

Calculation Guidance

February 2015

Addition and Subtraction

The aim is for children to use mental methods when appropriate, but to have one written method to be used accurately and with confidence for calculations that cannot be completed in their heads.

Initially the focus should be on becoming fluent with mental methods for addition and subtraction, including securing number bonds to 10, 20 and 100. Pictures, resources and informal jottings should be encouraged when adding and subtracting, before the column method is introduced as “recording addition and subtraction in columns supports place value and prepares for formal written methods with larger numbers”.

When knowledge of place value is secure, formal written methods for addition and subtraction should be taught.

Addition

Children should explore a range of mental strategies for adding numbers, including partitioning, using know number facts and compensating. When place value is secure, column method for addition should be taught.

$$\begin{array}{r} 258 \\ + 87 \\ \hline 345 \\ 11 \end{array}$$

Carry digits are recorded below the line, using the words ‘carry ten’ or ‘carry one hundred’, not ‘carry one’.

Column addition remains efficient when used with larger whole numbers and decimals. Once learned, the method is quick and reliable.

Multiplication

The aim is for children to use mental methods when appropriate, but to have one written method to be used accurately and with confidence for calculations that cannot be completed in their heads.

Initially the focus should be on recalling and applying multiplication facts to 12 x 12 so as to calculate products such as 70 x 5, 700 x 50 using the related fact 7 x 5. Before the grid method or short multiplication is introduced, children must be able to add two or more single digit numbers mentally and be able to apply this knowledge to add multiples of 10 or 100.

Children should explore multiplying mentally by partitioning before being introduced to the grid method as a written method for recording multiplications.

Grid method

This should allow children to apply mental methods of partitioning to larger numbers and begin to record in a more formal way. Children should be taught to estimate first before carrying out the calculation.

×	7
30	210
8	56
	266

×	20	7	
50	1000	350	1350
6	120	42	162
			1512

1

×	20	9	
200	4000	1800	5800
80	1600	720	2320
6	120	54	174
			8294

1

Partitioning

Children should become fluent in this mental method for dividing two digit numbers by one digit. It can also be used to divide larger numbers by one and two digit numbers. One way to work out $TU \div U$ mentally is to partition TU into a multiple of the divisor plus the remaining ones, then divide each part separately.

Informal recording for $84 \div 7$ might be:

$$\begin{array}{r} 84 \\ 70 + 14 \\ \downarrow \quad \downarrow \div 7 \\ 10 + 2 = 12 \end{array}$$

In this example, using knowledge of multiples, the 84 is partitioned into 70 (the highest multiple of 7 that is also a multiple of 10 and less than 84) plus 14 and then each part is divided separately using the distributive law.

Short division

This is the only formal written method for dividing by a single digit that children should be taught, once they have a conceptual understanding of division and a secure knowledge of multiplication facts. It should be taught alongside the mental method of partitioning so that children can appreciate the links between the two methods. Children should be encouraged to use knowledge of multiplication facts to check their answers. Remainders should be introduced when children are able to work with them mentally.

$$\begin{array}{r} 27 \\ 3 \overline{)821} \end{array}$$

$$\begin{array}{r} 97 \\ 3 \overline{)2921} \end{array}$$

When ready, children can be introduced to dividing by a two digit number using short division. It is essential that children are secure with mental methods for multiplying and dividing before learning this method. Division with remainders can also be introduced.

$$\begin{array}{r}
 45 \text{ r}1 \\
 \hline
 11 \overline{) 496} \\
 \underline{44} \\
 56 \\
 \underline{55} \\
 10
 \end{array}$$

Answer: $45 \frac{1}{11}$

Long division

In Upper Key Stage Two, children should be introduced to long division as a method for dividing by a two digit number. They should also be able to perform the calculation and estimate the answer using mental methods such as partitioning.

$$\begin{array}{r}
 28 \cdot 8 \\
 \hline
 15 \overline{) 432 \cdot 0} \\
 \underline{30} \\
 132 \\
 \underline{120} \\
 120 \\
 \underline{120} \\
 0
 \end{array}$$

1	2	3	4	5	6
Solve simple problems using objects, pictures or arrays	Recall and use facts for 2,5 and 10 times tables Understand commutative laws Solve problems using a range of methods	Recall and use facts for 3,4 and 8 times tables Multiply and divide mentally and derive facts for 2 digit numbers Use formal written methods for multiplying and dividing 2 digit numbers Solve missing number problems	Recall and use facts for tables up to 12x12 Multiply and divide mentally using factor pairs and derive facts for 3 digit numbers Use formal written methods for multiplying and dividing 3 digit numbers Solve two step problems in context	Recognise and use multiples, factors, square, cube and prime numbers up to 100 Use formal written methods for dividing and multiplying 4 digits numbers by 1 (or 2 digits) Multiply and divide numbers and decimals by up to 1000 Solve problems by combining all four operations	Perform mental calculations combining operations Identify common factors, multiples and primes Use knowledge of order of operations Divide 4 digit numbers by 2 digits and interpret remainders Multiply one-digit numbers with up to 2 dp by whole numbers

