Mental Mathematics Calculation Policy

October 2016

Approved by GB: November 2016

Next review due: October 2019

Key Principles of the Policy

This policy is to be read in conjunction with our written calculation policy (October 2015 Version). Mental maths objectives are included in the Primary Advantage Maths Document which is in line with the new Mathematics National Curriculum 2014. The document has appropriate mental maths objectives which are linked in with specific units per year group. They show a clear progression of skills throughout the school. Teachers all have access to a hard copy as well as an electronic copy of this document and use it to guide their planning and help with their understanding of the expectations.

5 key principles of mental calculation:

1. Children should be able to select an efficient method of their choice (whether this be mental, written or using a calculator) that is appropriate for a given task. They will do this by always asking themselves:
   'Can I do this in my head?'
   'Can I do this in my head using drawings or jottings?'
   'Do I need to use a pencil and paper procedure?'
   'Do I need a calculator?'
2. Calculating mentally should be the first choice to consider when presented with any question.
3. Children should understand that mental calculation is much more than just fast mental arithmetic and recall. It includes applying a secure number sense as well as the ability to select the most efficient method to solve a problem. Children should be able to justify and explain their method choice confidently.
4. All calculation questions should be presented horizontally, so that children can make appropriate choices based on efficiency and accuracy.
5. Jottings should be encouraged and modelled for pupils so as to support them in the required steps, overcome any 'working memory' issues, and to provide visual representation of steps:

   e.g.
   2009 – 1997

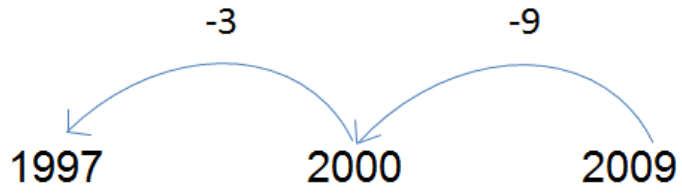
   If a child attempts to complete this vertically, many pupils will make mistakes exchanging the zeros.

   e.g.

   $$\begin{array}{r} {}^{1}2009 \\ -\ 1997 \\ \hline \end{array}$$

   However, if tackled mentally (with or without jottings) there is less room for error

   e.g.



   3 + 9 = 12

To be secure in mental calculations, pupils need to be 'taught' and have the opportunity to practise;

1. Key facts that they can rapidly recall.
2. How to use (apply those facts) to solve other questions. E.g.
   a) If I know 3 + 4 = 7, then I also know: 4 + 3 = 7
      7 – 3 = 4
      7 – 4 = 3
      And if I know 3 x 4 = 12, then I also know: 4 x 3 = 12
      12 ÷ 4 = 3
      12 ÷ 3 = 4
   b) Place value rules. E.g. If I know 4 + 3 = 7, then I also know 40 + 30 = 70
      400 + 300 = 700
      0.4 + 0.3 = 0.7 etc.
3. The 7 key addition and subtraction mental strategies, which are:
   i) counting forwards and backwards
   ii) re-ordering
   iii) partitioning - using multiples of 10 and 100
   iv) partitioning - bridging through multiples of 10
   v) partitioning – compensating
   vi) partioning – using near doubles
   vii) partitioning – bridging through numbers other than 10
4. The 5 key multiplication and division strategies, which are:
   i) knowing multiplication and division facts to 12
   ii) multiplying and dividing by multiples of 10
   iii) multiplying and dividing by single digit numbers and multiplying by 2 digit numbers
   iv) doubling and halving
   v) fractions, decimals and percentages

How to help children develop a range of mental strategies?

Individual children will be at different stages in terms of the number facts that they have committed to memory and the strategies available to them for figuring out other facts. This policy is designed so that teachers can be clear and teach the main calculation strategies that all children need to learn. It is essential that the teacher draws attention to and models a variety of strategies, so children are equipped with a choice when faced with a range of problems.

There are three aspects to developing a range of mental strategies and ensuring that children become effective in deploying these strategies:

- raising children's awareness that there is a range of strategies;
- working on children's confidence and fluency with the full range of strategies;
- developing efficient methods and being able to draw on these from memory.

What might a session on mental calculation look like?

Mental calculation strategies need to be taught, just like any other mathematical objective. Children need to be shown how to apply a certain strategy, have the opportunity to discuss why it works and have a go at applying it to their own questions independently.

Sessions on mental calculation therefore need to be managed in a way that enables all children to take part. These sections of a lesson need to be organised to provide some thinking time that enables all children to access and apply strategies which suit them. Emphasis should be on the process not the speed of calculating an answer.

It is important to spend time discussing the various ways that children reached the answer, to point out the range of possible strategies and to highlight the most efficient and appropriate strategies. The teacher should model strategies as well as encouraging children to share their own methods with the class. All of the mental calculation strategies in this policy will need to be taught by teachers and discussed with the children in a whole class group. Children will learn by comparing their strategies and discussing which strategies appear more effective for particular problems with particular types of number.

Teaching and learning of mental calculation strategies should be taught as a part of whole class lessons and be reinforced during mental/oral starters or other mental calculation times.

Teaching the 7 Addition and Subtraction Strategies

i) counting forwards and backwards

Children first encounter the act of counting by beginning at one and counting on in ones. Their sense of number is extended by beginning at different numbers and counting forwards and backwards in steps, not only of ones, but also of twos, tens, hundreds and so on. The image of a number line helps them to appreciate the idea of counting forwards and backwards. The use of a counting stick is fundamental is most maths lessons. Children should experience counting forwards and backwards in progressively harder jumps, starting at 0, as well as other numbers. For example, children should experience counting at 5, beginning with a number not in 5 times tables. They will also learn that, when adding two numbers together, it is generally easier to count on from the larger number rather than the smaller. Eventually 'counting-on' will be replaced by more efficient methods.

Progression:

Step 1	4 + 8 7 –3 13 + 4 15 – 3 18 – 6	count on in ones from 4 or count on in ones from 8 count back in ones from 7 count on from 13 count back in ones from 15 count back in twos
Step 2	14 + 3 27 – 4 18 – 4 30 + 3	count on in ones from 14 count on or back in ones from any two-digit number count back in twos from 18 count on in ones from 30
Step 3	40 + 30 90 – 40 35 – 15	count on in tens from 40 count back in tens from 90 or count on in tens from 40 count on in steps of 3, 4, or 5 to at least 50
Step 4	73 – 68 86 – 30 570 + 300 960 – 500	count on 2 to 70 then 3 to 73 count back in tens from 86 or count on in tens from 30 count on in hundreds from 300 count back in hundreds from 960 or count on in hundreds from 500
Step 5	$1^{1}/2 + {}^{3}/4$	count on in quarters
Step 6	1.7 + 0.5	count on in tenths

ii) reordering

Sometimes a calculation can be more easily worked out by changing the order of the numbers. The way in which children rearrange numbers in a particular calculation will depend on which number facts they have instantly available to them.

It is important for children to know when numbers can be reordered (eg 2 + 5 + 8 = 8 + 2 + 5 or 15 + 8 – 5 = 15 – 5 + 8 or 23 – 9 – 3 = 23 – 3 – 9) and when they can not (eg 8 – 5 ≠ 5 – 8).

The strategy of changing the order of numbers only really applies when the question is written down. It is difficult to reorder numbers if the question is presented orally.

Progression:

Step 1	2 + 7 = 7 + 2 5 + 13 = 13 + 5 3 + 4 + 7 = 3 + 7 + 4
Step 2	2 + 36 = 36 + 2 5 + 7 + 5 = 5 + 5 + 7
Step 3	23 + 54 = 54 + 23 12 – 7 – 2 = 12 – 2 – 7 13 + 21 + 13 = 13 + 13 + 21 (using double 13)
Step 4	6 + 13 + 4 + 3 = 6 + 4 + 13 + 3 17 + 9 – 7 = 17 – 7 + 9 28 + 75 = 75 + 28 (thinking of 28 as 25 + 3)
Step 5	3 + 8 + 7 + 6 + 2 = 3 + 7 + 8 + 2 + 6 25 + 36 + 75 = 25 + 75 + 36 58 + 47 – 38 = 58 – 38 + 47 200 + 567 = 567 + 200 1.7 + 2.8 + 0.3 = 1.7 + 0.3 + 2.8
Step 6	34 + 27 + 46 = 34 + 46 + 27 180 + 650 = 650 + 180 (thinking of 180 as 150 + 30) 4.6 + 3.8 + 2.4 = 4.6 + 2.4 + 3.8 8.7 + 5.6 – 6.7 = 8.7 – 6.7 + 5.6 4.8+ 2.5 – 1.8 = 4.8 – 1.8 + 2.5

iii) Partitioning – using multiples of 10 and 100

It is important for children to know that numbers can be partitioned into, for example, hundreds, tens and ones, so that 326 = 300 + 20 + 6. In this way, numbers are seen as wholes, rather than as a collection of single-digits in columns. This way of partitioning numbers can be a useful strategy for addition and subtraction. Both numbers involved can be partitioned in this way, although it is often helpful to keep the first number as it is and to partition just the second number.

Progression:

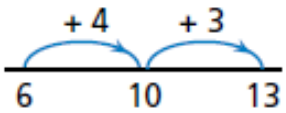
Step 1	30 + 47 78 –40 25 + 14	= 30 + 40 + 7 = 70 –40 + 8 = 20 + 5 + 10 + 4 = 20 + 10 + 5 + 4
Step 2	23 + 45 68 –32	= 40 + 5 + 20 + 3 = 40 + 20 + 5 + 3 = 60 + 8 –30 –2 = 60 – 30 + 8 – 2
Step 3	55 + 37 365 –40	= 55 + 30 + 7 = 85 + 7 = 300 + 60 + 5 –40 = 300 + 60 – 40 + 5
Step 4	43 + 28 + 51 5.6 + 3.7 4.7 –3.5	= 40 + 3 + 20 + 8 + 50 + 1 = 40 + 20 + 50 + 3 + 8 + 1 = 5.6 + 3 + 0.7 = 8.6 + 0.7 = 4.7 –3 –0.5
Step 5	540 + 280 276 –153	= 540 + 200 + 80 = 276 –100 –50 –3

iv) Partitioning – Bridging through multiples of 10

An important aspect of having an appreciation of number is to know when a number is close to 10 or a multiple of 10: to recognise, for example, that 47 is 3 away from 50, or that 96 is 4 away from 100. When adding or subtracting mentally, it is often useful to make use of the fact that one of the numbers is close to 10 or a multiple of 10 by partitioning another number to provide the difference. The use of an empty number line where the multiples of 10 are seen as 'landmarks' is helpful and enables children to have an image of jumping forwards or backwards to these 'landmarks'.

For example,

$6 + 7 = 6 + 4 + 3$



Progression:

Step 1	6 + 7 = 6 + 4 + 3 23 – 9 = 23 – 3 – 6 15 + 7 = 15 + 5 + 2
Step 2	49 + 32 = 49 + 1 + 31
Step 3	57 + 14 = 57 + 3 + 11 or 57 + 13 + 1
Step 4	3.8 + 2.6 = 3.8 + 0.2 + 2.4
Step 5	296 + 134 = 296 + 4 + 130 584 – 176 = 584 – 184 + 8 0.8 + 0.35 = 0.8 + 0.2 + 0.15

v) Partitioning – Compensating (sometimes known as rounding and adjusting)

This strategy is useful for adding numbers that are close to a multiple of 10, for adding numbers that end in 1 or 2, or 8 or 9. The number to be added is rounded to a multiple of 10 plus a small number or a multiple of 10 minus a small number. For example, adding 9 is carried out by adding 10 and then subtracting 1, and subtracting 18 is carried out by subtracting 20 and adding 2. A similar strategy works for decimals, where numbers are close to whole numbers or a whole number of tenths. For example, 1.4 + 2.9 = 1.4 + 3 – 0.1 or 2.45 – 1.9 = 2.45 – 2 + 0.1

Progression:

Step 1	5 + 9 = 5 + 10 –1
Step 2	34 + 9 = 34 + 10 –1 52 + 21 = 52 + 20 + 1 70 – 9 = 70 – 10 + 1
Step 3	53 + 11 = 53 + 10 + 1 58 + 71 = 58 + 70 + 1 84 – 19 = 84 – 20 + 1
Step 4	38 + 69 = 38 + 70 – 1 53 + 29 = 53 + 30 –1 64 – 19 = 64 – 20 + 1
Step 5	138 + 69 = 138 + 70 – 1 405 – 399 = 405 – 400 + 1 $2\frac{1}{2} + 1\frac{3}{4} = 2\frac{1}{2} + 2 - \frac{1}{4}$
Step 6	5.7 + 3.9 = 5.7 + 4.0 –0.1

vi) Partitioning – Using near doubles

If children have instant recall of doubles, they can use this information when adding two numbers that are very close to each other. So, knowing that 6 + 6 = 12, they can be encouraged to use this to help them find 7 + 6, rather than use a 'counting on' strategy or 'building up to 10'. Children need to be secure in doubling and halving in order to use this near doubles strategy. See multiplication and division strategies (iv).

Progression:

Step 1	5 + 6	is double 5 and add 1 or double 6 and subtract 1
Step 2	13 + 14 40 + 39	is double 14 and subtract 1 or double 13 and add 1 is double 40 and subtract 1
Step 3	18 + 16 36 + 35 60 + 70	is double 18 and subtract 2 or double 16 and add 2 is double 36 and subtract 1 or double 35 and add 1 is double 60 and add 10 or double 70 and subtract 10
Step 4	38 + 35 160 + 170 380 + 380	is double 35 and add 3 is double 150 and add 10 then add 20, or double 160 and add 10, or double 170 and subtract 10 is double 400 and subtract 20 twice
Step 5	1.5 + 1.6	is double 1.5 and add 0.1 or double 1.6 and subtract 0.1
Step 6	421 + 387	is double 400 add 21 and then subtract 13

vii) Partitioning – Bridging through numbers other than 10

Time is a universal measure that is non-metric, so children need to learn that bridging through 10 or 100 is not always appropriate. A digital clock displaying 9.59 will, in two minutes time, read 10.01 not 9.61. When working with minutes and hours, it is necessary to bridge through 60 and with hours and days through 24. So to find the time 20 minutes after 8.50, for example, children might say 8.50 + 10 minutes takes us to 9.00, then add another 10 minutes.

Progression:

Step 1	1 week = 7 days What time will it be in one hour's time? How long is it from 2 o'clock to 6 o'clock? It is half past seven. What time was it 3 hours ago? It is 7 o'clock in the morning. How many hours to mid-day?
Step 2	1 year = 12 months 1 week = 7 days 1 day = 24 hours 1 hour = 60 minutes What time will it be 1 hour after 9 o'clock? 10.30 to 10.45 9.45 to 10.15
Step 3	40 minutes after 3.30 50 minutes before 1.00 pm It is 10.40. How many minutes to 11.00? It is 9.45. How many minutes to 10.00?
Step 4	It is 8.35. How many minutes to 9.15?
Step 5	It is 11.30. How many minutes to 15.40?
Step 6	It is 10.45. How many minutes to 13.20?

Teaching the 5 Multiplication and Division Strategies

i) Knowing multiplication and division facts to 12

Instant recall of multiplication and division facts is a key objective in developing children's numeracy skills. Learning these facts and being fluent at recalling them quickly is a gradual process which takes place over time and which relies on regular opportunities for practice in a variety of situations.

Progression:

Step 1	Count in twos – 2, 4, 6, 8, … to 20 Count in tens – 10, 20, 30 … to 50 Count in fives – 5, 10, 15, 20, … to 20 or more
Step 2	Count in fives – 5, 10, 15, 20, … to at least 30 Recall the 2 times table up to 2 x 10 Recall the 10 times table up to 10 x 10 Recall division facts for the 2 and 10 times tables
Step 3	Count in threes – 3, 6, 9, 12, … to 30 Count in fours – 4, 8, 12, 16, … to 40 Recall the 5 times table up to 5 x 10 Recall the corresponding division facts
Step 4	Count in sixes, sevens, eights and nines Recall the 3 times table up to 3 x 10 Recall the 4 times table up to 4 x 10 Recall the corresponding division facts
Step 5	Know the square numbers (eg 2 x 2, 3 x 3, 4 x 4, etc) up to 10 x 10 Recall the 6 times table up to 6 x 10 Recall the 8 times table up to 8 x 10 Recall the 9 times table up to 9 x 10 Recall the 7 times table up to 7 x 10 Recall the corresponding division facts (N.B – this order recognises that children can use their knowledge of the 3 and 4 tables to help them with their 6 and 8 times tables, before moving on to 9 and 7 times tables)
Step 6	Recall the 11 times table up to 11 x 10 Recall the 12 times table up to 12 x 10 Recall the corresponding division facts Know the squares of 11 and 12 (ie 11 x 11 and 12 x 12)

ii) Multiplying and dividing by multiples of 10

Being able to multiply by 10 and multiples of 10 depends on an understanding of place value and is fundamental to being able to multiply and divide larger numbers.

Progression:

Step 1	7 x 10 60 ÷ 10
Step 2	6 x 100 26 x 10 700 ÷ 100
Step 3	4 x 60 3 x 80 351 x 10 79 x 100 976 x 10 580 ÷ 10
Step 4	9357 x 100 9900 ÷ 10 737 ÷ 10 2060 ÷ 100
Step 5	23 x 50 637.6 x 10 135.4 ÷ 100

iii) Multiplying and dividing by single digit numbers and multiplying by two digit numbers

Progression:

Step 1	9 x 2 5 x 4 18 ÷ 2 16 ÷ 4
Step 2	7 x 3 4 x 8 35 ÷ 5 24 ÷ 3 23 x 2 46 ÷ 2
Step 3	13 x 9 32 x 3 36 ÷ 4 93 ÷ 3
Step 4	428 x 2 154 ÷ 2 47 x 5 3.1 x 7
Step 5	13 x 50 14 x 15 153 ÷ 51 8.6 x 6 2.9 x 9 45.9 ÷ 9

iv) Doubling and halving

The ability to double numbers is a fundamental tool for multiplication. Historically, all multiplication was calculated by a process of doubling and adding. Most people find doubles the easiest multiplication facts to remember, and they can be used to simplify other calculations. Sometimes it can be helpful to halve one of the numbers in a product and double the other.

Progression:

Step 1	7 + 7 is double 7
Step 2	7 + 7 = 7 x 2 Half of 14 is 7 Half of 30 is 15
Step 3	18 + 18 is double 18 Half of 18 is 9 60 x 2 is double 60 Half of 120 is 60 Half of 900 is 450 Half of 36 is 18
Step 4	14 x 5 = 14 x 10 ÷ 2 12 x 20 = 12 x 2 x 10 60 x 4 = 60 x 2 x 2
Step 5	36 x 50 = 36 x 100 ÷ 2 Half of 960 = 480 Quarter of 64 = Half of half of 64 15 x 6 = 30 x 3
Step 6	34 x 4 = 34 x 2 x 2 26 x 8 = 26 x 2 x 2 x 2 20% of £15 = 10% of £15 x 2 36 x 25 = 36 x 100 ÷ 4 = (36 ÷ 4) x 100 1.6÷ 2 = 0.8

v) Fractions, decimals and percentages

Children need an understanding of how fractions, decimals and percentages relate to each other. For example, if they know that $^{1}/2$, 0.5 and 50% are all ways of representing the same part of a whole, then the calculations

$^{1}/2$ x 40
40 x 0.5
50% of £40 can be seen as different versions of the same calculation.

Sometimes it might be easier to work with fractions, sometimes with decimals and sometimes with percentages. There are strong links between this section and the earlier section 'Multiplying and dividing by multiples of 10'.

Progression:

Step 1	Find half of 8 Find half of 30
Step 2	Find one third of 18 Find one tenth of 20 Find one fifth of 15
Step 3	Find half of 9, giving the answer as $4^{1}/2$ Know that 0.7 is $^{7}/10$ Know that 0.5 is $^{1}/2$ Know that 6.25 is $6^{1}/4$ Find $^{1}/2$ of 36 Find $^{1}/2$ of 150 Find $^{1}/2$ of £21.60
Step 4	Know that $^{27}/100 = 0.27$ Know that $^{75}/100$ is $^{3}/4$ or 0.75 Know that 3 hundredths is $^{3}/100$ or 0.03 Find $^{1}/7$ of 35 Find $^{1}/2$ of 920 Find $^{1}/2$ of £71.30 Know that 10% = 0.1 = $^{1}/10$ Know 25% = 0.25 = $^{1}/4$ Find 25% of £100 Find 70% of 100cm
Step 5	Know that 0.007 is $^{7}/1000$ Know that 0.27 is $^{27}/100$ 0.1 x 26 0.01 x 17 7 x 8.6 Know that 43% is 0.43 or $^{43}/100$ Find 25% of £360 Find $17^{1}/2$% of £5250

Rapid recall facts

Children should be able to rapidly recall the following:

Step 1	all pairs of numbers with a total of 10, eg 3 + 7; addition and subtraction facts for all numbers to at least 5; addition doubles of all numbers to at least 5, eg 4 + 4.
Step 2	addition and subtraction facts for all numbers to at least 10; all pairs of numbers with a total of 20, eg 13 + 7; all pairs of multiples of 10 with a total of 100, eg 30 + 70; multiplication facts for the 2 and 10 times-tables and corresponding division facts; doubles of all numbers to ten and the corresponding halves; multiplication facts up to 5 x 5, eg 4 x 3.
Step 3	addition and subtraction facts for all numbers to 20; all pairs of multiples of 100 with a total of 1000; all pairs of multiples of 5 with a total of 100; multiplication facts for the 2, 5 and 10 times-tables and corresponding division facts.
Step 4	multiplication facts for 2, 3, 4, 5 and 10 times-tables; division facts corresponding to tables of 2, 3, 4, 5 and 10.
Step 5	multiplication facts to 10 x 10; division facts corresponding to tables up to 10 x 10.
Step 6	squares of all integers from 1 to 10.

There are 25 essential addition recall facts. From knowledge of these facts, children can be taught to work out a wide range of other number facts. For example through use of '3 for free' and place value.

Step 1	Facts of all numbers up to 5	2	1 + 1
		3	2 + 1
		4	3 + 1 2 + 2
		5	4 + 1 3 + 2
Step 2	All pairs of numbers totalling 10		9 +1 8 + 2 7 + 3 6 + 4 5 + 5
Step 3	All facts to 10	6	5 + 1 4 + 2 3 + 3
		7	6 + 1 5 + 2 4 + 3
		8	7 + 1 6 + 2 5 + 3 4 + 4
		9	8 + 1 7 + 2 6 + 3 5 + 5

The ability to recall and use times tables is also vital. However it can be a daunting task. This system is intended to simplify the process and break it into more progressive and manageable steps. Maths Challenge time occurs four times a week in every classroom. Three times a week, this time is used to practise times table skills, including multiplication and division facts as well as related number facts such as decimals. Once a week, the children will answer set Maths Challenge questions, differentiated into: Starter, Bronze, Silver, Gold, Platinum and Diamond sets. They require progressively more complex skills as the children progress through them. Once a child has accurately completed all 4 questions sets for a colour, in a given time (year group specific) they move on to the next.

Starter	To be able to count forwards and backwards in 2s, 5s and 10s.	Children should be confident in recalling the numbers in the 2s, 5s and 10 times tables in order and should be able to do this mentally. When counting forwards and backwards, it is important to start and stop at numbers other than 0. E.g. start counting in 3s from 18 and stop at 27. Likewise, although not part of times tables, it's important that children count forwards and back in steps of 3, 4 etc. on numbers that are not multiples, e.g. count back in 3s starting on 23.

Bronze	To be able to count forwards and backwards in all times tables (2 – 12) e.g. 0, 5, 10, 15 …. 30, 27, 24, 21 …. 18, 24, 30, 36 ….	In counting forwards and backwards it is important to start and stop at numbers other than 0. E.g. start counting in 3s from 18 and stop at 27. Likewise, although not part of times tables, it's important that children count forwards and back in steps of 3, 4 etc. on numbers that are not multiples, e.g. count back in 3s starting on 23.
Silver	To know by heart and be able to recall multiplication facts in a random order. e.g. 5 x 5 9 x 4 6 x 2	Children are exposed to times table facts in a range of different activities, through chanting, games and challenges both individually and collaboratively. The learning of these facts, underpin many other mathematical skills that will the children will experience throughout their maths education and provide them with a basis to build on.
Gold	To be able to derive and recall division facts. e.g. How many 4s in 24? How many 9s in 63?	The use of inverses and doubling/halving are very effective ways of reducing the number of facts needed to learn by heart. For example the '3 for free' approach tells us that if we know 1 fact e.g. 5 x 4 = 20, then we also know 3 other facts, 4 x 5 = 20, 20 ÷ 4 = 5, and 20 ÷ 5 = 4.
Platinum	To be able to use times tables to calculate other facts. e.g. if it is known that 3 x 5 = 15, there must be an ability to also know that 3 x 50 = 150, 3 x 0.5 = 1.5 etc.	Once the gold has been achieved, this needs to continue to be practiced in subsequent years and extended to platinum. The platinum level is the ability to use and apply this knowledge. e.g. if you know 6 x 7 = 42, then you can also work out many other facts using knowledge of place value, for example 0.6 x 7 = 4.2 and 4.2 divided by 0.6 = 7.

Diamond	To be able to use times tables to calculate other facts. To be able to multiply and divide fractions.	The skills required for the Platinum question sets are still applied in the Diamond question sets, but are also combined with fraction questions. Children need to fully understand fractions and how they work, in order for them to multiply and divide them effectively. Times table knowledge is still being used and practised on the Diamond sets.

Review

This policy is monitored by the maths subject leader and the Senior Leadership Team through:

- Regular scrutiny of children's books to find evidence of mental calculation jottings
- Regular monitoring of teaching plans to find evidence of discrete teaching of mental strategies
- Evaluation and review of assessment data
- Lesson observations to monitor the quality of teaching and implementation of teaching plans
- Pupil interviews

This policy is reviewed by staff and governors at least once every three years, and reviewed whenever Government policy changes. The next review is due November 2019. Parents are most welcome to read copies of this document on the school website and comments are invited from anyone involved in the life of the school.

Appendix 1

Maths Challenge Questions:

Maths Challenge takes place in all classrooms across the school, which provides consistency in the way we approach times tables and related number facts.

This is how Maths Challenge works:

- Once a week, children are given a set of questions to complete in a given time, dependent on which year group they are in.

Year 3: 4 minutes Year 4: 3 minutes Year 5: 2 minutes Year 6: 2 minutes

- The question sets vary in difficulty: Starter, Bronze, Silver, Gold, Platinum, Diamond, and each colour contains 4 sets of questions.
- In the Maths Challenge time, a timer is displayed on the interactive whiteboard and the children answer as many questions as they can in the time given.
- If a child completes them all, they record down the time from the interactive whiteboard onto a record sheet in the back of their book.
- All children then mark their answers from a set answer sheet and their mark is also recorded in the back of their books.
- Once all 4 sets of questions have been correctly completed in the given time, children progress onto the next difficulty set.
- Each week the children try to beat their personal best, whether that is a time or a score.
- In each classroom there is a Maths Challenge display board, where all children's names are displayed on the colour there are currently working on. When a child moves onto a different colour, they receive a certificate to celebrate their progress!