Mental maths

Rapid recall

- Rapid recall of basic facts and procedures that have already been taught is known as fluency. Once fluency has been achieved these procedures can then be applied to more challenging numbers.
- Key facts such as multiplication tables and addition/subtraction facts are learnt so that they become automatic to avoid overload in the working memory and enable pupils to focus on new concepts.
- The use of Numbots and TTRS should be encouraged at home (and school if there is time). Certificates will be given out in special mention to raise the profile of these programmes.
- Staff will need to assess the fluency of their class.   The table below outlines what children should know by the end of each year group once all the units have been taught. If any gaps are identified then at least **one mental maths session a week** should be used to **teach** and practise factual fluency in these key areas.

Factual fluency progression

	Year 1	Year 2	Year 3	Year 4	Year 5
Additive factual fluency	Addition and subtraction within 10.	Addition and subtraction across 10.	Secure and maintain fluency in addition and subtraction within and across 10, through continued practice.		
Multiplicative factual fluency			Recall the 10 and 5 multiplication tables, and corresponding division facts.	Recall the 3, 6 and 9 multiplication tables, and corresponding division facts.	Secure and maintain fluency in all multiplication tables, and corresponding division facts, through continued practice.
			Recall the 2, 4 and 8 multiplication tables, and corresponding division facts.	Recall the 7 multiplication table, and corresponding division facts.	
				Recall the 11 and 12 multiplication tables, and corresponding division facts.	

- There is no expectation that these extra sessions are formally recorded in books. It will be sufficient for these sessions to be recorded on whiteboards or on paper.

- A times table planner has been included to support staff in Years 1-4 to provide more detail about know what children should be able to do by the end of each term.

- White Rose resources should be used to **teach** times tables as part of the long-term plan during maths lessons.
- It is important that we are teaching children to look for patterns and relationships both within and across the times tables.
- Images (both real life and abstract) should be used to support children's conceptual understanding of times tables.
- Activities should encourage children to consider times tables in different ways.
- NP to provide links to NCETM resources to support class teachers to re-teach any times tables outside of maths sessions using the mastery approach.
- Year 5 and 6 staff will need to assess their class and then may need to look back at other year groups resources depending on the needs of the class.
- Once times tables have been formally taught then repeated practise needs to take place. If time allows, paper based TTRS could be used for five minutes each day in addition to any time given for computer based TTRS.   There are record sheets available which can be used to show progress.

Year 1	
Autumn 1 & 2	Count in 2's up to 24, linking with even numbers and supporting doubles. Count in multiples of 10 in order up to 120.
Spring 1 & 2	Focus on counting in multiples of 5 up to 60, linking with knowledge of counting in 10s. Continue to develop fluency of counting in 2's and 10's.
Summer 1	Count in multiples of 10, 2 and 5 in order with growing fluency.
Summer 2	Count in multiples of 10, 2 and 5 in order fluently.

Year 2

Autumn 1	Consolidate counting in steps of 2, 5 and 10 in order from 0 up to 12x.
Autumn 2	Count in steps of 2 and 5 from 0 up to 12x fluently. Recall multiples of 10 up to 12x10 in any order, including missing numbers and related division facts with growing fluency.
Spring 1	Recall multiples of 2 up to 12x2 in any order, including missing numbers and related division facts. Recall multiples of 10 up to 12x10 fluently.
Spring 2	Recall multiples of 5 up to 12x5 in any order, including missing numbers and related division facts. Recall multiples of 2 up to 12x2 in any order, including missing numbers and related division facts with growing fluency.
Summer 1	Count in multiples of 3 to 12x3 in order from 0. Recall multiples of 2 up to 12x2 in any order, including missing numbers and related division facts fluently. Recall multiples of 5 up to 12x5 in any order, including missing numbers and related division facts with growing fluency.
Summer 2	Count in multiples of 3 to 12x3 in order from 0 with growing fluency. Recall multiples of 5 up to 12x5 in any order, including missing numbers and related division facts fluently.

Year 3

Autumn 1	Count in multiples of 3 to 12x3 in order from 0 fluently.
Autumn 2	Recall multiples of 3 up to 12x3 in any order, including missing numbers and related division facts with growing fluency. Count in multiples of 4 to 12x4 in order from 0 with growing fluency. Introduce (relating to x4) and begin to count in multiples of 8 from 0 to 12x8.
Spring 1	Recall multiples of 3 up to 12x3 in any order, including missing numbers and related division facts fluently. Count in multiples of 4 to 12x4 in order from 0 with fluently. Count in multiples of 8 to 12x8 in order from 0 with growing fluency.
Spring 2	Recall multiples of 4 up to 12x4 in any order, including missing numbers and related division facts with growing fluency. Count in multiples of 8 to 12x8 in order from 0 fluently.
Summer 1	Recall multiples of 4 up to 12x4 in any order, including missing numbers and related division facts fluently. Recall multiples of 8 up to 12x8 in any order, including missing numbers and related division facts with growing fluency.
Summer 2	Recall multiples of 8 up to 12x8 in any order, including missing numbers and related division facts fluently.

Year 4

Autumn 1	Recall multiples of 3,4 and 8 up to 12x in any order, including missing numbers and related division facts fluently. Fluently count in 6's in order up to 12x6, using multiples of 3 to support.
Autumn 2	Recall multiples of 6 in any order, including missing numbers and related division facts with growing fluency. Fluently count in 7's in order up to 12x7.
Spring 1	Recall multiples of 6 in any order, including missing numbers and related division facts fluently. Recall multiples of 7 in any order, including missing numbers and related division facts with growing fluency.
Spring 2	Recall multiples of 7 in any order, including missing numbers and related division facts fluently. Fluently count in 9's in order up to 12x9. Fluently count in 11's in order up to 12x11.
Summer 1	Recall multiples of 9 in any order, including missing numbers and related division facts with growing fluency (using 10x and adjusting by 1 group to find 9x as a strategy) Recall multiples of 11 in any order, including missing numbers and related division facts fluently. Fluently count in 12's in order up to 12x12.
Summer 2	Recall multiples of 9 in any order, including missing numbers and related division facts fluently. Recall multiples of 12 in any order, including missing numbers and related division facts with growing fluency (using 10x and adjusting by adding 2 more groups).

Mental strategies

- Children need to know there are a range of mental maths strategies but more importantly which are the most effective.
- It is important to get them to explain their methods and then to have a discussion about which are the most effective.
- Strategies will first need to be **explicitly taught** as part of maths lessons. However extra mental maths sessions will then allow children to choose the most effective strategies they have been taught when presented with mental maths calculations.

Mental calculations

- Their mental calculations can be supported by pen and pencil to make jottings or draw visual prompts.
- Sessions on mental calculation need to be managed in a way that enables all children to take part. Lessons need to be organised to provide some thinking time that enables rapid rather than instant responses and supports those children who need a bit longer to figure things out.
- Provide suitable equipment for children to manipulate and explore how and why a calculation strategy works, and that helps them to describe and visualise or 'see' the method working. The equipment can include objects like counters, interlocking cubes, coins, counting sticks, bead strings, number lines, 100-squares, place-value cards, structural apparatus like base 10 blocks, diagrams of shapes divided into fractional parts.

Progression documents for each year group have been included below:

Year 1

Rapid Recall	~ All pairs of numbers with a total to 10 e.g. 3+7 ~ Addition and subtraction facts for all numbers to any number to 10. ~ Addition doubles of all numbers to at least 10+10 ~ Halving facts of even numbers to 20. ~ One and two more/ less than any number up to 100. ~ 10 more/less of multiples of 10 ~ 5 more/ less of multiples of 5
Mental Strategies Children should be able to use the following strategies, as appropriate, for mental calculations	~ Count on or back in ones, twos, fives and tens ~ Reorder numbers in calculation ~ Begin to bridge through 10, and later 20, when adding a single-digit number ~ Use known number facts and place value to add or subtract pairs of single-digit numbers ~ Add 9 to single-digit numbers by adding 10 then subtracting 1 ~ Subtract 9 by subtracting 10 then adding 1 ~ Identify near doubles using doubles already know ~ Use patterns of similar calculations
Mental Calculations Children should be able to calculate mentally:	~ Add or subtract a single digit to or from a single digit, without crossing 10 e.g. 4+ 5 , 8-3 ~ Add or subtract a single digit to or from 10 ~ Add or subtract a single digit to or from a 'teens' number, without crossing 20 or 10 e.g. 13 + 5, 17 – 3 ~ Double of all numbers to 10 e.g. 8+8, double 6

Year 2

Rapid Recall	- Addition and subtraction facts for all numbers to at least 10 - All pairs of numbers with a total of 20 e.g. 13 +7 - All pairs of multiples of 10 with a total of 100 e.g. 30+70 - Multiplication facts for the 2 and 10 times tables and corresponding division facts - Double of all numbers to ten and the corresponding halves - Multiplication facts up to 5x5 e.g. 4x3 - Know 10x, 2x, 5x tables - Count forwards and backwards in 3's to 36 - Know inverse ÷ for 10, 2 and 5
Mental Strategies Children should be able to use the following strategies, as appropriate, for mental calculations.	- count on or back in tens or ones - find a small difference by counting up from the smaller to the larger number - reorder numbers in a calculation - add three small numbers by putting the largest number first and/or finding a pair totaling 10 - partition additions into tens and units then recombine - bridge through 10 or 20 - use known number facts and place value to add or subtract pairs of numbers - partition into '5 and a bit' when adding 6, 7, 8 or 9 - add or subtract 9, 19, 11 or 21 by rounding and compensating - identify near doubles - use patterns of similar calculations - use the relationship between addition/subtraction - use knowledge of number facts and place value to multiply or divide by 2, 5 or 10 - use doubles and halves and halving as the inverse of doubling
Mental Calculations Children should be able to calculate mentally:	- add or subtract any single-digit to or from any two-digit number, without crossing the tens boundary, e.g. 62 + 4, 38 − 7 - add or subtract any single-digit to or from a multiple of 10, e.g. 60 + 5, 80 − 7 - add or subtract any 'teens' number to any two-digit number, without crossing the tens boundary, e.g. 23 + 14, 48 − 13 - find what must be added to any two-digit multiple of 10 to make 100, e.g. 70 + ? = 100 - add or subtract a multiple of 10 to or from any two-digit number, without crossing 100, e.g. 47 + 30, 82 − 50 - subtract any two-digit number from any two-digit number when the difference is less than 10, e.g. 78 − 71 or 52 − 48 - doubles of all numbers to at least 15, e.g. double 14 - double any multiple of 5 up to 50, e.g. double 35 - halve any multiple of 10 up to 100, e.g. halve 50

Year 3

Rapid Recall	– addition and subtraction facts for each number to 20, e.g. 13 + 4 – sums and differences of multiples of 10, e.g. 70 + 20 or 80 – 30 – number pairs that total 100, e.g. 46 + 54 – multiplication facts for the 2, 3, 4, 5, 6 and 10 times tables and the corresponding division facts
Mental Strategies Children should be able to use the following strategies, as appropriate, for mental calculations:	– count on or back in tens or ones – find a small difference by counting up from the smaller to the larger number – reorder numbers in a calculation – add three or four small numbers by putting the largest number first and/or by finding pairs totaling 9, 10 or 11 – partition into tens and units then recombine – bridge through a multiple of 10, then adjust – use knowledge of number facts and place value to add or subtract pairs of numbers – partition into '5 and a bit' when adding 6, 7, 8 or 9 – add or subtract mentally a 'near multiple of 10' to or from a two-digit number – identify near doubles – use patterns of similar calculations – say or write a subtraction statement corresponding to a given addition statement – to multiply a number by 10/100, shift its digits one/two places to the left – use knowledge of number facts and place value to multiply or divide by 2, 5 or 10, 100 – use doubling or halving – say or write a division statement corresponding to a given multiplication statement
Mental Calculations Children should be able to calculate mentally:	– find what must be added to any multiple of 100 to make 1000, e.g. 300 + ? = 1000 – add or subtract any pair of two-digit numbers, without crossing a tens boundary or 100, e.g. 33 + 45, 87 – 2 – add or subtract any single-digit to any two-digit number, including crossing the tens boundary, e.g. 67 + 5, 82 – 7 – find what must be added to/subtracted from any two-digit number to make the next higher/lower multiple of 10. e.g. 64 + ? = 70, 56 - ? = 50 – subtract any three-digit number from any three-digit number when the difference is less than 10, e.g. 458 – 451, or 603 – 597 – find what must be added to/subtracted from any three-digit number to make the next higher/lower multiple of 10, e.g. 647 + ? = 650, 246 - ? = 240 – double any number to *at least* 20, e.g. double 18, and corresponding halves, e.g. halve 36; double 60, halve 120; double 35, halve 70; double 450, halve 900 – multiply single-digit numbers by 10 or 100, e.g. 6 x 100 – divide any multiple of 10 by 10, e.g. 60 ÷ 10, and any multiple of 100 by 100, e.g. 700 ÷ 100

Year 4

Rapid Recall	– Multiplication facts of the 2,3,4,5, 6, 7, 8, 9, 10,11 and 12 times tables – Division facts corresponding to tables of 2,3,4,5, 6, 7, 8, 9, 10,11 and 12
Mental Strategies Children should be able to use the following strategies, as appropriate, for mental calculations:	– count on or back in repeated steps of 1, 10 and 100 – count up through the next multiple of 10, 100 or 1000 – reorder numbers in a calculation – add 3 or 4 small numbers, finding pairs totaling 10 – add three two-digit multiples of 10 – partition into tens and units, adding the tens first – bridge through 100 – use knowledge of number facts and place value to add or subtract any pair of two-digit numbers – add or subtract 9, 19, 29, 11, 21 or 31 by rounding and compensating – add or subtract the nearest multiple of 10 then adjust – identify near doubles – continue to use the relationship between addition and subtraction – double any two-digit number by doubling tens first – use known number facts and place value to multiply or divide, including multiplying and dividing by 10 and then 100 – partition to carry out multiplication – use doubling or halving – use closely related facts to carry out multiplication and division – use the relationship between multiplication and division
Mental Calculations Children should be able to calculate mentally:	– find what must be added to any two-digit number to make 100, e.g. 37 + ? = 100 – add or subtract any pair of two-digit numbers, e.g. 38 + 85, 92 – 47 – find out what must be added to/subtracted from any two- or three-digit number to make the next higher/lower multiple of 100, e.g. 374 + ? = 400, 826 - ? = 800 – subtract any four-digit number from any four-digit number when the difference is small, e.g. 3641 – 3628, 6002 – 5991 – double any whole number from 1 to 50, e.g. double 36, and find all the corresponding halves, e.g. 96 ÷ 2 – double any multiple of 10 to 500, e.g. 380 x 2, and find all the corresponding halves, e.g. 760 ÷ 2, 130 ÷ 2 – double any multiple of 5 to 100, e.g. 65 x 2 – multiply any two-digit number by 10, e.g. 26 x 10 – divide a multiple of 100 by 10, e.g. 600 ÷ 10 – multiply any two-digit multiple of 10 by any single-digit number

Year 5

Rapid Recall	– multiplication facts up to 12 x 12 and corresponding division facts Derive: – sums and differences of decimals, e.g. 6.5 ± 2.7 doubles and halves of decimals, e.g. half of 5.6
Mental Strategies Children should be able to use the following strategies, as appropriate, for mental calculations:	– count up through the next multiple of 10, 100 or 1000 – reorder numbers in a calculation – partition into hundreds, tens and units, adding the most significant digit first – use known number facts and place value to add or subtract pairs of three-digit multiples of 10 and two-digit numbers with one decimal place – add or subtract the nearest multiple of 10 or 100 then adjust – identify near doubles – add several numbers – develop further the relationship between addition and subtraction – use factors – partition to carry out multiplication – use doubling and halving – use closely related facts to carry out multiplication and division – use the relationship between multiplication and division – use knowledge of number facts and place value to multiply or divide
Mental Calculations Children should be able to calculate mentally:	– add or subtract any pair of three-digit multiples of 10, e.g. 570 + 250, 620 – 380 – find what must be added to a decimal fraction with units and tenths to make the next higher whole number, e.g. 4.3 + ? = 5 – add or subtract any pair of decimal fractions each with units and tenths, or each with tenths and hundredths, e.g. 5.7 + 2.5, 0.63 – 0.48 – subtract a four-digit number just less than a multiple of 1000 from a four-digit number just more than a multiple of 1000, e.g. 5001-1997 – multiply any two- or three-digit number by 10 or 100, e.g. 79 x 100, 363 x 100 – divide a multiple of 100 by 10 or 100, e.g. 4000 ÷ 10, 3600 ÷ 100 – multiply any two-digit multiple of 10 y a single-digit, e.g. 60 x 7, 90 x 6 – double any whole number from 1 to 100, multiples of 10 to 1000, and find corresponding halves – find 50%, 25%, 10% of small whole numbers or quantities, e.g. 25% or £8

Year 6

Rapid Recall	– multiplication and division facts involving decimals, e.g. 0.8 x 7 and 4.8 ÷ 6 – squares of numbers to 12 x 12 and the corresponding squares of multiples of 10
Mental Strategies Children should be able to use the following strategies, as appropriate, for mental calculations:	– consolidate all strategies from previous years – use knowledge of number facts and place value to add or subtract pairs of three-digit multiples of 10 and two-digit numbers with one decimal place – add or subtract the nearest multiple of 10, 100 or 1000, then adjust – continue to use the relationship between addition and subtraction – use factors – partition to carry out multiplication – use doubling and halving – use closely related facts to carry out multiplication and division – use the relationship between multiplication and division – use knowledge of number facts and place value to multiply or divide
Mental Calculations Children should be able to calculate mentally:	– multiply any two-digit number by a single-digit, e.g. 34 x 6 – multiply any two-digit number by 50 or 25, e.g. 23 x 50, 47 x 25 – multiply or divide any whole number by 10 or 100, giving any remainder as a decimal, e.g. 47 ÷ 10 = 4.7, 1763 ÷ 100 = 17.63 – find squares of multiples of 10 to 100 – find any multiple of 10% of a whole number or quantity, e.g. 70% of £20, 50% of 5kg, 20% of 2 metres