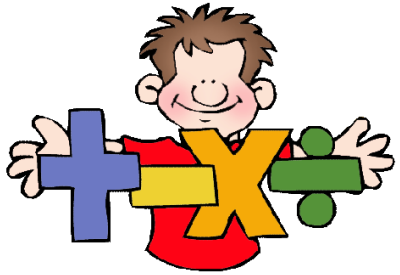
Progression in Mental Calculation Skills



Multiplication and division

PROGRESSION IN MENTAL CALCULATION SKILLS

Recall **Children should be able to derive and recall:**	**Mental calculation skills** **Working mentally – with jottings if needed – children should be able to do the following:**	**Mental methods or strategies** **Children should be able to apply the following strategies/methods appropriately:**
	YEAR 1	
• doubles of all numbers to 10, e.g. double 6 • odd and even numbers to 20	• count in multiples of twos, fives and tens from different multiples.	• Use the patterns of the last digits e.g. 0 and 5 when counting in 5s. Knowing that all multiples of 2 are even.
	YEAR 2	
• doubles of all numbers to 20, e.g. double 13 and corresponding halves. • doubles of multiples of 10 to 50, e.g. double 40 and corresponding halves • multiplication facts for the 2, 5 and 10 times tables and corresponding division facts • odd and even numbers to 100	• count in steps of 2, 3, and 5 from 0, and in tens from any number, forward or backward • double any multiple of 5 up to 50, e.g. 35. • halve any multiple of 10 up to 100, e.g. halve 90 • find half of even numbers to 40 • find the total number of objects when they are organised into groups of 2, 5 or 10	• **partition** – double the tens and ones separately then recombine • use knowledge that halving is the inverse of doubling and that doubling is equivalent to multiplying by two. • use knowledge of multiplication facts from the 2, 5 and 10 times tables, e.g. recognise that there are 15 objects altogether because there are three groups of five • use the commutative law and inverse relations to develop multiplicative reasoning (e.g. 4 × 5 = 20 and 20 ÷ 5 = 4).

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YEAR 3

Recall **Children should be able to derive and recall:**	**Mental calculation skills** **Working mentally – with jottings if needed – children should be able to do the following:**	**Mental methods or strategies** **Children should be able to apply the following strategies/methods appropriately:**
• multiplication facts for the 2, 3, 4, 5, 8 and 10 times tables and corresponding division facts. • doubles of multiples of 10 to 100, e.g. double 90 and corresponding halves.	• count on or back in 1s, 10s or 100s starting from any 2 or 3 digit number. • double any multiple of 5 up to 100, e.g. 75. • halve any multiple of 10 up to 200, e.g. halve 170. • multiply one-digit or two-digit numbers by 10 or 100, e.g. 7 x 100, 46 x 10, 54 x 100 • find unit fractions of numbers and quantities involving halves, thirds, quarters, fifths and tenths	• use doubling to connect the 2, 4 and 8 times table. • **partition –** when doubling, double the tens and ones separately, then recombine. When halving, halve the tens and ones separately, then recombine • use knowledge that halving and doubling are inverse operations • using the commutative law to make calculations easier (rearranging numbers), e.g. 4 x 12 x 5 = 4 x 5 x 12 = 20 x 12 = 240. • recognise that when multiplying by 10 or 100 the digits move one or two places to the left and zero as a place holder. • use multiplication and division facts (e.g. using 3 x 4 = 12, 12 ÷ 4 = 3 and 3 = 12 ÷ 4) to derive related facts (30 x 4 = 120, 120 ÷ 4 = 30 and 30 = 120 ÷ 4).

		• Recognise that finding a unit fraction is equivalent to dividing by the denominator and use knowledge of division facts.

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YEAR 4

Recall **Children should be able to derive and recall:**	Mental calculation skills **Working mentally – with jottings if needed – children should be able to do the following:**	Mental methods or strategies **Children should be able to apply the following strategies/methods appropriately:**
• recall multiplication and division facts for multiplication tables up to 12 x 12. • doubles of numbers 1 to 100, e.g. double 58 and corresponding halves • doubles of multiples of 10 to 100 and corresponding halves • factor pairs for known multiplication facts	• count in multiples of 6, 7, 9, 25 and 1000 • double any 2 digit number, e.g. double 39 • double any multiple of 10 or 100, e.g. double 340, double 800 and halve the corresponding multiples of 10 • multiply and divide numbers to 1000 by 10 and then 100, e.g. 325 x 10, 42 x 100, 120 ÷ 10, 600 ÷ 100, 850 ÷ 10 • multiply a multiple of 10 to 100 by a single digit number, e.g. 40 x 6. Multiply numbers to 20 by a single digit, e.g. 17 x 3 • give the factor pair associated with a multiplication fact, eg. identify that if 2 x 3 = 6 then 6 has the factor pair 2 and 3	• **partition –** double or halve the tens and ones separately, then recombine • use understanding that when a number is multiplied or divided by 10 or 100, its digits move one or two places to the left or the right and zero is used as a place holder • use knowledge of multiplication facts and place value, e.g. 7 x 8 = 56 to find 70 x 8, 7 x 80 • use partitioning and the distributive law to multiply, e.g. 16 x 7 = (10 + 6) x 7 = (10 x 7) + (6 x 7) = 70 + 42 = 112 • use the associative law to multiply (rearranging operations), e.g. (2 x 3) x 4 = 2 x (3 x 4)

	• divide a 2-digit number by a single-digit number, e.g. 84 ÷ 3	• use branching to chunk off multiples of the divisor using knowledge of multiplication facts and multiplying by multiples of 10, e.g. 84 ÷ 3 = (20 x 3) + (8 x 3) = 28

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YEAR 5

Recall **Children should be able to derive and recall:**	**Mental calculation skills** **Working mentally – with jottings if needed – children should be able to do the following:**	**Mental methods or strategies** **Children should be able to apply the following strategies/methods appropriately:**
• recall multiplication and division facts for multiplication tables up to 12 x 12. • square numbers to 12 x 12 • percentage equivalents of one half, one quarter, three quarters, tenths and hundredths • factor pairs to 100 • prime numbers up to 19	• count forwards or backwards in steps of powers of 10 for any given number up to 1 000 000 • multiply and divide two digit numbers by 4, 5, 8 or 20, e.g. 26 x 4, 320 x 5, 14 x 20, 96 ÷ 8 • multiply by 25 or 50, e.g. 48 x 25, 32 x 50 • multiply and divide whole numbers and decimals by 10, 100 or 1000, e.g. 4.3 x 10, 0.75 x 100, 673 ÷ 100 • multiply pairs of multiples of 10, e.g. 60 x 30 and a multiple of 100 by a single digit number, e.g. 900 x 8	• multiply or divide by 4 or 8 by repeated doubling or halving. To multiply by 5, multiply by 10 then halve; to multiply by 20, double, then multiply by 10 • to multiply by 5, multiply by 10 then halve; to multiply by 20, double then multiply by 10 or multiply by 10 then double • use knowledge of doubles/halves and understanding of place value, e.g. when multiplying by 50 multiply by 100 and divide by 2 • use understanding that when a number is multiplied or divided by 10 or 100, its digits move one or two places to the left or the right

	• divide a multiple of 10 by a single digit number, e.g. 80 ÷ 4, 270 ÷ 3 • find factor pairs for numbers to 100. E.g. 30 has the factor pairs 1 x 30, 2 x 15, 3 x 10 and 5 x 6. • Multiply and divide 2-digit decimals such as 0.8 x 7, 4.8 ÷ 6 • divide a 3-digit number by a single-digit number, e.g. 154 ÷ 7	relative to the decimal point and zero is used as a place holder. • use the distributive **(partitioning),** commutative (rearranging numbers) and associative law (rearranging operations) for multiplication to make calculations easier. • doubling one number and halving another to get to the product, e.g. 25 x 32 = 50 x 16 = 100 x 8 • use branching to chunk off multiples of the divisor using knowledge of multiplication facts and multiplying by multiples of 10, e.g. 154 ÷ 7 = (20 x 7) + (2 x 7) = 22

PROGRESSION IN MENTAL CALCULATION SKILLS

YEAR 6		
Recall **Children should be able to derive and recall:**	**Mental calculation skills** **Working mentally – with jottings if needed – children should be able to do the following:**	**Mental methods or strategies** **Children should be able to apply the following strategies/methods appropriately:**
• recall multiplication and division facts for multiplication tables up to 12 x 12. • identify common factors and common multiples • Prime numbers up to 100 • Equivalent fractions, decimals, percentages for hundredths, e.g. 35% ia equivalent to 0.35 or 35/100	• count on or back in tenths, hundredths and thousandths • multiply pairs of 2-digit and single digit numbers, e.g. 28 x 3 • divide by 25 or 50, e,g, 480 ÷ 25, 3200 ÷ 50 • double decimals to 1 dp, e.g. double 7.6 and find the corresponding halves, e.g. half of 15.2 • multiply pairs of multiples of 10 and 100, e.g. 50 x 30, 600 x 20	• to divide by 25, divide by 100, then multiply by 4; to divide by 50, divide by 100 then double • use the distributive **(partitioning),** commutative (rearranging numbers) and associative law (rearranging operations) for multiplication to make calculations easier. • doubling one number and halving another to get to the product, e.g. 25 x 32 = 50 x 16 = 100 x 8

	• divide multiples of 100 by a multiple of 10 or 100 (whole number answer), e.g. 600 ÷ 20, 800 ÷ 400, 2100 ÷ 300 • divide a 3-digit number by a 2-digit number, e.g. 336 ÷ 14 • scale up and down using known facts, e.g. given that 3 oranges cost 24p, find the cost of 4 oranges	• use branching to chunk off multiples of the divisor using knowledge of multiplication facts and multiplying by multiples of 10, e.g. 336 ÷ 14 = (20 x 14 = 280) + (4 x 14 = 56) = 24 • recognise how to scale up or down using multiplication and division, e.g. if 3 oranges cost 24p: **one orange costs 24 ÷ 3 = 8p** **four oranges cost 8 x 4 = 32p**