally. ***However, we must also recognize changes to the 2014 National Curriculum at all key stages mean that we must endeavour to secure this understanding as early as possible so that formal written methods are securely understood before transition to secondary school.***
- To provide outstanding CPD for all adults working with children, including for parents. In particular, high quality CPD should be directed towards learning support staff who may have received the least amount of formal training, but who are expected to lead small group work within the class.
- Adults will have high expectations of all children, and all children will have high expectations of themselves. More able children will be given the opportunity to advance their learning beyond national expectations at all phases.
- To apply maths to practical, engaging and purposeful tasks across the curriculum and beyond.
- To implement a policy which promotes consistency between local schools, including secondary schools, to ensure maximum progress at Year 7.

How Will We Achieve This?

- All staff will be trained and regularly retrained in consistent pedagogy which will promote the highest standard of learning for all children. Consistency between classes and between adults, including parents is essential to avoid confusion. All staff members will have a secure understanding of what precedes and supersedes their particular area of teaching, including at KS3.
- We will promote a culture where children recognize that getting something 'wrong' at first is part of the learning process and not failure.
- We will actively encourage parents to take part in their child's mathematical understanding. To achieve this we will provide regular, informal and enjoyable workshops to help parents understand methods of calculation used by their children and how important careful progression through many stages of learning is to ultimate understanding.
- We will recognize that many adults (including members of staff) have had poor experiences of maths in their formative years and may harbour personal fears of maths. We will try to help them to overcome this to avoid fears being passed on to children. This will be achieved by supporting

all members of staff and parents to overcome any shortcomings in their own mathematical understanding in a manner which does not cause embarrassment or anxiety.

- We will recognize that the majority of adults learnt calculation only through formal written methods, often picked up from a variety of sources. We will advise parents when to use formal written methods with their children and which methods are used in school.
- We will provide a learning environment which encourages mathematical discussion and frequent use of mental strategies. We will give children time to do this and recognize that an outstanding maths lesson does not always require a completed worksheet to demonstrate success.
- We will ensure that maths is learnt through stimulating, and whenever possible, real life practical applications. The Brew with a View Café is an excellent example of how being given the opportunity to utilize maths for a meaningful purpose promotes enthusiasm, understanding and accuracy in mental and written calculation.

Key Information for Outstanding Teaching and Learning of Calculation

- Encourage methods which develop secure mathematical understanding, but recognize the rigorous demands of the 2014 National Curriculum in which formal written methods must be taught to and secured by all children before the end of Upper Key Stage Two. Remember that calculation includes working with fractions, decimals and percentages as well as whole numbers.
- Develop strategies which easily translate into mental understanding.
- Use correct terminology for digits, numbers, numerals, symbols etc. from Nursery; do not underestimate children's ability to secure language at an early age.
- **Secure understanding of place value is a fundamental prerequisite for good understanding of calculation. Refer to The School Maths Curriculum to ensure that this is being taught to the correct level for the potential ability of each child.**
- Encourage estimation at all levels. This is a difficult but vital skill, it must be taught frequently.
- Learn to round numbers as early as possible to allow this.
- Think – is this a sensible answer?
- Encourage children to ask questions of each other and of themselves; how can I use what I already know to learn something new? i.e. if $7+3 = 10$ then $0.7+0.3 = 1$ and $70+30=100$.
- Basic facts common to each operation should be taught from Nursery. i.e. For addition, the answer will always be bigger than any of the numbers in the calculation.
- As the term 'sum' also means total when adding, we need to use the word calculation for other operations to avoid confusion – **we are not doing take away sums!**
- We always try to write one digit/symbol in each square from Nursery. This will encourage good practice as a matter of course and avoid place value errors later in the school.
- When calculating at the early stages, it is important to label the meaning of each digit in a number. E.g. H T O.t above numbers.
- Calculation methods are a tool to be applied to solve problems and we must apply the skill not just teach it. Children need to interpret written problems and decide which calculations are required, including multi- step problems.
- We should provide frequent real life applications for practising skills which give purpose to the learning of skills.
- We should celebrate good understanding of number in the same way that we celebrate fine poetry or good stories. This should be reflected in displays and celebration assemblies.
- As an appendix to this policy we have produced flow charts of learning (including a variety of options) to ensure optimum and consistent progress. This should be fully understood by all members of staff from Nursery to KS3. Everyone should know what comes before and after their own specialist area, and more importantly, why?
- Workshops for parents should endeavour to explain this progression and parents should frequently be made aware at what stage their child is working, so that they may support this.
- Workshops for parents should be friendly, informal and enjoyable. We must recognize that many adults harbour a fear of mathematics and it is our job to help them to overcome this.

Crucially, for the development of their child, they must not pass on this fear. There is no reason at all for anyone to be afraid of maths. If it is not understood then this is likely to be because it was poorly taught!

No more must we hear: “Don’t worry, I was no good at maths either, you get it from me.”

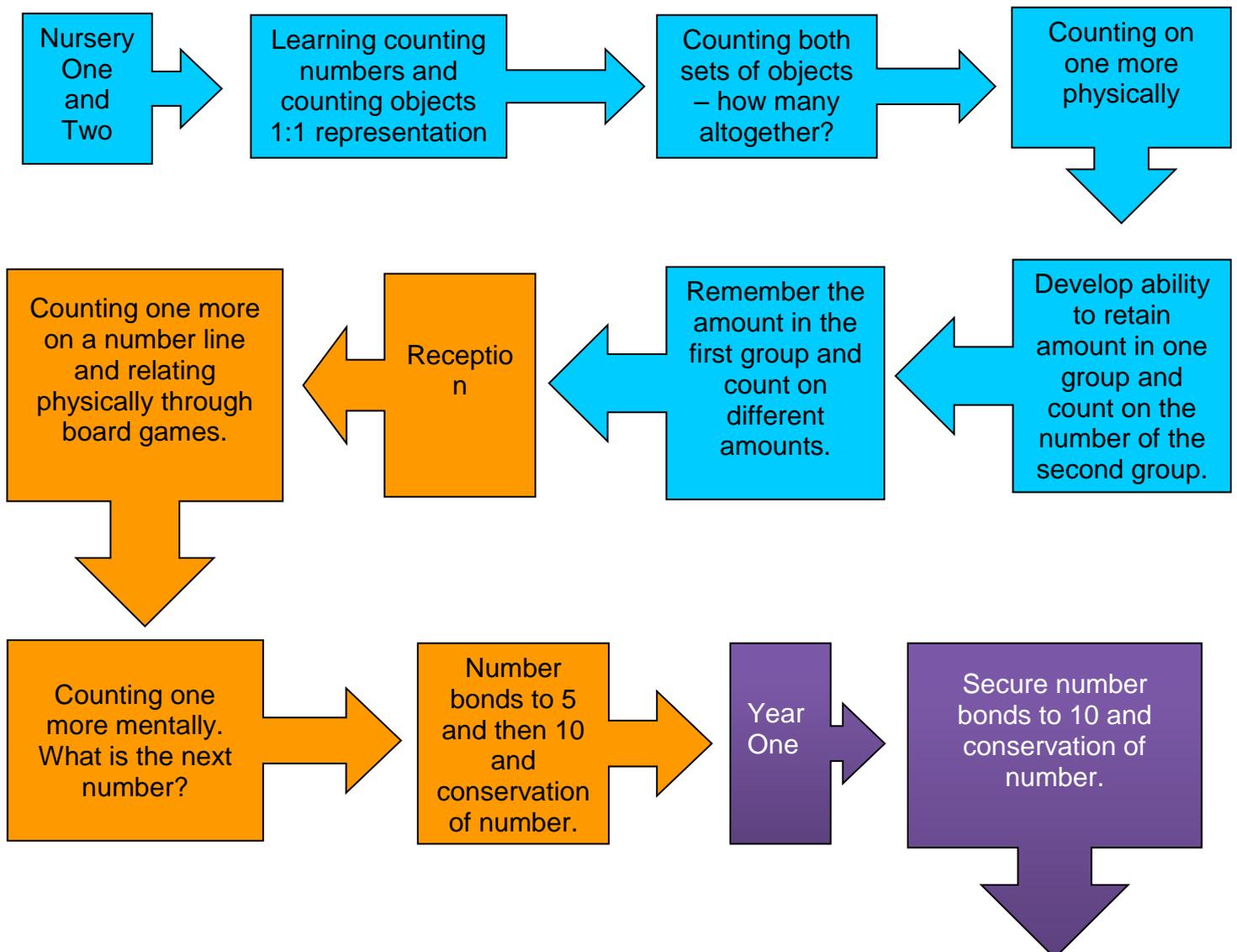
Appendix One – Addition

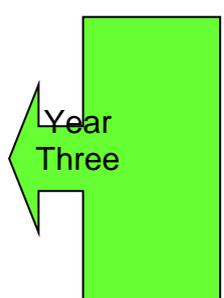
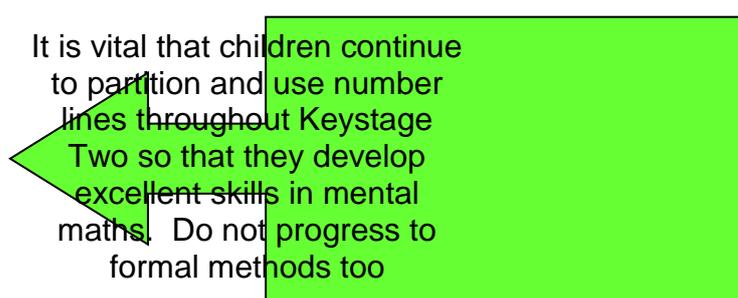
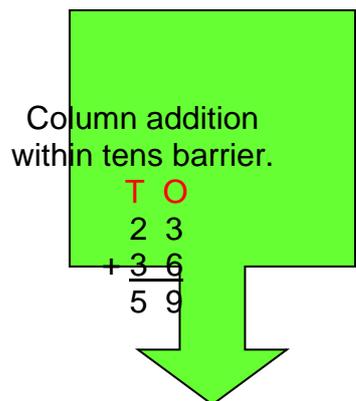
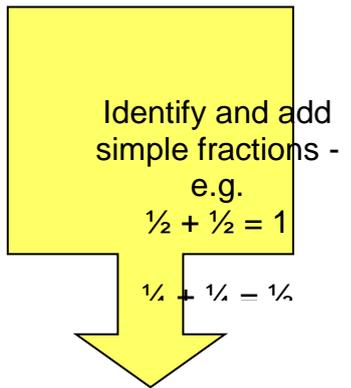
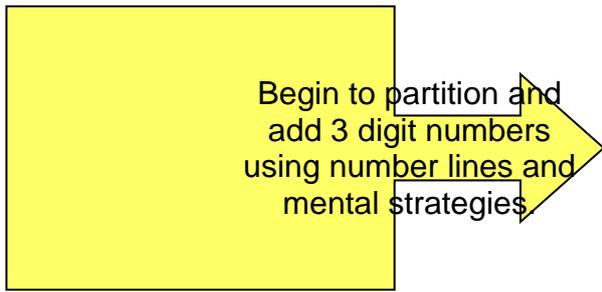
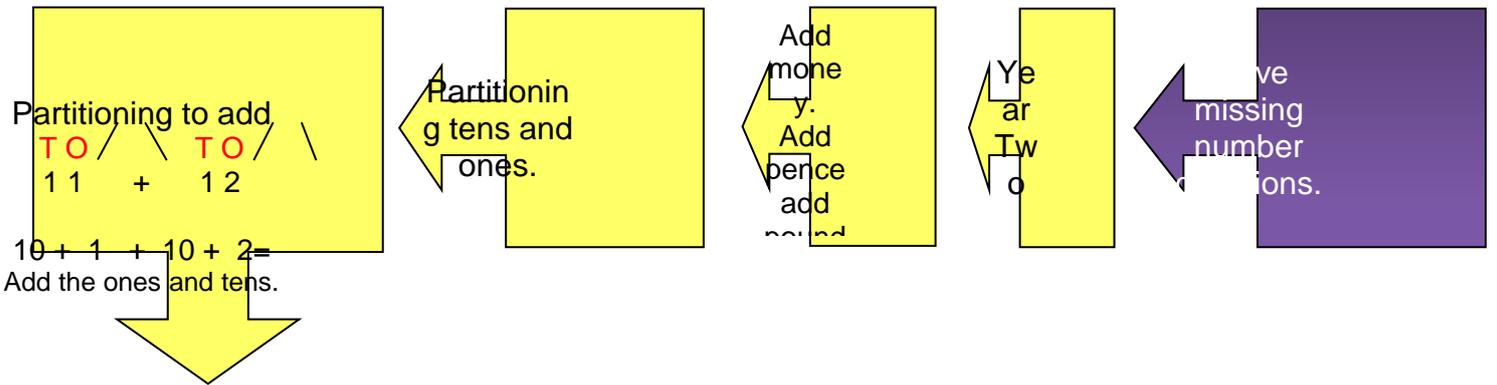
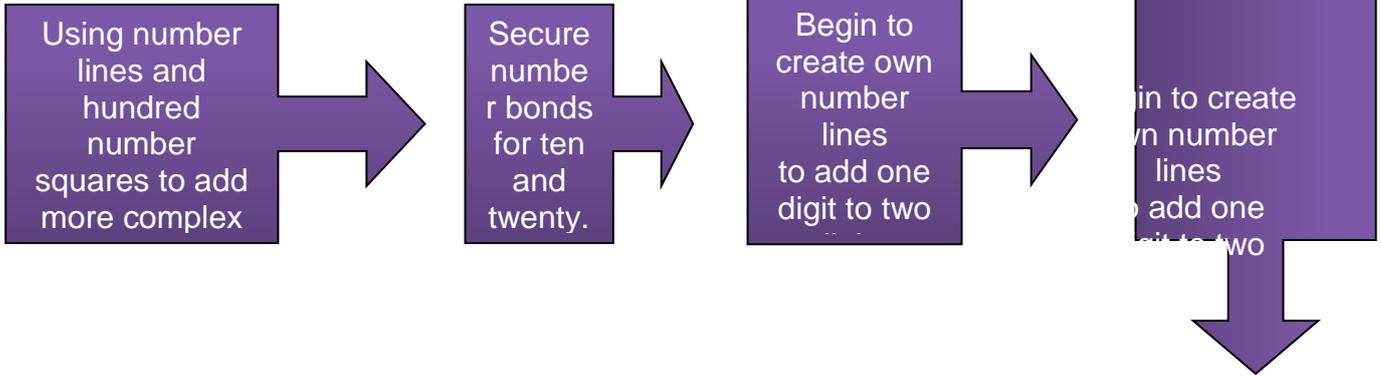
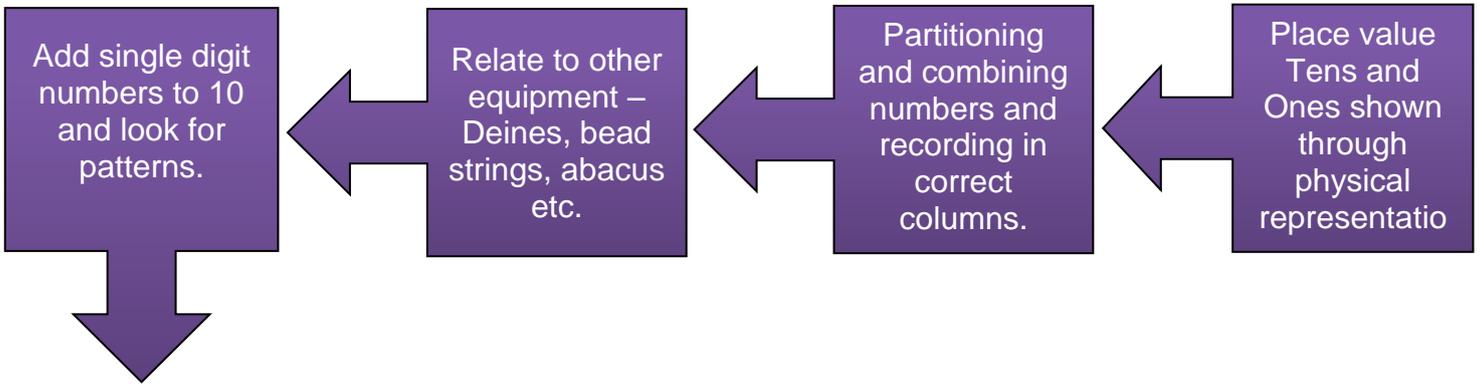
Vocabulary – it is essential that we use correct vocabulary and that we interchange words frequently. We use the same language in Nursery as we do in Year Six.

- **Take care with ones NOT units**
- Addition
- Add
- More than
- >
- The sum (of)
- Total
- Altogether
- Plus
- Jump on
- Count on
- Increase
- Greater than
- Bigger/higher

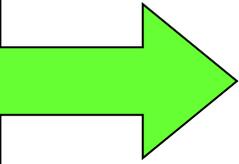
Progression Flow Chart

Indicative year for teaching of specified strategy is identified by the colour of the flow diagram. Important: Note where most new learning takes place; in the earlier years. The diagram shows processes only. It is vital that frequent and varied application takes place in many contexts. Flow chart shows achievable progression beyond the National Curriculum in some areas.

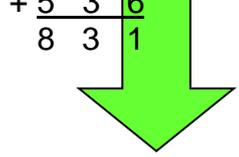




Column addition beyond tens barrier.

$$\begin{array}{r} \text{T O} \\ 25 \\ + 36 \\ \hline 61 \end{array}$$


Column addition beyond tens barrier to hundreds

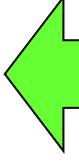
$$\begin{array}{r} \text{H T O} \\ 295 \\ + 536 \\ \hline 831 \end{array}$$


Column addition to four digits plus decimals to hundredths



Year Four

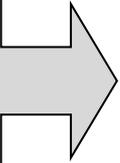
Addition of fractions with same denominator and of decimals to tenths



Recognize when column addition does not work and use other methods.

Apply method to money.

Algebra
The collection and addition of like terms.
 $a+a+a=3a$
 $a+b-2a$

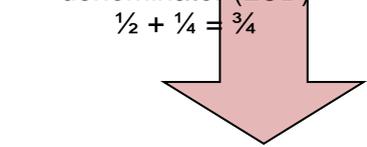


Year Five

Calculations involving numbers to tens of thousands and beyond



Addition of fractions where denominators are the same or multiples of the same number by finding lowest common denominator (LCD)

$$\frac{1}{2} + \frac{1}{4} = \frac{3}{4}$$


Addition of algebraic equations to solve problems.
e.g. Number wall



Addition and understanding of numbers to 1,000,000



Addition of fractions where denominators are more varied by finding lowest common denominator (LCD)

$$\frac{1}{2} + \frac{1}{4} + \frac{3}{8} =$$

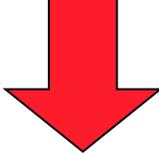
Addition of mixed numbers

$$1\frac{3}{4} + 2\frac{1}{2} =$$

by turning whole numbers into fractions



Year Six



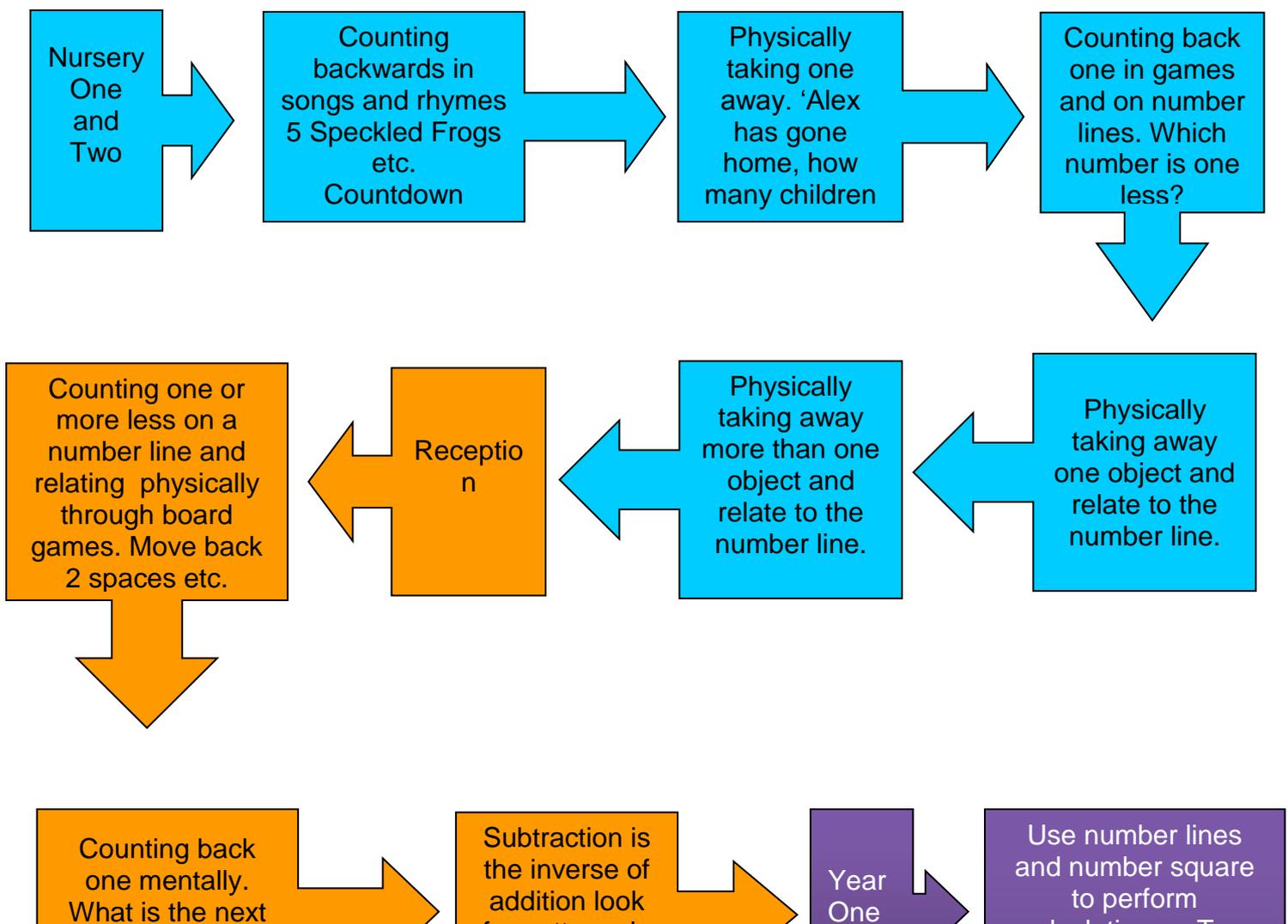
Appendix Two – Subtraction

Vocabulary – it is essential that we use correct vocabulary and that we interchange words frequently. Where appropriate, we use the same language in Nursery as we do in Year Six.

- Take away
- Find the difference – introduce this as soon as possible
- Less than
- <
- Subtraction
- Subtract
- Minus
- Decrease
- Fewer
- Count back
- Jump back
- Difference between
- Smaller/lower

Progression Flow Chart

Indicative year for teaching of specified strategy is identified by the colour of the flow diagram. Important: Note where most new learning takes place; in the earlier years. The diagram shows processes only. It is vital that frequent and varied application takes place in many contexts. Flow chart shows achievable progression beyond the National Curriculum in some areas. Particular care must be taken not to introduce column subtraction too early; i.e before understanding of place value and number system is secure.



Solve missing number questions.

Number line and count back in jumps of one.

two digit numbers and recognize that ones column remains the

Relate to other equipment – Deines, bead strings, abacus etc.

Year Two

Subtract money using amounts less than one pound.

Begin to partition and subtract 2 digit numbers by counting back on number lines and mental strategies.

Identify and subtract simple fractions - e.g.
 $\frac{1}{2} - \frac{1}{2} = 0$
 $\frac{3}{4} - \frac{1}{4} = \frac{1}{2}$

It is vital that children continue to partition and use number lines throughout Keystage Two so that they develop excellent skills in mental maths. Do not progress to column subtraction too quickly. Children must recognize when it does not work; time.

Year Three

Find the difference. Count on from the smallest number to largest and recognize that answer is in the

Subtract money in excess of £1 by converting to pence and then calculate on a number line.

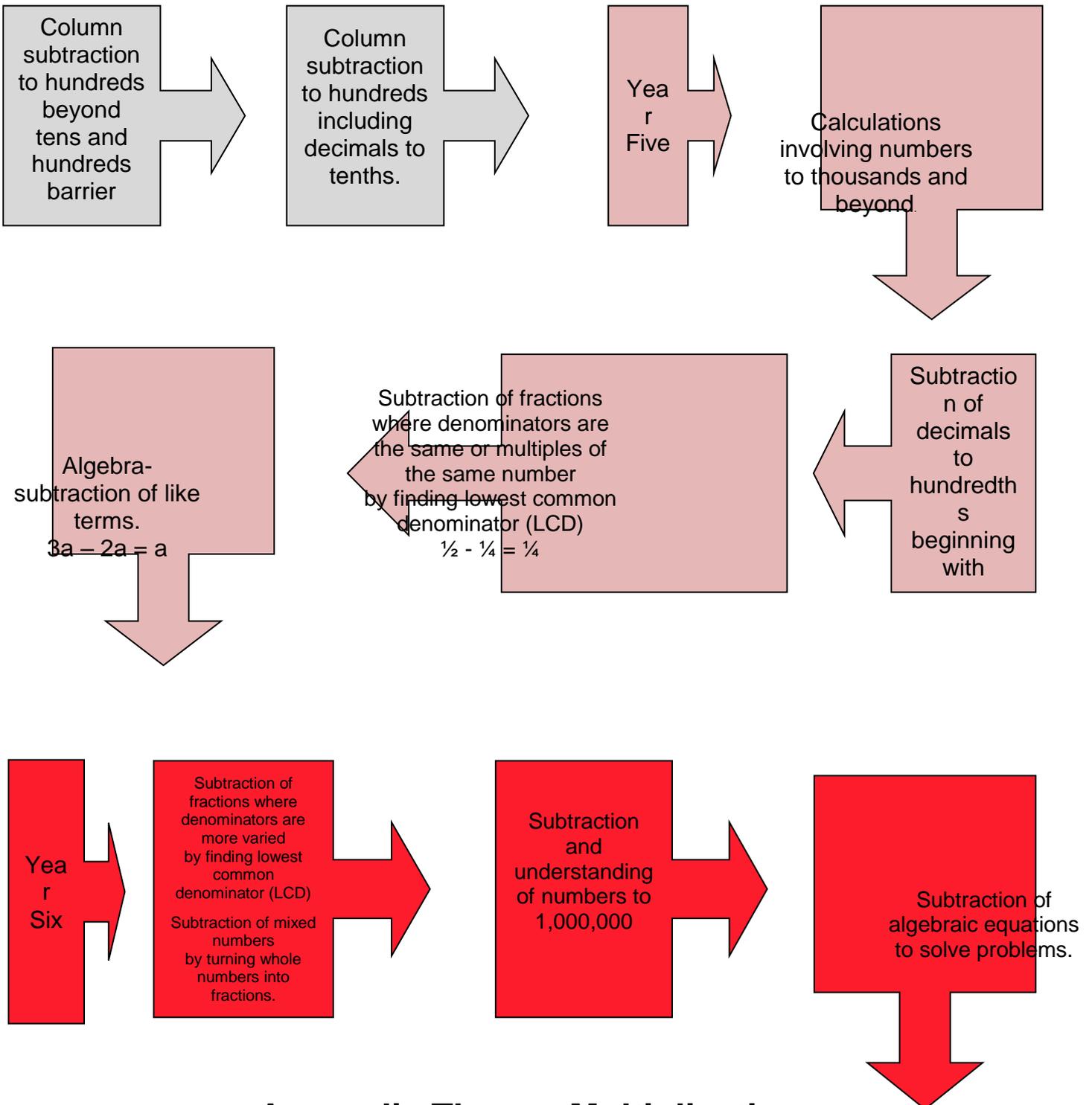
Subtract one/two/three digit numbers on number line. Recognize whether it is efficient to count back or

Subtract near tens or hundreds mentally and on number lines by counting back whole tens or hundreds and adding back

Column

Column subtraction within tens

Subtract HTO.t by finding difference on a



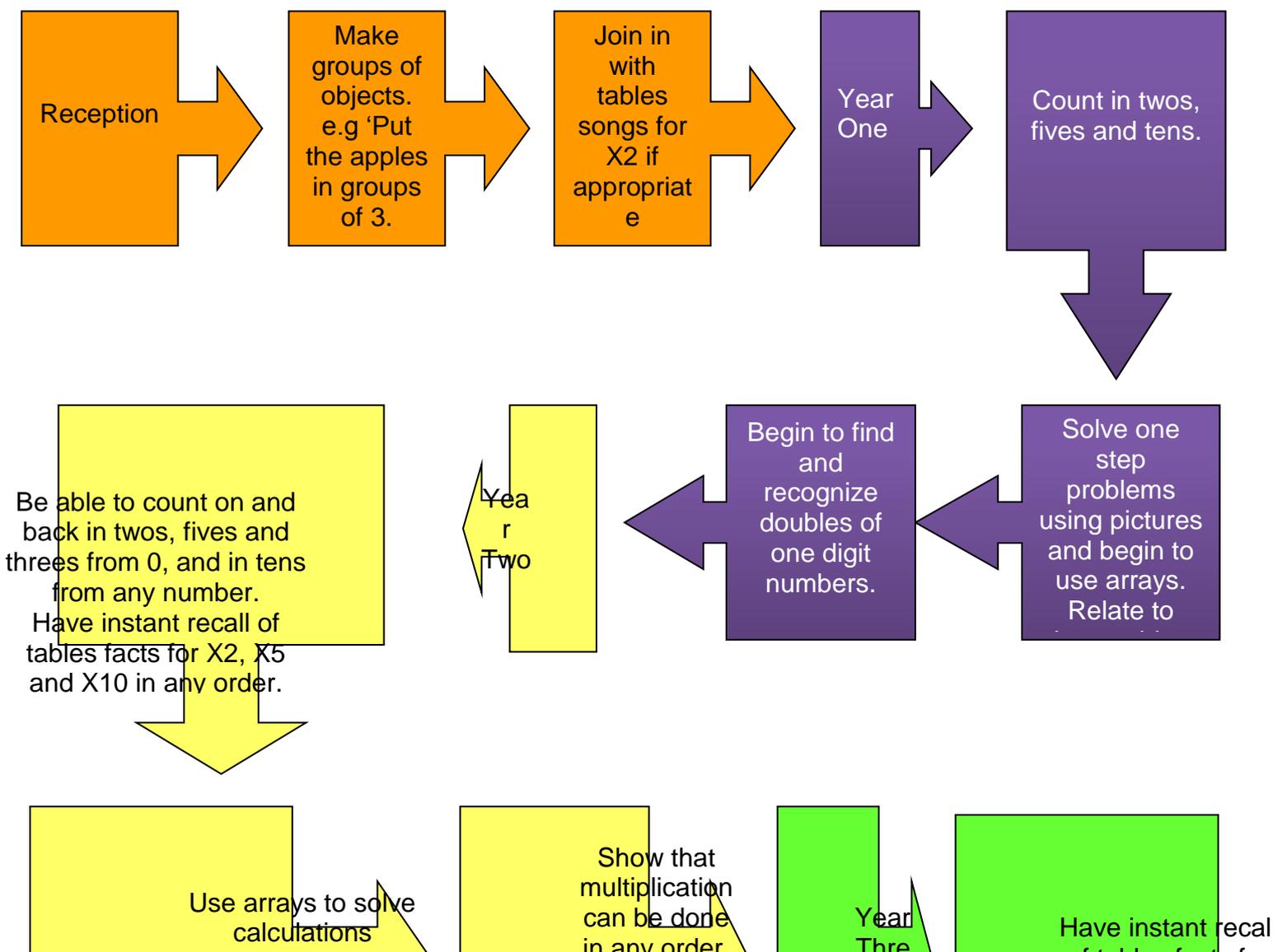
Appendix Three – Multiplication

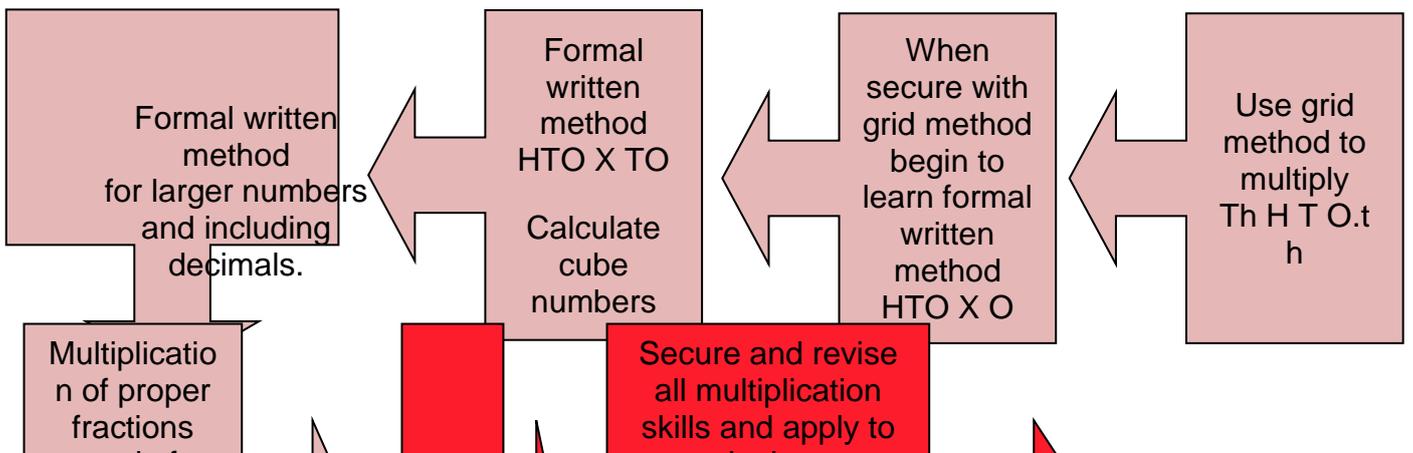
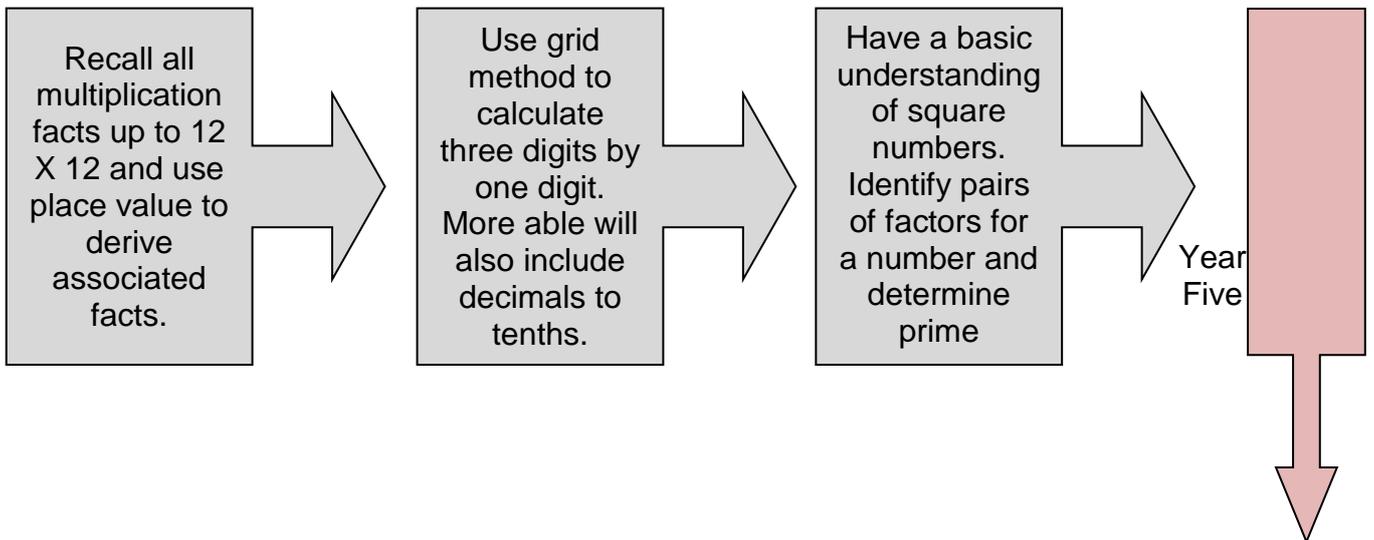
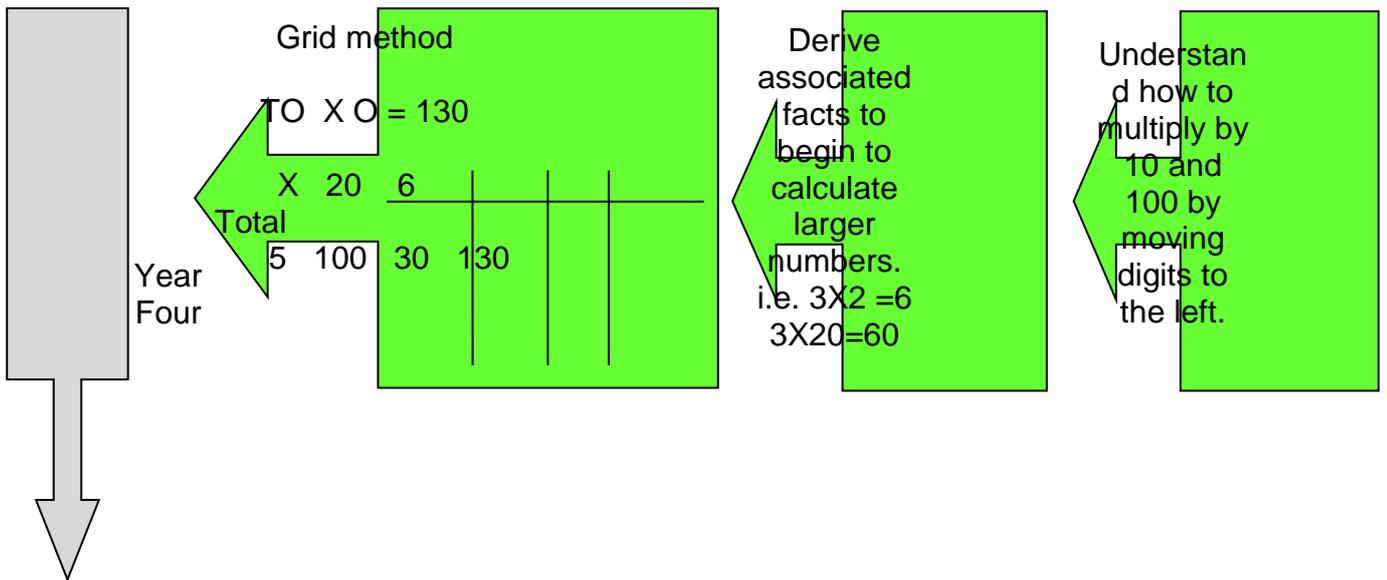
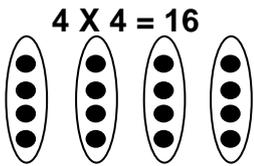
Vocabulary – it is essential that we use correct vocabulary and that we interchange words frequently. Where appropriate, we use the same language in Year One as we do in Year Six. Although it would usually be ill-advised to begin multiplication before Year One, where Reception children share some lessons with Year One, it would not be harmful to join in times tables songs and rhymes. Reception children would also be expected place objects in groups of the same number.

- Multiplication
- Multiply
- Times
- Lots of
- Multiples
- Repeated addition
- Product
- Array

Progression Flow Chart

Indicative year for teaching of specified strategy is identified by the colour of the flow diagram. Important: Although we recognize the requirement of the 2014 National Curriculum to teach the formal written method for Multiplication, we would argue that the grid method is equally efficient and promotes more secure understanding, particularly when dealing with decimals. Therefore we do not aim to teach the formal method until grid method is totally secure. Grid method also presents the opportunity for outstanding mental calculation and use of known facts to secure new. i.e 'I know that $6 \times 7 = 42$ therefore I also know that $0.7 \times 6 = 4.2$ and $0.6 \times .07 = 0.42$.' Most children should understand this by Upper Keystage Two.





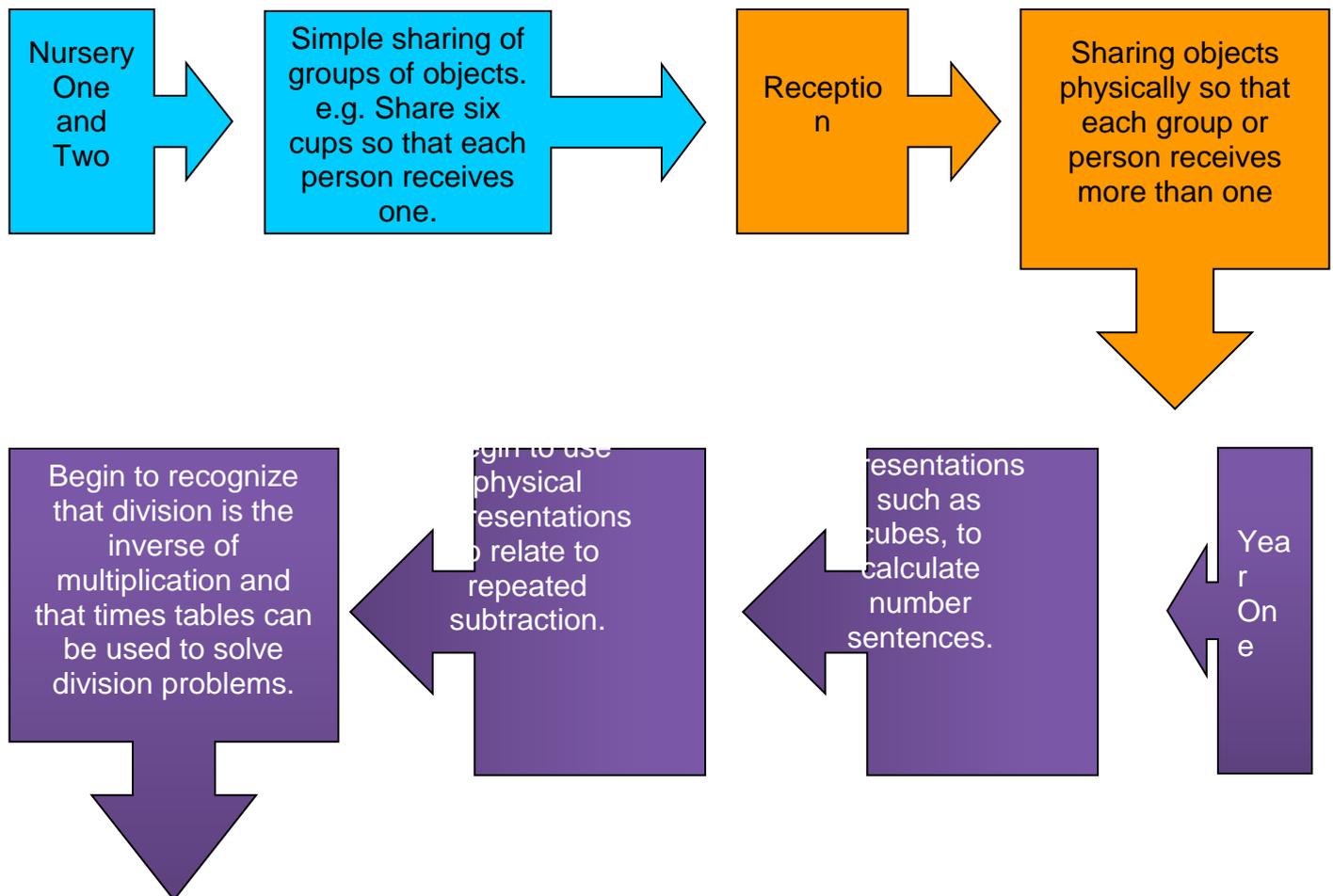
Appendix Four – Division

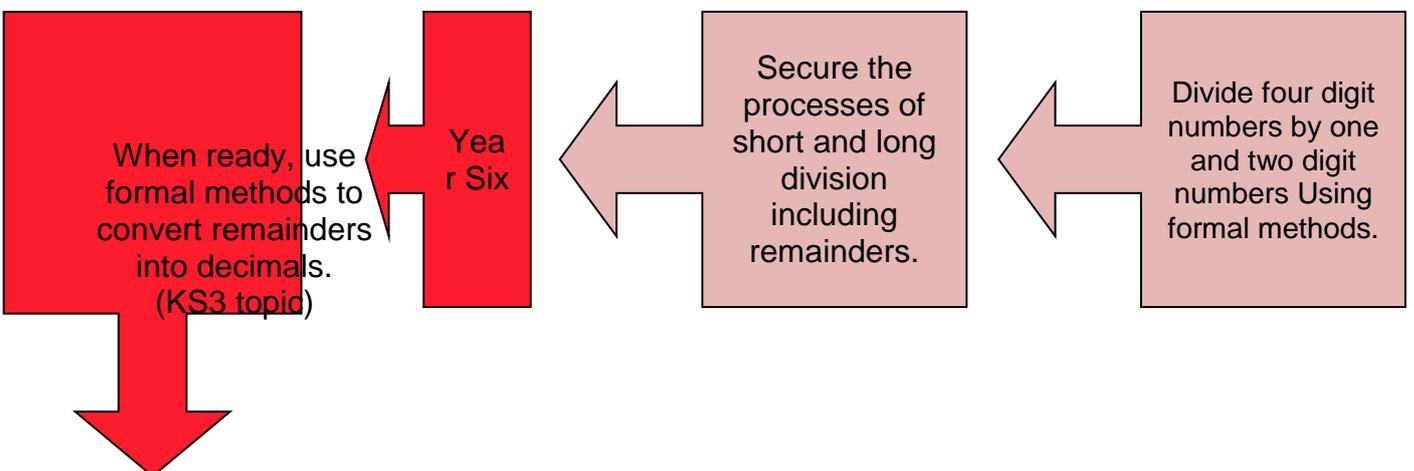
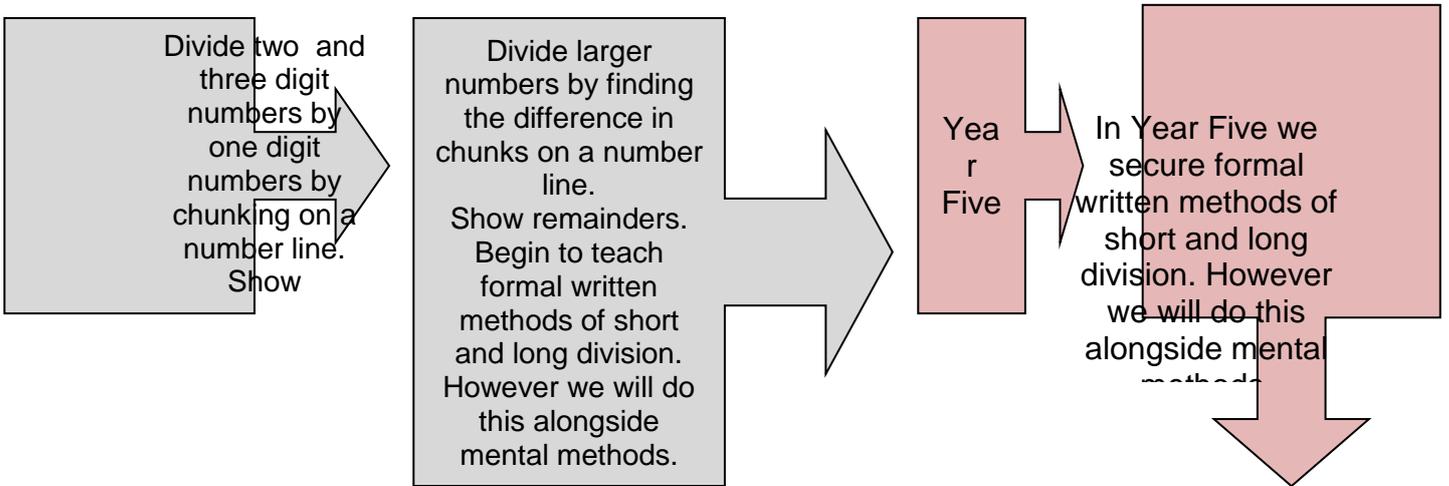
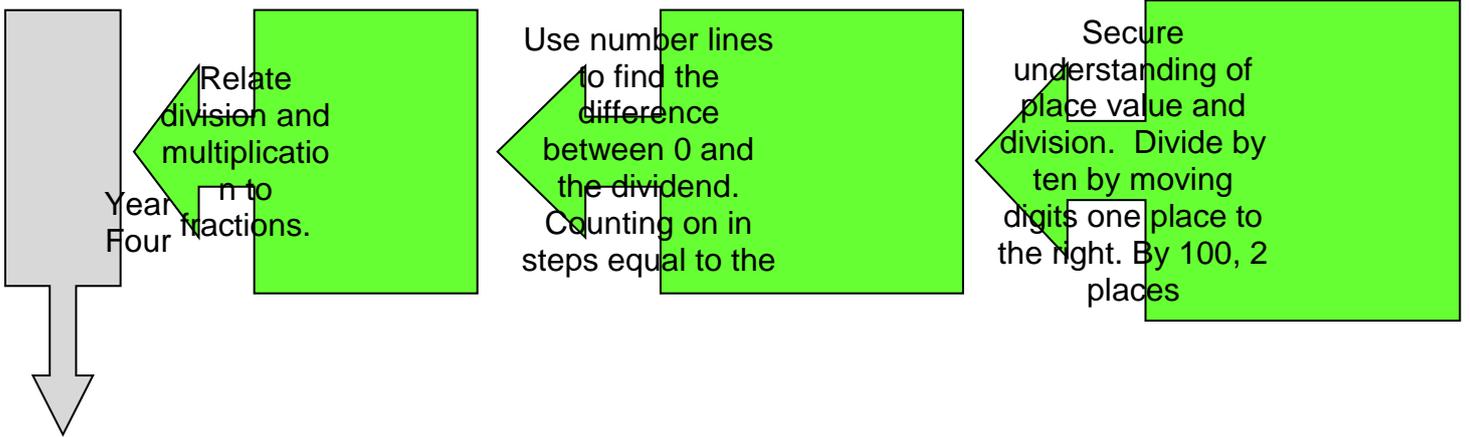
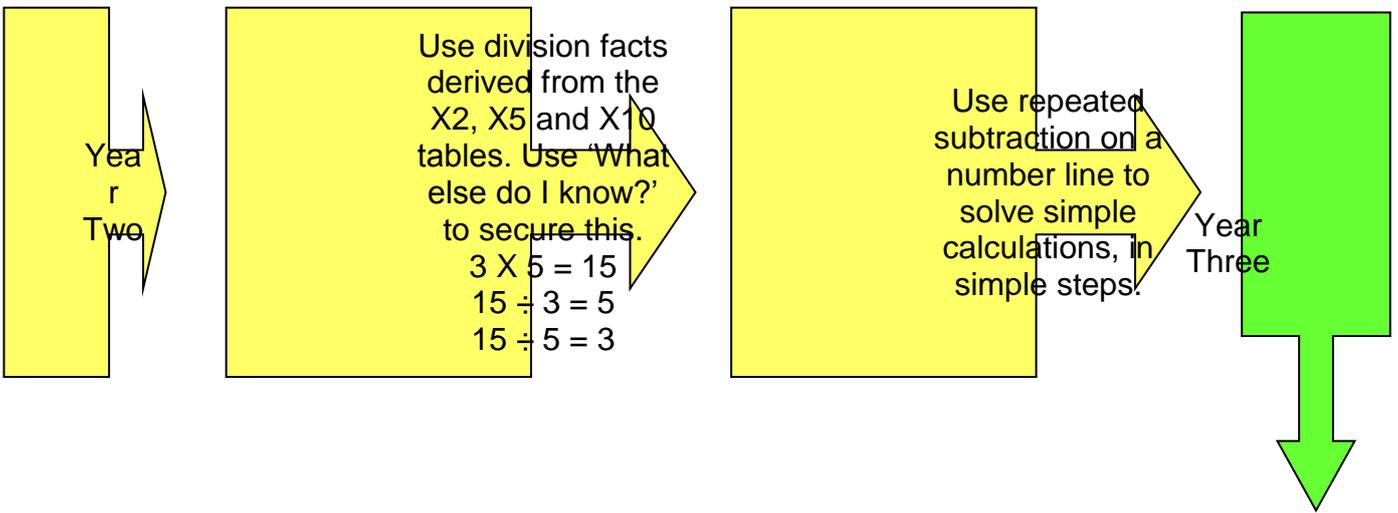
Vocabulary – it is essential that we use correct vocabulary and that we interchange words frequently. Where appropriate, we use the same language in the early years and Key Stage One as we do in Year Six.

- Division
- Divide
- Repeated subtraction
- Share equally
- Divisible
- Divisor
- Dividend (number to be divided)
- Equal groups
- Factors
- Inverse of multiplication

Progression Flow Chart

Indicative year for teaching of specified strategy is identified by the colour of the flow diagram. Important: Whilst we accept the rigours of the National Curriculum and teaching towards formal written methods, we also aim to promote the good understanding which less formal methods provide. Repeated subtraction, by chunking on a number line allows children to fully understand very complex calculations. Once this is secure then we will teach the standard written algorithms of short and long division. The diagram shows processes only. It is vital that frequent and varied application takes place in many contexts. Flow chart shows achievable progression beyond the National Curriculum in some areas. Much of the academic work on division comes at the end of Year Two and beyond, but the concept of sharing out equally should be secured in the early years.





Process calculations where the divisor or the dividend includes decimals to hundredths. Ensure that children understand that they must first multiply number by 100 or 10 to get rid of decimal point and then divide final calculation by the same to reach answer.

For the more able, use mental methods (number line) and formal written methods to convert a proper fraction into a

Use mental methods (number line) and formal written methods to convert a proper/improper fraction into a decimal.

Use standard methods to divide proper fractions and recognize why this process works.
(Multiplication is the inverse of division)