Mathematics

Progression in
Mental Calculations

This guidance aims to give teachers guidance linked to the progression in teaching and learning of mental calculations from EY to year 6.

Overview:

The aim at All Saints Academy Trust is that by the end of Key Stage 2, children should be able to use an efficient method for each operation confidently and with understanding. It is encouraged that children recognise how and when to use mental methods to work out a calculation.

For calculations that they cannot do in their heads they choose an appropriate written method which they can use accurately and with confidence (refer to written calculation policy).

EYFS

Counting/ Using Number	**30-50** Uses some number names accurately in play. Recites numbers in order to 10. Knows that numbers identify how many objects are in a set. Shows an interest in numerals in the environment. Realises not only objects, but anything can be counted, including steps, claps or jumps. **40 – 60** 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. Counts an irregular arrangement of up to ten objects. Estimates how many objects they can see and checks by counting them. Says the number that is one more than a given number.
Number Recognition	**30 - 50** Uses some number names and number language spontaneously. Sometimes matches numeral and quantity correctly. **40 – 60** Recognise some numerals of personal significance. Recognises numerals 1 to 5. Selects the correct numeral to represent 1 to 5, then 1 to 10 objects.

Applying Knowledge to mathematical problems	30 - 50
	
	    Beginning to represent numbers using fingers, marks on paper or pictures.
	    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 representing numbers.
	
	40 - 60
	
	    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.
	    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 10, 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.
	Children at the expected level of development will: -
	Have a deep understanding of number to 10, including the composition of each number;
	Subitise (recognise quantities without counting) up to 5; - Automatically recall (without reference to rhymes, counting or other aids) number bonds up to 5 (including subtraction facts) and some number bonds to 10, including double facts. ELG:
	Numerical Patterns Children at the expected level of development will: -
	Verbally count beyond 20, recognising the pattern of the counting system; -
	Compare quantities up to 10 in different contexts, recognising when one quantity is greater than, less than or the same as the other quantity; -
	Explore and represent patterns within numbers up to 10, including evens and odds, double facts and how quantities can be distributed equally.

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