Calculation Policy

Ready-to-progress criteria and the curriculum

The ready-to-progress criteria in this document are organised into 6 strands, each of which has its own code for ease of identification. These are listed below. *Measurement* and *Statistics* are integrated as applications of number criteria, and elements of measurement that relate to shape are included in the *Geometry* strand.

Ready-to-progress criteria strands	Code
Number and place value	**NPV**
Number facts	**NF**
Addition and subtraction	**AS**
Multiplication and division	**MD**
Fractions	**F**
Geometry	**G**

Special educational needs and disability (SEND)

Pupils should have access to a broad and balanced curriculum. The *National Curriculum Inclusion Statement* states that teachers should set high expectations for every pupil, whatever their prior attainment. Teachers should use appropriate assessment to set targets which are deliberately ambitious. Potential areas of difficulty should be identified and addressed at the outset. Lessons should be planned to address potential areas of difficulty and to remove barriers to pupil achievement. In many cases, such planning will mean that pupils with SEN and disabilities will be able to study the full national curriculum. The guidance in this document will support planning for all SEND pupils by highlighting the most important concepts within the national curriculum so that teaching and targeted support can be weighted towards these.

Year 1- Calculation and fluency

1NF–1 Fluently add and subtract within 10

Develop fluency in addition and subtraction facts within 10.

The main addition and subtraction calculation focus in year 1 is developing fluency in additive facts within 10, as outlined in the **1NF–1 Teaching guidance**

Fluency in these facts allows pupils to more easily master addition and subtraction with 2-digit numbers in year 2, and underpins all future additive calculation. Pupils should practise carrying out addition and subtraction calculations, and working with equations in different forms, such as those below, until they achieve automaticity. Pupils should begin to recognise the inverse relationship between addition and subtraction, and use this to calculate. For example, if a pupil knows $6 + 4 = 10$, then they should be able to reason that $10 - 4 = 6$ and $10 - 6 = 4$.

Pupils should also be expected to solve contextual addition and subtraction calculations with the 4 structures described in **1AS–2** (aggregation, partitioning, augmentation and reduction), for calculation within 10. Pupils will need extensive practice, throughout the year, to achieve the fluency required to meet this criterion.

$5 + 2 = \square$	$6 + 4 = \square$	$\square = 1 + 8$	$\square = 3 + 4$
$5 + \square = 8$	$\square + 1 = 7$	$6 = \square + 2$	$10 = 5 + \square$
$8 - 7 = \square$	$7 - 2 = \square$	$6 - 3 = \square$	$\square = 9 - 5$
$\square - 3 = 4$	$9 - \square = 7$	$3 = \square - 5$	$2 = 10 - \square$

1NF–2 Count forwards and backwards in multiples of 2, 5 and 10

Count forwards and backwards in multiples of 2, 5 and 10, beginning with any multiple, and count forwards and backwards through the odd numbers.

Pupils must be fluent in counting in multiples of 2, 5 and 10 by the end of year 1. Although this is the basis of multiplication and division by 2, 5, and 10, pupils do not need to be introduced to the words ‘multiplication’ and ‘division’ or to the multiplication and division symbols (× and ÷) in year 1, and are not expected to solve calculations presented as written equations. However, through skip counting (using practical resources, images such as number lines, or their fingers) pupils should begin to solve contextual multiplication and quotitive division problems, involving groups of 2, 5 or 10, for example:

- “I have four 5p coins. How much money do I have altogether?”
- “There are 10 apples in each bag. How many bags do I need to have 60 apples?”

Pupils will need extensive practice, throughout the year, to achieve the fluency required to meet this criterion.

Year 2- Calculation and fluency

2AS–1 Add and subtract across 10

Add and subtract across 10, for example: **8+5=13 so 13–5=8**

At first, pupils will use manipulatives, such as tens frames, to understand the strategies for adding and subtracting across 10. However, they should not be using the manipulatives as a tool for finding answers. Pupils should be able to carry out these calculations mentally, using their fluency in complements to 10 and partitioning. Pupils are fluent in these calculations when they no longer rely on extensive written methods, such as equation sequences or partitioning diagrams.

Pupils do not need to memorise all additive facts for adding and subtracting across 10, but they need to be able to recall appropriate doubles (double 6, 7, 8 and 9) and corresponding halves (half of 12, 14, 16 and 18), and use these known facts for calculations such as $6+6=12$ and $18-9=9$.

Year 2 pupils will need lots of practice to be able to add and subtract across 10 with sufficient fluency to make progress with the year 3 curriculum. They should also continue to practise adding and subtracting within 10.

2AS–3 Add and subtract within 100 – part 1

Add and subtract within 100 by applying related one-digit addition and subtraction facts: add and subtract only ones or only tens to/from a two-digit number

For pupils to become fluent with the strategies for these two-digit additive calculations, as well as having automatic recall of one-digit additive facts, they must also be conceptually fluent with the connections between one-digit facts and two-digit calculations. This conceptual fluency is based on:

- being able to unitise (for example, understanding $40+50$ as 4 units of ten + 5 units of ten)
- an understanding of place-value

Pupils should be able to solve these calculations mentally and be able to demonstrate their reasoning either verbally or with manipulatives or drawings. Note that this is different from using manipulatives or drawings to calculate an answer, which pupils should not need to do.

2AS–4 Add and subtract within 100 – part 2

Add and subtract within 100 by applying related one-digit addition and subtraction facts: add and subtract any 2 two-digit numbers

These calculations involve more steps than those in **2AS–3**. To avoid overload of working memory, pupils should learn how to record the steps using informal written notation or equation sequences, as shown below. This is particularly important for calculations where addition of the ones involves bridging a multiple of 10, as these require a further calculation step.

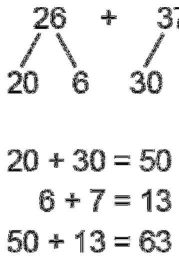


Figure 57: adding 26 and 37 by partitioning both addends

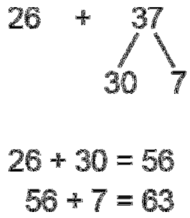


Figure 58: adding 26 and 37 by partitioning one addend

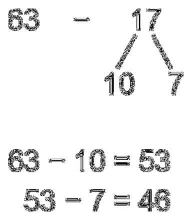


Figure 59: subtracting 17 from 63 by subtracting the tens first

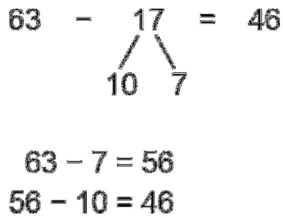


Figure 60: subtracting 17 from 63 by subtracting the ones first

Pupils do not need to learn formal written methods for addition and subtraction in year 2, but column addition and column subtraction could be used as an alternative way to record two-digit calculations at this stage. For calculations such as $26 + 37$, pupils can begin to think about the 2 quantities arranged in columns under place-value headings of tens and ones. They can use counters or draw dots for support:

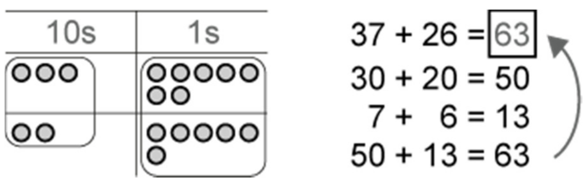


Figure 61: adding 2 two-digit numbers using 10s and 1s columns

2MD–1 Multiplication as repeated addition

Recognise repeated addition contexts, representing them with multiplication equations and calculating the product, within the 2, 5 and 10 multiplication tables.
Pupils must be able to carry out calculations connected to the 2, 5 and 10 multiplication tables, for example:

$4 \times 5 = \square$

Pupils should practise skip counting in multiples of 2, 5 and 10, up to 10 groups of each, until they are fluent. When carrying out a multiplication calculation by skip counting, they may keep track of the number of twos, fives or tens using their fingers or by tallying.
Pupils may also recite, using the language of the multiplication tables to keep track (1 times 5 is 5, 2 times 5 is 10…). They can also use or draw 2-, 5- or 10-value counters to support them in solving multiplicative problems.

Pupils who are sufficiently fluent in year 2 multiplicative calculations are not reliant on drawing arrays or using number lines as tools to calculate. Pupils should have sufficient conceptual understanding to recognise these as models of multiplication and division, and explain how they link to calculation statements. However, they should not need to use them as methods for carrying out calculations.

Pupils need to be able to represent 4 fives (or 5, 4 times) as both 4×5 and 5×4. They should be able to use commutativity to solve, for example, 2 sevens, using their knowledge of 7 twos.

2MD–2 Grouping problems: missing factors and division

Relate grouping problems where the number of groups is unknown to multiplication equations with a missing factor, and to division equations (quotitive division).
Pupils need to be able to solve missing-factor and division problems connected to the 2, 5 and 10 multiplication tables, for example:

- $\square \times 5 = 20$
- $20 \div 5 = \square$

Pupils should solve division (and missing-factor) problems, such as these, by connecting division to their emerging fluency in skip counting and known multiplication facts. Pupils should not be solving statements such as $20\div5$ by sharing 20 between 5 using manipulatives or by drawing dots. Pupils should also not rely on drawing arrays or number lines as tools for calculation.

As for 2MD–1, pupils can keep track of the number of twos, fives or tens using their fingers or by tallying. They may also recite, using the language of the multiplication tables, or draw 2-, 5- or 10-value counters. Eventually pupils should be fluent in isolated multiplication facts (for example, 4 fives are 20) and use these to solve missing-factor multiplication problems and division problems.

Reviewed: 14.7.20

Year 3 Calculation and fluency

Number, place value and number facts: 3NPV–2 and 3NF–3

- **3NPV–2:** Recognise the place value of each digit in *three*-digit numbers, and compose and decompose *three*-digit numbers using standard and non-standard partitioning.
- **3NF–3:** Apply place-value knowledge to known additive and multiplicative number facts (scaling facts by 10), for example:

$8+6=14$ **and** *$14-6=8$*	*$3\times4=12$* **and** *$12\div4=3$*
so	**so**
$80+60=140$ **and** *$140-60=80$*	*$30\times4=120$* and $120\div4=30$

Representations such as place-value counters and partitioning diagrams (**3NPV–2**), and tens-frames with place-value counters (**3F–3**), can be used initially to help pupils understand calculation strategies and make connections between known facts and related calculations. However, pupils should not rely on such representations for calculating. For the calculations in **3NF–3**, for example, pupils should instead be able to calculate by verbalising the relationship.

3NF–1 Fluently add and subtract within and across 10

Secure fluency in addition and subtraction facts that bridge 10, through continued practice.

Pupils who are fluent in addition and subtraction facts within and across 10 have the best chance of mastering columnar addition and columnar subtraction. Teachers should make sure that fluency in addition and subtraction facts is given the same prominence as fluency in multiplication tables.

Pupils should continue to practise calculating with additive facts within 10.

Pupils may initially use manipulatives, such as tens frames and counters, to apply the strategies for adding and subtracting across 10 described in year 2 (**2AS–1**). However, they should not be using the manipulatives as a tool for finding answers, and by the end of year 3 pupils should be able to carry out these calculations mentally, using their fluency in complements to 10 and partitioning.

Pupils do not need to memorise all additive facts for adding and subtracting across 10, but need to be able to recall appropriate doubles (double 6, 7, 8 and 9) and corresponding halves (half of 12, 14, 16 and 18), and use these known facts for calculations such as $6+6=12$ and $18-9=9$.

3AS–2 Columnar addition and subtraction

Add and subtract up to three-digit numbers using columnar methods.

Pupils must be able to add 2 or more numbers using columnar addition, including calculations whose addends have different numbers of digits.

$$
\begin{array}{r}
274 \\
+\ 354 \\
\hline
628 \\
\hline
{\scriptstyle 1}
\end{array}
\qquad\qquad
\begin{array}{r}
62 \\
+\ 481 \\
\hline
543 \\
\hline
{\scriptstyle 1}
\end{array}
\qquad\qquad
\begin{array}{r}
186 \\
57 \\
+\ 434 \\
\hline
677 \\
\hline
{\scriptstyle 1\ 1}
\end{array}
$$

Figure 101: columnar addition for calculations involving three-digit numbers

For calculations with more than 2 addends, pupils should add the digits within a column in the most efficient order. For the third example above, efficient choices could include:

- beginning by making 10 in the ones column
- making double 8 in the tens column

Pupils must be able to subtract 1 three-digit number from another using columnar subtraction. They should be able to apply the columnar method to calculations where the subtrahend has fewer digits than the minuend, and they must be able to exchange through 0.

$$
\begin{array}{rrr}
\overset{5}{\cancel{6}} & \overset{1}{}2 & 8 \\
-\ 2 & 7 & 4 \\
\hline
3 & 5 & 4 \\
\hline
\end{array}
\qquad\qquad
\begin{array}{rrr}
\overset{4}{\cancel{5}} & \overset{1\,4}{\cancel{5}} & \overset{1}{}6 \\
- & 7 & 8 \\
\hline
4 & 7 & 8 \\
\hline
\end{array}
\qquad\qquad
\begin{array}{rrr}
\overset{2}{\cancel{3}} & \overset{1\,9}{\cancel{0}} & \overset{1}{}2 \\
-\ 1 & 5 & 4 \\
\hline
1 & 4 & 8 \\
\hline
\end{array}
$$

Figure 102: columnar subtraction for calculations involving three-digit numbers

Pupils should make sensible decisions about how and when to use columnar subtraction. For example, when the minuend and subtrahend are very close together pupils may mentally find the difference, avoiding the need for column subtraction. For example, for $402-398$, pupils can see that 398 is 2 away from 400, and then there is 2 more to get to 402, so the difference is 4. This is more efficient than the corresponding columnar subtraction calculation which requires exchange through the zero.

3NF–2 Recall of multiplication tables

Recall multiplication facts, and corresponding division facts, in the 10, 5, 2, 4 and 8 multiplication tables, and recognise products in these multiplication tables as multiples of the corresponding number.

Pupils who are fluent in these multiplication table facts can solve the following types of problem by automatic recall of the relevant fact rather than by skip counting or reciting the relevant multiplication table:

- identifying products

  $8 \times 4 = \square$ $\quad \square = 3 \times 5$ $\quad 10 \times 10 = \square$

- solving missing-factor problems

  $\square \times 5 = 45$ $\quad 6 \times \square = 48$ $\quad 22 = \square \times 2$

Pupils should also be fluent in interpreting contextual multiplication and division problems, identifying the appropriate calculation and solving it using automatic recall of the relevant fact. This is discussed, and example questions are given, in **3MD–1**.

As pupils become fluent with the multiplication table facts, they should also develop fluency in related calculations as described in **3NF–3** (scaling number facts by 10).

Year 4-Calculation and fluency

Number, place value and number facts: 4NPV–2 and 4NF–3

- **4NPV–2** Recognise the place value of each digit in *four*-digit numbers, and compose and decompose four-digit numbers using standard and non-standard partitioning.
- **4NF–3** Apply place-value knowledge to known additive and multiplicative number facts (scaling facts by 100), for example:

$8+6=14$ **and** $14-6=8$	$3\times4=12$ **and** $12\div4=3$
so	**so**
800+600=1,400 and 1,400–600=800	**300×4=1,200 and 1,200 ÷ 4 = 300**

Representations such as place-value counters and partitioning diagrams (4NPV–2) and tens-frames with place-value counters (4NF–3), can be used initially to help pupils understand calculation strategies and make connections between known facts and related calculations. However, pupils should not rely on such representations for calculating. For the calculations in **4NF–3**, for example, pupils should instead be able to calculate by verbalising the relationship.

Addition and subtraction: extending 3AS–3

Pupils should also extend columnar addition and subtraction methods to four-digit numbers.

Pupils must be able to add 2 or more numbers using columnar addition, including calculations whose addends have different numbers of digits.

```
   6, 5 8 4          3, 3 6 2          1, 6 4 9
 + 2, 7 3 9        +     6 4 9          3, 1 0 4
 ----------        ----------        +     5 1 6
   9, 3 2 3          4, 0 1 1        ----------
 ----------        ----------          5, 2 6 9
   1  1 1            1  1 1            ----------
                                       1    1
```

Figure 150: columnar addition for calculations involving four-digit numbers

For calculations with more than 2 addends, pupils should add the digits within a column in the most efficient order. For the third example above, efficient choices could include:

- beginning by making 10 in the ones column
- making double-6 in the hundreds column

Pupils must be able to subtract one four-digit number from another using columnar subtraction. They should be able to apply the columnar method to calculations where the subtrahend has fewer digits than the minuend, and must be able to exchange through 0.

```
   5 14 12 1                             3 1 9 1
   6, 5  3  8        2, 7 9 6          8, 4 0 3
 – 2, 7  8  9      –     4 8 5       – 2, 1 7 6
 ------------      ----------        ----------
   3, 7  4  9        2, 3 1 1          6, 2 2 7
 ------------      ----------        ----------
```

Figure 151: columnar subtraction for calculations involving four-digit numbers

Pupils should make sensible decisions about how and when to use columnar subtraction. For example, when the minuend is a multiple of 1,000, they may transform to an equivalent calculation before using column subtraction, avoiding the need to exchange through zeroes.

```
                   –1
   7, 0 0 0    ---------->      6, 9 9 9
 – 2, 6 4 8    ---------->    – 2, 6 4 7
 ----------        –1         ----------

 ----------                   ==========
```

Figure 152: transforming a columnar subtraction calculation to an equivalent calculation

Reviewed: 14.7.20

4NF–1 Recall of multiplication tables

Recall multiplication and division facts up to 12×12, and recognise products in multiplication tables as multiples of the corresponding number.

Recall of all multiplication table facts should be the main multiplication calculation focus in year 4. Pupils who leave year 4 fluent in these facts have the best chance of mastering short multiplication in year 5.

Pupils who are fluent in multiplication table facts can solve the following types of problem by automatic recall of the relevant fact rather than by skip counting or reciting the relevant multiplication table:

- $8 \times 9 = \square$ $\quad \square = 3 \times 12$ $\quad 6 \times 6 = \square$
  (identify products)
- $\square \times 5 = 45$ $\quad 8 \times \square = 48$ $\quad 121 = \square \times 11$
  (solve missing-factor problems)
- $35 \div 7 = \square$ $\quad \square = 63 \div 9$

  (use relevant multiplication table facts to solve division problems)

> Pupils should also be fluent in interpreting contextual multiplication and division problems, identifying the appropriate calculation and solving it using automatic recall of the relevant fact. Examples are given in **4NF–1 Example assessment questions**.
>
> As pupils become fluent with the multiplication table facts, they should also develop fluency in related calculations as described in **4NF–3** (scaling number facts by 100). Pupils should also develop fluency in multiplying and dividing by 10 and 100 (**4MD–1**).

4MD–2 Manipulating the multiplicative relationship

Manipulate multiplication and division equations, and understand and apply the commutative property of multiplication.

Pupils who are fluent in manipulating multiplicative expressions can solve the following types of problem:

- $\square \div 4 = 7$ $\quad 6 = \square \div 5$ $\quad 9 = \square \div 9$
  (apply understanding of the inverse relationship between multiplication and

$\square$ $\quad \square$

division to solve missing-dividend problems)

- $72 \div \square = 8$ $35 \div \quad = 5$ $81 \div \quad = 9$

Year 5-Calculation and fluency

Number, place value and number facts: 5NPV–2 and 5NF–2

- **5NPV–2** Recognise the place value of each digit in numbers with up to 2 decimal places, and compose and decompose numbers with up to 2 decimal places using standard and non-standard partitioning.

- **5NF–2** Apply place-value knowledge to known additive and multiplicative number facts (scaling facts by 1 tenth or 1 hundredth), for example:

$8 + 6 = 14$	$3 \times 4 = 12$
$0.8 + 0.6 = 1.4$	$0.3 \times 4 = 1.2$
$0.08 + 0.06 = 0.14$	$0.03 \times 4 = 0.12$

Representations such as place-value counters and partitioning diagrams (5NPV–2) and tens-frames with place-value counters (5NF–2) can be used initially to help pupils understand calculation strategies and make connections between known facts and related calculations. However, pupils should not rely on such representations for calculating. For the calculations in **5NF–2**, for example, pupils should instead be able to calculate by verbalising the relationship.

Addition and subtraction: extending 3AS–3

Pupils should also extend columnar addition and subtraction methods to numbers with up to 2 decimal places.

Pupils must be able to add 2 or more numbers using columnar addition, including calculations whose addends have different numbers of digits.

```
    2 7 4·1           4 7·5 2            6·3
  + 1 9 5·8       +   8 1·7              1·4 9
  ---------       -----------        + 2 5·6
    4 6 9·9         1 2 9·2 2        ---------
  ---------       -----------          3 3·3 9
    1                 1              ---------
                                       1 1
```

Figure 202: columnar addition for calculations involving numbers with up to 2 decimal places

For calculations with more than 2 addends, pupils should add the digits within a column in the most efficient order. For the third example above, efficient choices could include:

- beginning by making 10 in the tenths column
- making double-6 in the ones column

Pupils must be able to subtract one number from another using columnar subtraction, including numbers with up to 2 decimal places. They should be able to apply the columnar method to calculations presented as, for example, 21.8 – 9.29 or 58 –14.69, where the subtrahend has more decimal places than the minuend. Pupils must also be able to exchange through 0.

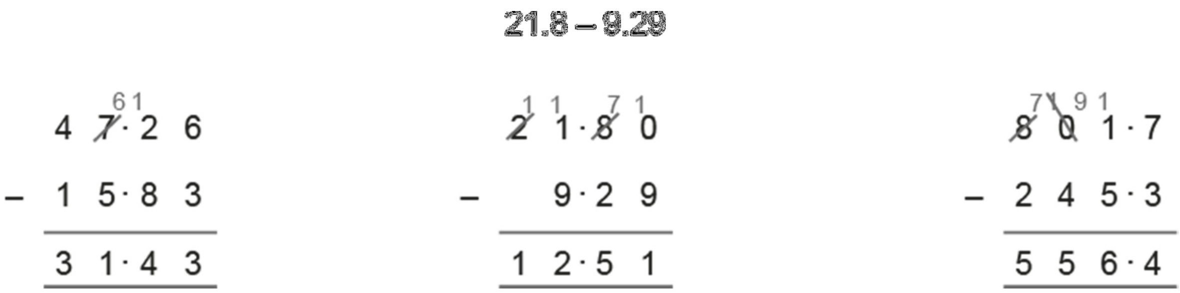


Figure 203: columnar subtraction for calculations involving numbers with up to 2 decimal places

Pupils should make sensible decisions about how and when to use columnar methods. For example, when subtracting a decimal fraction from a whole numbers, pupils may be able to use their knowledge of complements, avoiding the need to exchange through zeroes. For example, to calculate 8 – 4.85 pupils should be able to work out that the decimal complement to 5 from 4.85 is 0.15, and that the total difference is therefore 3.15.

5NF–1 Secure fluency in multiplication and division facts

Secure fluency in multiplication table facts, and corresponding division facts, through continued practice.

Pupils who have automatic recall of multiplication table facts and corresponding division facts have the best chance of mastering formal written methods. The facts up to 9× 9 are required for calculation within the 'columns' during application of formal written methods, and all mental multiplicative calculation also depends on these facts.

Pupils will need regular practice of multiplication tables and associated division facts (including calculating division facts with remainders) to maintain the fluency they achieved by the end of year 4.

Pupils should also maintain fluency in related calculations including:

- scaling known multiplicative facts by 10 or 100 (3NF–3 and 4NF–3)
- multiplying and dividing by 10 and 100 for calculations that involve whole numbers only (4MD–1)

They should develop fluency in:

- scaling multiplicative facts by one-tenth or one-hundredth (**5NF–2**)
- multiplying and dividing by 10 and 100, for calculations that bridge 1 (**5MD–1**)

5MD–3 Multiply using a formal written method

Multiply any whole number with up to 4 digits by any one-digit number using a formal written method.

Pupils must be able to multiply whole numbers with up to 4 digits by one-digit numbers using short multiplication.

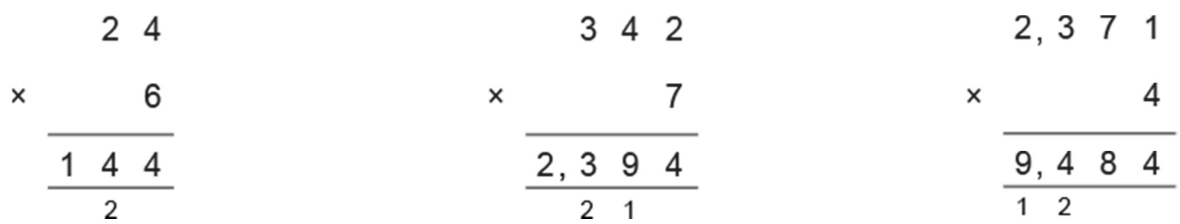


Figure 204: short multiplication for multiplication of 2-, 3- and 4-digit numbers by one-digit numbers

Pupils should be fluent in interpreting contextual problems to decide when multiplication is the appropriate operation to use, including as part of multi-step problems. Pupils should use short multiplication when appropriate to solve these calculations. Examples are given in **5MD–3**.

5MD–4 Divide using a formal written method

Divide a number with up to 4 digits by a one-digit number using a formal written method, and interpret remainders appropriately for the context.

Pupils must be able to divide numbers with up to 4 digits by one-digit numbers using short division, including calculations that involve remainders. Pupils do not need to be able to express remainders arising from short division, using proper fractions or decimal fractions.

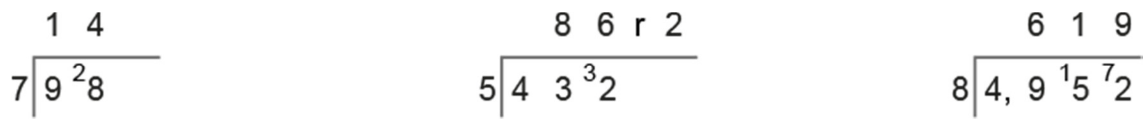


Figure 205: short division for division of 2-, 3- and 4-digit numbers by one-digit numbers

Pupils should be fluent in interpreting contextual problems to decide when division is the appropriate operation to use, including as part of multi-step problems. Pupils should use short division when appropriate to solve these calculations. For contextual problems, pupils must be able to interpret remainders appropriately as they learnt to do in year 4 (**4NF–2**). Examples are given in **5MD–4** Example assessment questions.

Year 6-Calculation and fluency

Number, place value and number facts: 6NPV–1 and 6NPV–2

- **6NPV–1** Understand the relationship between powers of 10 from 1 hundredth to 10 million, and use this to make a given number 10, 100, 1,000, 1 tenth, 1 hundredth or 1 thousandth times the size (multiply and divide by 10, 100 and 1,000).
- **6NPV–2** Recognise the place value of each digit in numbers up to 10 million, including decimal fractions, and compose and decompose numbers up to 10 million using standard and non-standard partitioning.

Pupils should develop fluency in multiplying numbers by 10, 100 and 1,000 to give products with up to 7 digits, and dividing up to 7-digit numbers by 10, 100 and 1,000.

Pupils should be able to carry out calculations based on their understanding of place-value as well as non-standard partitioning, for example:

4,000 + 30,000 + 0.2 + 5,000,000 = ☐

381,920 – 900 = ☐

518.32 + 30 = ☐

381,920 – 60,000 = ☐

Pupils should also be able to apply their place-value knowledge for larger numbers to known additive and multiplicative number facts, including scaling both factors of a multiplication calculation, for example:

8 + 6 = 14
800,000+600,000=1,400,000

3 × 4 = 12
3 × 40,000 = 120,000
300 × 400 = 120,000

Representations such as place-value counters, partitioning diagrams and Gattegno charts can be used initially to help pupils understand calculation strategies and make connections between known facts and related calculations. However, pupils should not rely on such representations for calculating.
Pupils should maintain fluency in both formal written and mental methods for calculation. Mental methods can include jottings to keep track of calculations. Pupils should select the most efficient method to calculate depending on the numbers involved.
Pupils should learn to check their calculations with a calculator so that they know how to use one. This will help pupils when they progress to key stage 3.

Addition and subtraction: formal written methods

Pupils should continue to practise adding whole numbers with up to 4 digits, and numbers with up to 2 decimal places, using columnar addition. This should include calculations with more than 2 addends, and calculations with addends that have different numbers of digits.

```
    6, 5 8 4          1, 6 4 9            4 7·5 2
+   2, 7 3 9          3, 1 0 4      +       8 1·7
    --------      +       5 1 6         ----------
    9, 3 2 3          --------          1 2 9·2 2
    1  1 1            5, 2 6 9              1
                      1    1
```

Figure 237: range of columnar addition calculations

For calculations with more than 2 addends, pupils should add the digits within a column in the most efficient order. For the second example above, efficient choices could include:

- beginning by making 10 in the ones column
- making double-6 in the hundreds column

Pupils should continue to practise using columnar subtraction for numbers with up to 4 digits, and numbers with up to 2 decimal places. This should include calculations where the minuend and subtrahend have a different numbers of digits or decimal places, and those involving exchange through 0.

```
                                          21.8 – 9.29

                         3 1 9 1          1  1   7 1
    2, 7 9 6          8, 4 0  3          2  1·8  0
–      4 8 5      –   2, 1 7  6     –       9·2  9
    --------          ---------         ----------
    2, 3 1 1          6, 2 2  7          1  2·5  1
```

Figure 238: range of columnar subtraction calculations

Pupils should make sensible decisions about how and when to use columnar methods. For example, when subtracting a decimal fraction from a whole number, pupils may be able to use their knowledge of complements, avoiding the need to exchange through zeroes. For example, to calculate 8 – 4.85 pupils should be able to work out that the decimal complement to 5 from 4.85 is 0.15, and that the total difference is therefore 3.15.

Multiplication: extending 5MD–3

In year 5, pupils learnt to multiply any whole number with up to 4 digits by any 1-digit number using short multiplication (5MD–3). They should continue to practise this in year 6. Pupils should also learn to use short multiplication to multiply decimal numbers by 1-digit numbers, and use this to solve contextual measures problems, including those involving money.

$$\begin{array}{r} 24 \\ \times \quad 6 \\ \hline 144 \\ \hline {\scriptstyle 2\,\,} \end{array} \qquad \begin{array}{r} 342 \\ \times \quad 7 \\ \hline 2{,}394 \\ \hline {\scriptstyle 2\;1\,\,} \end{array} \qquad \begin{array}{r} 5\cdot35 \\ \times \quad 4 \\ \hline 21\cdot40 \\ \hline {\scriptstyle 1\;2\;\;\,} \end{array}$$

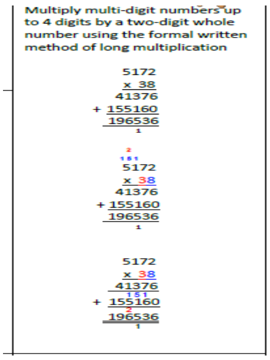
Figure 239: range of short multiplication calculations

Pupils should be able to multiply a whole number with up to 4 digits by a 2-digit whole number by applying the distributive property of multiplication (4MD–3). This results in multiplication by a multiple of 10 (which they can carry out by writing the multiple of 10 as a product of 2 factors (5MD–3) and multiplication by a one-digit number.

$$\begin{aligned} 124 \times 26 &= 124 \times 20 + 124 \times 6 \\ &= 124 \times 2 \times 10 + 124 \times 6 \\ &= 2{,}480 + 744 \\ &= 3{,}224 \end{aligned}$$

Pupils should be able to represent this using the formal written method of long multiplication, and explain the connection to the partial products resulting from application of the distributive law.

$$\begin{array}{r} {\scriptstyle 1\;\;2\;\;\;\;} \\ 124 \\ \times \quad 26 \\ \hline 744 \\ 2{,}480 \\ \hline 3{,}224 \\ \hline {\scriptstyle 1\;\;1\;\;\;\;\;\;\;} \end{array}$$



Supplementary Diagram 1

It is useful to encourage pupils to use the + symbol to add the products in long multiplication as shown in the supplementary diagram 1.

Figure 240: long multiplication calculation

Pupils should be fluent in interpreting contextual problems to decide when multiplication is the appropriate operation to use, including as part of multi-step problems. Pupils should use short or long multiplication as appropriate to solve these calculations.

Reviewed: 14.7.20

Division: extending 5MD–4

In year 5, pupils learnt to divide any whole number with up to 4 digits by a 1-digit number using short division, including with remainders (**5MD–4**). They should continue to practise this in year 6. Pupils should also learn to use short division to express remainders as a decimal fraction.

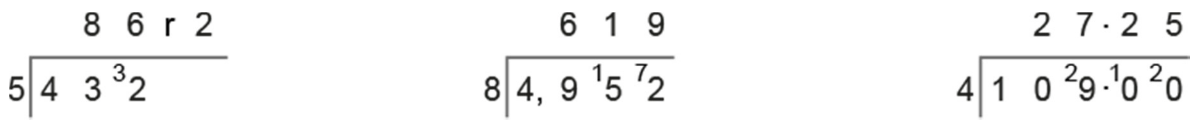


Figure 241: range of short division calculations

For contextual problems, pupils must be able to interpret remainders appropriately as they learnt to do in year 4 (**4NF–2**). This should be extended to making an appropriate decision about how to represent the remainder. Consider the question "4 friends equally share the cost of a £109 meal. How much does each of them pay?" Pupils should recognise that an answer of £27 remainder 1 is not helpful in this context, and that they need to express the answer as a decimal fraction (£27.25) to provide a sufficient answer to the question.

Pupils should also be able to divide any whole number with up to 4 digits by a 2-digit number, recording using either short or long division. Pupils are likely to need to write out multiples of the divisor to carry out these calculations and can do this efficiently using a ratio table – they can write out all multiples up to $10\times$ (working in the most efficient order) or write out multiples as needed.

	X17
1	17
2	34
3	51
4	68
5	85
6	
7	
8	136

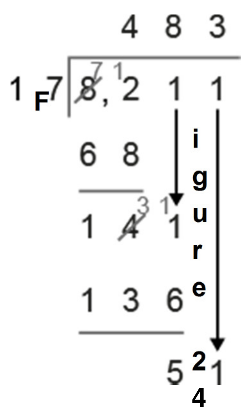


Figure 242: Long division calculation ($8{,}211 \div 17$)

Reviewed: 14.7.20

Divide numbers up to 4-digits by a two-digit whole number using the formal written method of short division where appropriate for the context

$564 \div 13$

Using known multiplication facts

1	13
2	26
4	52
5	130
8	104
10	260

$$\begin{array}{r} 4\ 3\ r\ 5 \\ 13 \overline{)\,5\ 6\ {}^{4}4} \end{array}$$

$564 \div 13 = 43 \text{ r } 5 = 43\frac{5}{13} = 43.38\ldots$

$$\begin{array}{r} 4\ 3\ .\ 3\ 8\ \ldots \\ 13 \overline{)\,5\ 6\ {}^{4}4\ .\ {}^{5}0\ {}^{11}0} \end{array}$$

Divide numbers up to 4 digits by a two-digit whole number using the formal written method of long division, and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context

$564 \div 13$

$$\begin{array}{r} 4\ 3\ .\ 3\ 8\ \ldots \\ 13 \overline{)\,5\ 6\ 4\ .\ 0\ 0\ \ldots} \\ \underline{5\ 2} \\ 4\ 4 \\ -\ \underline{3\ 9} \\ 5\ 0 \\ -\ \underline{3\ 9} \\ 1\ 1\ 0 \\ -\ \underline{1\ 0\ 4} \\ 6 \end{array}$$

$= 43 \text{ r } 5 = 43\frac{5}{13} = 43.4$ (to 1dp)

Supplementary Diagram 2

It is useful to encourage pupils to use the **minus symbol** to subtract quantities in long division as shown in the **supplementary diagram 2**

Pupils should be fluent in interpreting contextual problems to decide when division is the appropriate operation to use, including as part of multi-step problems. Pupils should use short or long division as appropriate to solve these calculations.

Pupils should learn to check their short and long division calculations with a calculator so that they know how to use one. This will help pupils when they progress to key stage 3.

Reviewed: 14.7.20