Pyrford Church of England Primary School

UKS2
Calculation Policy
2022

Number and Place Value

Year 5

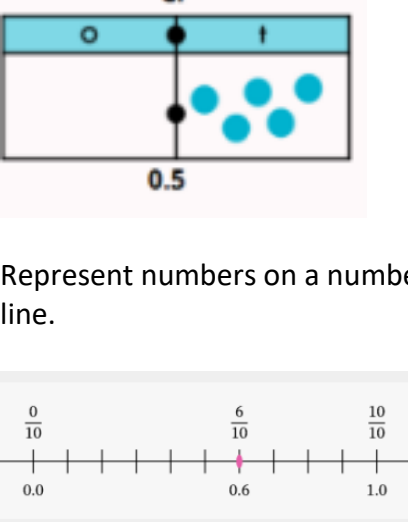| Statutory requirements |
| --- |
| Pupils should be taught to: |

- read, write, order and compare numbers to at least 1 000 000 and determine the value of each digit
- count forwards or backwards in steps of powers of 10 for any given number up to 1 000 000
- interpret negative numbers in context, count forwards and backwards with positive and negative whole numbers, including through zero
- round any number up to 1 000 000 to the nearest 10, 100, 1000, 10 000 and 100 000
- solve number problems and practical problems that involve all of the above
- read Roman numerals to 1000 (M) and recognise years written in Roman numerals.

Year 6

Statutory requirements
Pupils should be taught to:

- read, write, order and compare numbers up to 10 000 000 and determine the value of each digit
- round any whole number to a required degree of accuracy
- use negative numbers in context, and calculate intervals across zero
- solve number and practical problems that involve all of the above.

Concrete	Pictorial	Abstract
Use base 10 apparatus to represent numbers to 1,000 on a Place Value Chart to help visualise the 'size' of a number. Use place value counters to calculate and to introduce decimals.	 0.5 Represent numbers on a number line. 	

Addition and Subtraction

Year 5

Statutory requirements

Pupils should be taught to:

- add and subtract whole numbers with more than 4 digits, including using formal written methods (columnar addition and subtraction)

- add and subtract numbers mentally with increasingly large numbers

- use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy

- solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why.

Notes and guidance (non-statutory)

Pupils practise using the formal written methods of columnar addition and subtraction with increasingly large numbers to aid fluency (see Mathematics Appendix 1).

Year 6

Statutory requirements

Pupils should be taught to:

- perform mental calculations, including with mixed operations and large numbers

- use their knowledge of the order of operations to carry out calculations involving the four operations

- solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why

Addition

Concrete	Pictorial	Abstract
Consolidate understanding using numbers with more than 4 digits and extend by adding numbers with up to 3 decimal places.		

		789 + 642 becomes
		
		    7 8 9
		+ 6 4 2
		   1 1
		1 4 3 1

NB:
With columnar addition *we leave space beneath the final number in the equation to allow room to regroup ten ones for one ten so that the ten is not 'forgotten'.*

Subtraction

Concrete	Pictorial	Abstract

		Addition and subtraction
		
		789 + 642 becomes
		   7 8 9
		+ 6 4 2
		1 4 3 1
		  1 1
		Answer: 1431
		
		874 – 523 becomes
		 8 7 4
		– 5 2 3
		 3 5 1
		Answer: 351
		
		932 – 457 becomes
		^{8}9 ^{12}3 ^{1}2
		– 4 5 7
		 4 7 5
		Answer: 475
		
		932 – 457 becomes
		^{1}9 ^{1}3 2
		– 4 5 7
		 ^{5} ^{6}
		 4 7 5
		Answer: 475

NB:
With columnar subtraction, *we leave space beneath the final number in the equation as we have set this up in columnar addition.*

Multiplication and Division

Year 5

Pupils should be taught to:

- identify multiples and factors, including finding all factor pairs of a number, and common factors of two numbers

- know and use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers

- establish whether a number up to 100 is prime and recall prime numbers up to 19

- multiply numbers up to 4 digits by a one- or two-digit number using a formal written method, including long multiplication for two-digit numbers

- multiply and divide numbers mentally drawing upon known facts

- divide numbers up to 4 digits by a one-digit number using the formal written method of short division and interpret remainders appropriately for the context

- multiply and divide whole numbers and those involving decimals by 10, 100 and 1000

Notes and guidance (non-statutory)

Pupils practise and extend their use of the formal written methods of short multiplication and short division (see Mathematics Appendix 1). They apply all the multiplication tables and related division facts frequently, commit them to memory and use them confidently to make larger calculations.

Year 6

Statutory requirements

Pupils should be taught to:

- multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication

- 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

- divide numbers up to 4 digits by a two-digit number using the formal written method of short division where appropriate, interpreting remainders according to the context

- perform mental calculations, including with mixed operations and large numbers

- identify common factors, common multiples and prime numbers

- use their knowledge of the order of operations to carry out calculations involving the four operations

- solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why

- solve problems involving addition, subtraction, multiplication and division
- use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy.
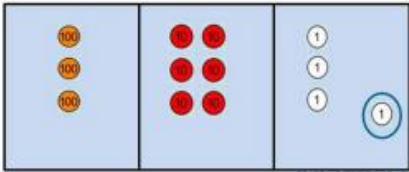
Notes and guidance (non-statutory)

Pupils practise addition, subtraction, multiplication and division for larger numbers, using the formal written methods of columnar addition and subtraction, short and long multiplication, and short and long division (see Mathematics Appendix 1).

Multiplication

Concrete	Pictorial	Abstract
Continue with number lines, place value counters or base 10 as appropriate.	Continue with grid method as appropriate.	Start with long multiplication, reminding the children about lining up their numbers clearly in columns. If it helps, children can write out what they are solving next to their answer. $\begin{array}{r} 7\ 4 \\ \times \quad 6\ 3 \\ \hline 1\ 2 \\ 2\ 1\ 0 \\ 2\ 4\ 0 \\ +\ 4\ 2\ 0\ 0 \\ \hline 4\ 6\ 6\ 2 \end{array}$ This moves to the more compact method.

Division

Concrete	Pictorial	Abstract
$364 \div 3 =$ $\begin{array}{r} 1\ 2\ 1 \text{ rem } 1 \\ 3\ \overline{\smash{)}\ 3\ 6\ 4} \end{array}$ 	Draw dots and group them to divide an amount and clearly show a remainder. 	Complete written divisions and show the remainder using r. $29 \div 8 = 3$ REMAINDER 5 dividend divisor quotient remainder Move onto divisions with a remainder. $\begin{array}{r} 8\ 6 \text{ r } 2 \\ 5\ \overline{\smash{)}\ 4\ ^3 3\ 2} \end{array}$ Once children understand remainders, begin to express as a

fraction or decimal according to the context.

```
        1  8  6 1/5
    5 | 9 ⁴3 ³1
```

```
        1  4  .  6
            16     21
    3  5 | 5  1  1  .  0
```

Children will use long division to divide numbers with up to 4 digits by 2 digit numbers.

```
         015
    32 | 487
        -0
        ──
         48
        -32
        ──
        167
       -160
        ───
          7
```

```
             17 r 19
    31 | 546
         31↓
        236
        217
        ───
         19
```

Mathematics Appendix 1: Examples of formal written methods for addition, subtraction, multiplication and division

This appendix sets out some examples of formal written methods for all four operations to illustrate the range of methods that could be taught. It is not intended to be an exhaustive list, nor is it intended to show progression in formal written methods. For example, the exact position of intermediate calculations (superscript and subscript digits) will vary depending on the method and format used.

For multiplication, some pupils may include an addition symbol when adding partial products. For division, some pupils may include a subtraction symbol when subtracting multiples of the divisor.

Addition and subtraction

789 + 642 becomes	874 − 523 becomes	932 − 457 becomes	932 − 457 becomes
| ```
  7 8 9
+ 6 4 2
-------
1 4 3 1
  1 1
``` | ```
  8 7 4
- 5 2 3
-------
  3 5 1
``` | ```
  8 12 1
  9  3  2
- 4  5  7
---------
  4  7  5
``` | ```
  1    1
  9  3  2
-  4  5  7
  5  6
---------
  4  7  5
``` |
| Answer: 1431 | Answer: 351 | Answer: 475 | Answer: 475 |

Short multiplication

24 × 6 becomes	342 × 7 becomes	2741 × 6 becomes
| ```
    2 4
  ×   6
  -----
  1 4 4
    2
``` | ```
    3 4 2
  ×     7
  -------
  2 3 9 4
    2 1
``` | ```
    2 7 4 1
  ×       6
  ---------
  1 6 4 4 6
    4 2
``` |
| Answer: 144 | Answer: 2394 | Answer: 16 446 |

Long multiplication

24 × 16 becomes

```
        2
    2   4
×   1   6
─────────
    2   4   0
    1   4   4
─────────
    3   8   4
```

Answer: 384

124 × 26 becomes

```
      1   2
    1   2   4
×       2   6
─────────────
    2   4   8   0
        7   4   4
─────────────
    3   2   2   4
        1   1
```

Answer: 3224

124 × 26 becomes

```
      1   2
    1   2   4
×       2   6
─────────────
        7   4   4
    2   4   8   0
─────────────
    3   2   2   4
        1   1
```

Answer: 3224

Short division

98 ÷ 7 becomes

```
      1   4
    ─────────
7 |  9  ²8
```

Answer: 14

432 ÷ 5 becomes

```
      8   6   r 2
    ─────────────
5 |  4   ³3   2
```

Answer: 86 remainder 2

496 ÷ 11 becomes

```
        4   5   r 1
      ───────────────
1 1 |  4   9  ⁵6
```

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

Long division

432 ÷ 15 becomes

```
              2   8   r 12
      ─────────────────
1  5 |  4   3   2
        3   0   0
      ─────────────
        1   3   2
        1   2   0
      ─────────────
            1   2
```

Answer: 28 remainder 12

432 ÷ 15 becomes

```
              2   8
      ─────────────────
1  5 |  4   3   2
        3   0   0    15×20
      ─────────────
        1   3   2
        1   2   0    15×8
      ─────────────
            1   2
```

$$\frac{12}{15} = \frac{4}{5}$$

Answer: $28\frac{4}{5}$

432 ÷ 15 becomes

```
              2   8 · 8
      ─────────────────
1  5 |  4   3   2 · 0
        3   0   ↓
      ─────────────
        1   3   2
        1   2   0   ↓
      ─────────────
            1   2   0
            1   2   0
      ─────────────
                    0
```

Answer: 28·8