

Addition and Subtraction		
Mental Fluency Expectations	National Curriculum Programme of Study	SATs question examples
By the end of lower KS2 (Year 4) Apply all mental strategies to addition and subtraction using 4-digit whole numbers, including - Using known facts and related facts - Rounding and adjusting - Using doubles / halves / near doubles - Partitioning and recombining - Using approximation to estimate an answer Apply known facts and understanding of unit and non-unit fractions to add and subtract fractions with the same denominator Use understanding of place value in decimals, and simple fraction / decimal equivalents to add and subtract some decimals	Recall and use addition and subtraction facts to 20 fluently and derive and use related facts up to 100 (Year 2) Add and subtract numbers mentally, including - A two-digit number and ones - A two-digit number and tens - Two two-digit number - Adding three one-digit numbers (Year 2) Add and subtract - A three-digit number and ones - A three-digit number and tens - A three-digit number and hundreds (Year 3) Estimate the answer to a calculation and use inverse operations to check answers (Year 3) Solve problems, including missing number problems, using number facts [and] place value (Year 3) Add and subtract fractions with the same denominator within one whole Year 4: Find 1000 more or less than a given number (Year 4) Estimate and use inverse operations to check answers to calculations (Year 4) Practise mental methods with increasingly large numbers to aid fluency (Year 4 non-statutory guidance) Add and subtract fractions with the same denominator (Year 4)	= 6,000 + 90 = 8,275 + 82 7,064 – 502 = $\frac{9}{11} - \frac{4}{11} =$ 7 – 2.25 = 9 – 1.9 = 10 – 5.4 =

Count up and down in tenths; recognise that tenths arise from dividing an object into 10 equal parts and dividing one-digit numbers or quantities by 10 (Year 3)

Count up and down in hundredths; recognise that hundredths arise when dividing an object by 100 and dividing tenths by 10 (Year 4)

Recognise and write decimal equivalents to $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$ (Year 4)

$$826 = 800 + \boxed{} + 6$$

$$\boxed{} + 5 = 341$$

$$\boxed{} = 87 - 65$$

$$602 - \boxed{} = 594$$

$$39 + 673 =$$

$$\boxed{} - 10 = 298$$

Addition and Subtraction		
Mental Fluency Expectations	National Curriculum Programme of Study	SATs question examples
By the end of upper KS2 (Year 6) Pupils now apply all mental strategies to addition and subtraction with increasingly large numbers, decimals and fractions, including • Using known facts and related facts • Rounding and adjusting • Using doubles / halves / near doubles • Partitioning and recombining • Using approximation to estimate an answer Use knowledge of common factors and multiples to support the addition and subtraction of fractions with different denominators. This includes calculations that exceed 1 as a mixed number.	Add and subtract numbers mentally with increasingly large numbers (Year 5) Use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy (Year 4) [Pupils] mentally add and subtract tenths, and one-digit whole numbers and tenths (Year 5 non-statutory guidance). [Pupils] practice adding and subtracting decimals, including a mix of whole numbers and decimals, with different numbers of decimal places and complements of 1 (Year 5 non-statutory guidance). Pupils] undertake mental calculations with increasingly large numbers and more complex calculations (Year 6 non-statutory guidance). Use estimations to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy. (Year 6) Pupils round answers to a specified degree of accuracy (Year 6 non-statutory guidance). Add and subtract fractions with different denominators and mixed numbers, using the concept of equivalent fractions (Year 6)	$\frac{1}{5} + \frac{3}{4} =$ $1\frac{1}{5} + 2\frac{1}{10} =$ $\frac{8}{9} - \frac{1}{4} =$ $1\frac{3}{7} - \frac{4}{7} =$ $2\frac{1}{2} - \frac{3}{4} =$ $5.87 + 3.123 =$ $3,050,020 = 3,000,000 + \boxed{} + 20$ $37.8 - 14.671 =$

KS2 Assessment for transition to KS3– Mental Fluency Check

Mental Fluency Expectations	National Curriculum Programme of Study Addition and subtraction	Sample questions (NCETM Y6 assessment for mastery resource)
At the beginning of KS3- Year 7 Pupils should consolidate their numerical and mathematical capability from KS2 and begin to build on prior knowledge and understanding of the number system and place value They should use the four operations applied to integers, decimals, proper and improper fractions, and mixed numbers. This will include: • Using known facts and related facts • Rounding and adjusting • Using doubles / halves / near doubles • Partitioning and recombining • Using approximation to estimate an answer Pupils should begin to formalise their understanding of the three laws of arithmetic and how they are used to increase mental fluency: • Commutativity $a + b = b + a$ • Associativity $a + (b + c) = (a + b) + c$ • Distributivity $a(b + c) = ab + ac$	Understand and use place value for decimals and integers of any size (KS3) Use four operations applied to integers, decimals, proper and improper fractions, and mixed numbers. (KS3) Recognise and use the relationships between operations including inverse operations. (KS3) Use approximation through rounding (for calculations) (KS3)	Calculate $36.2 + 19.8$ with a mental method, explaining your reasoning. Calculate $8.78 + 5.26$ using a suitable adjustment ($8.75 + 5.75$ then adjust) Two numbers sum to 1000: What could they be? If one is 498, what is the other? If one is 398, what is the other? If one is 328. What is the other? Calculate mentally, using informal jottings: 37×15 ($37 \times 10 + 37 \times 5$) Know that $\times 5$ is half of $\times 10$ I buy eight pens at £1.99 each. How much have I spent? Which is harder and which is easier? Explain why. $2001 - 48$; $130 - 48$; $199 - 48$ Which is harder and which is easier? Explain why. $2996 + 1650$; $3461 + 2537$; $4837 + 2189$

Multiplication and Division (including FDP)		
Mental Fluency Expectations	National Curriculum Programme of Study	SATs question examples
By the end of lower KS2 (Year 4) Pupils should be fluent with all multiplication and division facts up to 12×12, and be able to use a range of mental strategies to solve some calculations involving larger numbers. They should also be able to use multiplication facts to solve some problems involving known decimals.	Recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables (Year 2) Recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables (Year 3). Write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including two-digit numbers times one-digit numbers, using mental methods (Year 3). Pupils develop efficient mental methods, for example using commutativity and associativity and multiplication and division facts to derive related facts (Year 3 non-statutory guidance). Recall multiplication and division facts for multiplication tables up to 12×12 (Year 4) Use place value, known and derived facts to multiply and divide mentally, including multiplying by 0 and 1; dividing by 1; multiplying together 3 numbers (Year 4)	$2 \times 45 =$ $180 \div 3 =$ $120 \div 12 =$ $213 \times 0 =$ $60 \div 15 =$

KS2 Assessment for transition to KS3– Mental Fluency Check

	Recognise and use factor pairs and commutativity in mental calculations (Year 4 non-statutory guidance) Pupils practise mental methods and extend this to three-digit numbers to derive facts (Year 4).	$99 \div 11 =$	$270 \div 3 =$
		$120 \div 12 =$	$1,210 \div 11 =$
		$\frac{3}{4}$ of 1,000 =	$5 \times 4 \times 10 =$
		$5,400 \div 9 =$	$0.5 \times 28 =$

Multiplication and Division (including FDP)		
Mental Fluency Expectations	National Curriculum Programme of Study	SATs question examples
By the end of upper KS2 (Year 6) Pupils secure understanding of place value, and scaling up or down by a scale factor of ten, should enable pupils to accurately multiply and divide numbers by 10, 100, 1000. Pupils continue to apply their quick recall of all multiplication facts to derive related facts and to solve multiplication and division calculations, including those involving fractions. Pupils can use their recall of multiplication table facts to work out square and cube numbers. Pupils understanding of percentages enables them to use their known facts and mental strategies to work out percentages such as 1%, 10%, 25% of an amount. Pupils are able to apply their mental skills and strategies to increasingly large numbers and also to decimals and fractions.	Multiply and divide numbers mentally drawing upon known facts .(Year 5) Recall prime numbers up to 19 (Year 5). Multiply and divide whole numbers and those involving decimals by 10, 100 and 1000 (Year 5). Recognise and use square numbers and cube numbers, and the notation for square and cubed (Year 5) Multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams (Year 5). [Pupils] undertake mental calculations with increasingly large numbers and more complex calculations (Year 6) Pupils continue to use all the multiplication tables to calculate mathematical statements in order to maintain their fluency (Year 6) Multiply simple pairs of proper fractions, writing the answer in its simplest form (Year 6). Divide proper fractions by whole numbers (Year 6).	$1,210 \div 11 =$ $3^3 =$ $101 \times 1,000 =$ $6^2 + 10 =$ $1\frac{3}{4} \times 10 =$ $0.1 \div 100 =$

KS2 Assessment for transition to KS3– Mental Fluency Check

Multiply and divide numbers by 10, 100 and 1000 giving answers up to three decimal places (Year 6).

Recall and use equivalences between simple fractions, decimals and percentages (Year 6)

Pupils develop their skills of rounding and estimating as a means of predicting and checking the order of magnitude of their answers to decimal calculations (Year 6 non-statutory guidance).

Solve problems which require knowing percentage equivalents of $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{5}$, $\frac{2}{5}$, $\frac{4}{5}$ and those fractions with a denominator of a multiple of 10 or 25

$$20\% \text{ of } 3,000 =$$

$$35\% \text{ of } 320 =$$

$$51\% \text{ of } 900 =$$

$$20\% \text{ of } 1,200 =$$

$$99\% \text{ of } 200 =$$

$$\frac{1}{4} \times \frac{1}{2} = \frac{1}{8}$$

$$\frac{1}{3} \div 2 = \frac{1}{6}$$

$$\frac{4}{5} \div 4 =$$

Multiplication and Division (including FDP)		
Mental Fluency Expectations	National Curriculum Programme of Study	Sample Questions (NCETM Y6 assessment for mastery resource)
At the beginning of KS3- Year 7 Pupils should consolidate their numerical and mathematical capability from KS2 and begin to build on prior knowledge and understanding of the number system and place value. They are able to apply their mental skills and strategies to increasingly large numbers and also to decimals and fractions. They should use the four operations applied to integers, decimals, proper and improper fractions, and mixed numbers. Pupils should begin to formalise their understanding of the three laws of arithmetic and how they are used to increase mental fluency: • Commutativity $a \times b = b \times a$ • Associativity $a \times (b \times c) = (a \times b) \times c$ • Distributivity $a \times (b + c) = ab + ac$	Understand and use place value for decimals and integers of any size (KS3) Use four operations applied to integers, decimals, proper and improper fractions, and mixed numbers. (KS3) Recognise and use the relationships between operations including inverse operations. (KS3) Use approximation through rounding (for calculations) (KS3)	Work out $1668 \div 8$ using an informal method ($\div 2 \div 2 \div 2$) Work out using an informal method $8.4 \times 3 + 8.4 \times 7$ $6.7 \times 5 - 0.67 \times 50$ $93 \times 0.2 + 0.8 \times 93$ $7.2 \times 4 + 3.6 \times 8$ A box of labels costs £24. There are 100 sheets in the box. There are 10 labels on each sheet. Calculate the cost of one label, in pence. Put the following numbers into groups: $\frac{3}{4}$, $\frac{3}{2}$, 0.5, 1.25, $\frac{3}{8}$, 0.125. Explain your choices. Last month Kira saved $\frac{3}{5}$ of her £10 pocket money. She also saved 15% of her £20 birthday money. How much did she save altogether? You can buy 3 pots of banana yoghurt for £2.40 How much will it cost to buy 12 pots of banana yoghurt? Which method would you use? Explain why: $144 \div 16$; $516 \div 12$; $140 \div 14$; $300 \div 50$ $280 \div 24$; $1000 \div 15$ Which is harder and which is easier? $693 \div 7$; $300 \div 7$; $287 \div 7$; $5600 \div 7$