Oswald Road Primary School

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Written Calculations Policy

OSWALD ROAD PRIMARY SCHOOL

At Oswald Road Primary School, we have developed a consistent approach to the teaching of written calculation methods. This will establish continuity and progression throughout the school.

It is important children become confident mathematicians using mental and written strategies to explain their thinking and solve problems. The aim at Oswald Road is that children become fluent in the fundamentals, reason mathematically to follow an enquiry and can solve problems by applying their mathematics. Children will be encouraged to use mental methods when appropriate, but for calculations that they cannot do in their heads they use an efficient written method accurately. It is essential that these skills must be based on a solid understanding of place value in number.

To ensure children are challenged and progress appropriately in their learning, there are not age limits for each stage; it is vital that teachers progress children, as soon as they are confident and ready for the next stage. This may mean that groups of children progress, even if the rest of the class is not ready to do so. This may even be within the same lesson.

Children must use and apply what they have learnt to solve a wide variety of mathematical puzzles and problems. Teachers will extend children within each method by using larger, more complex numbers and also through the use of decimals.

Addition

- The children are introduced to the vocabulary of addition in practical 'real-life' addition problems, e.g. *How many teddies altogether? How many more do we need? Etc.*
- The children then progress to use language such as more than to compare 2 numbers instead of object They then relate this to combining 2 groups of objects practically and verbally.
- Children will recognise that different numbers can make the same total (e.g. 2+3 = 5 and 1+4 = 5)
- The children begin to record combining sets and adding 'one more than' in pictorial representation. E.g. drawing and colouring sets of numbers.
- Children will have an understanding of symbols and the language associated with it:
+ means add, plus and altogether, = means equals, = sign needs work on equivalences, balances – making sets the same as each other – practical.

Stages in Addition

1. Begin formal recordings in a calculation:	3 + 2 = 5	
2. Use of number line to count up:	34 +23	Note: Always use the largest whole number first. Next, partition into Tens and Ones E.g. add 20 add 3. +10 +10 +3 0 34 44 54 57
3. Introduction to vertical layout, using partitioning:	378 + 487 300 + 70 + 8 400 + 80 + 7 _____ 700 + 150 + 15 = 865	
4. Vertical layout, expanded working, ones first: *As an additional support method (If needed)*	398 + 493 368 + 493 ____ 11 150 700 ____ 861	
5. Formal written addition: *Vertical layout, contracting the working to a compact efficient form.*	789 + 642 becomes 7 8 9 + 6 4 2 _____ 1 4 3 1 1 1 Answer: 1431	

Subtraction

- Children will play games and sing songs e.g. five little speckled frogs, ten green bottles.
- Children will have an understanding of symbols and the language associated with it
  - means minus, less than, take away.
- Children will use practical and pictorial methods to take away. E.g. I have 5 cakes. I eat 2 of them. How many are left?
- Children may use the method of counting back verbally or on a number line.

Stages in Subtraction

1.	Begin formal recordings in a calculation:	6 − 1 = 5	*As an additional support method, children will use a number line to count back.*

2. Using a number line to count back:
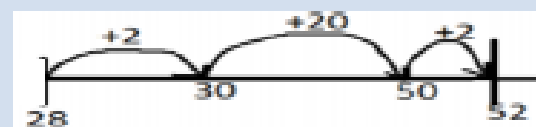
47-23=24

Partition the number; take away into tens and Ones. Next, Partition in tens using a single jump E.g. -20.

3. Using a number line to count on:

52-28=24

Note: This method is used when numbers are close together or near to multiple of 10,100.

4. Expanded Decomposition:

563 - 241

```
      500    60    3
  -   200    40    1
      ----  ----  ----
      300    20    2  = 322
```

Partition and then recombine.

5. Formal written subtraction:

932 – 457 becomes

```
    8   12   1
    9    3   2
-   4    5   7
    ----------
    4    7   5
```

Answer: 475

Note: We are not 'borrowing'. We are exchanging. E.g. I am exchanging one ten for ten **ones**.

'We can't take 7 away from 2 without it being a negative number.'

Multiplication

- Children's early experiences of multiplication will take the form of pictorial representation/visual images. This provides good opportunities to discuss the ways different numbers can be put together.
- Children to begin to use language associated with multiplication e.g. groups of, lots of.
- Children may see multiplication as repeated addition.
- Games and songs to begin to learn times tables.
- Children will count in 2's, 5's, 10's.
- Children will double numbers.

Stages in Multiplication

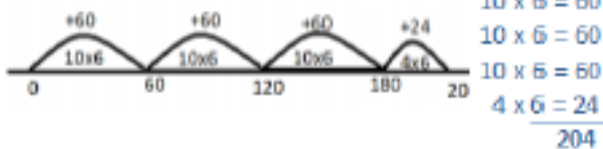**1. Begin formal recording:**

$5 \times 2 = 10$

2. Use of arrays: 3 ×6 or 6 ×3

There are 6 Three times.

"I can see 6 +6 +6"

34×6
$10 \times 6 = 60$
$10 \times 6 = 60$
$10 \times 6 = 60$
$4 \times 6 = 24$
204

3. Partitioning: 34 x 6 =

4. Grid method:

38 x 7

x	30	8	
7	210	56	266

and 56 x 27

x	50	6	
20	1000	120	1 120
7	350	42	392
			1 512

Partition the two digit number; place each part at the top. Multiply the top number by the side number.

5. Vertical format, expanded working:- *As an additional support method* (If needed)

38 × 7=

```
      38
   ×   7
      56   (8x7)
     210   (30x7)
     266
```

6. Short Multiplication: *Vertical format, compact working*

24 x 6 becomes

```
    2 4
  ×   6
  1 4 4
    2
```
Answer: 144

342 × 7 becomes

```
    3 4 2
  ×     7
  2 3 9 4
    2 1
```
Answer: 2394

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7. Long Multiplication:

a. Two digit multiplied by a two digit.

$56 \times 27 = 1512$

```
       5 6
    x  2 7
     3 9⁴2    (7x56)
  + 1 1¹2 0   (20x56)
     1 5 1 2
         1
```

Note: Use language of place value.

Digits have been 'carried' over the partial products .Eg. I will carry the four tens underneath the tens column.

Prompts in brackets can be omitted if children no longer need them.

b. Extend to three digit numbers multiplied by two digits.

$124 \times 26 = 3224$

```
      1 2 4
  X     2 6
    7¹4²4    (6x124)
  + 2 4 8 0  (20x124)
    3 2 2 4
      1 1
```

c. Extend with short and long multiplication of decimals (initially in the context of money and measures).

$53.2 \times 24=$

```
       5 3·2
   x   2 4·0
     2 1²2·8
     1 0 6 4·0
     1 2 7 6·8
```
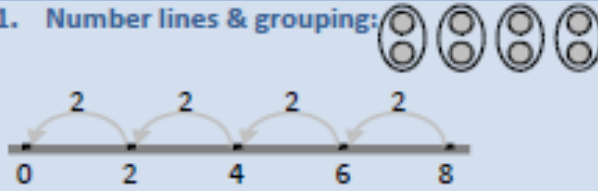
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Division

- Children will use objects and pictures to begin to share. E.g. 6 cakes put into groups of 2.
- Children will begin to use mathematical language for division e.g. share, groups of.
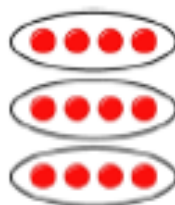- Children will halve numbers.

Stages in Division

1. Number lines & grouping:

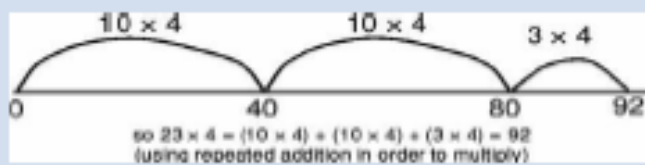How many groups of 2 can be made from the original set of 8? 8 divided by 4 = 2

2. Arrays:

Twelve divided by four equals 3

$12 \div 4 = 3$

3. Chunking using a number line:

so $23 \times 4 = (10 \times 4) + (10 \times 4) + (3 \times 4) = 92$
(using repeated addition in order to multiply)

4. Chunking:

$48 \div 4 = 12$

```
    48
-   40   (10 × 4)
     8
-    8   (2 × 4)
     0
```

$97 \div 4 = 24 \, r \, 1$

```
    97
-   80   (20 × 4)
    17
-   16   (4 × 4)
     1
```

5. Short division:

$98 \div 7$ becomes

```
      1   4
        2
  7 | 9   8
```

Answer: 14

$432 \div 5$ becomes

```
      8   6  r2
          3
  5 | 4   3   2
```

Answer: 86 remainder 2

Short Division continued:

$496 \div 11$ becomes

```
        4   5  r1
            5
  1  1 | 4  9   6
```

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

Note: How many 11s divide equally into 4?

Remainder can be given as a fraction.

6. Long Division:

a. Example setting out the result as a mixed number or a remainder:

$432 \div 15$ 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: $28 \frac{4}{5}$

Answer: 28 remainder 12

Multiples of the divisor (15) have been subtracted from the dividend (432)

20 (groups of 15) +8 (groups of 15)= 28 (groups of 15)

Remainder 12
Answer: 28 r 12

b. Example setting out the result as a decimal:

$432 \div 15$ becomes

```
          2   8 · 8
  1   5 | 4   3   2 · 0
          3   0   ↓      (15 x 2)
          1   3   2
          1   2   0      (15 x 8)
              1   2   0
              1   2   0
                      0
```

Answer: 28·8

Note: Only teach this method when the children are secure with the previous method.

The remainder (4/5) is expressed as a decimal.