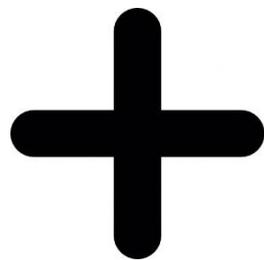# Numeracy
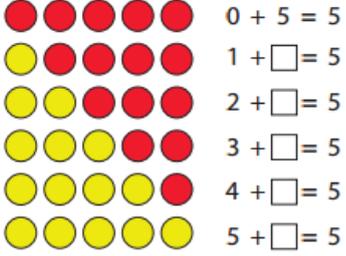
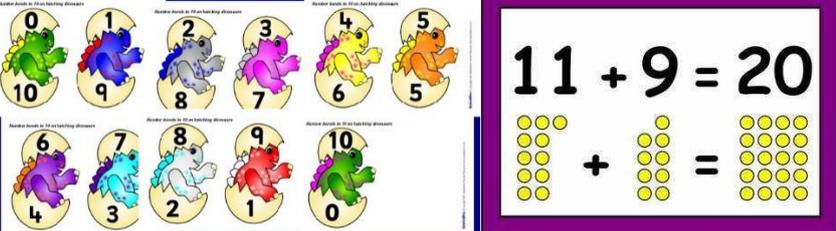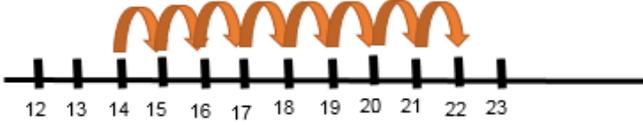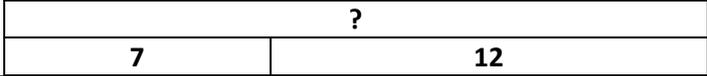# Progression in Addition including Written Calculations

+

**INTRODUCTION**

At Park we follow the New National Curriculum (September 2014) and aim to provide a systematic approach to teaching number. This document demonstrates the progression in the mathematical written methods and approaches to calculations across years 1-6. There is a considerable emphasis on teaching mental calculation strategies and up to Year 3 pupils choose an informal written method to record how they work out their answers. The Standard Written Method is introduced when the child begins to work within year 3 and has a secure understanding of place value.
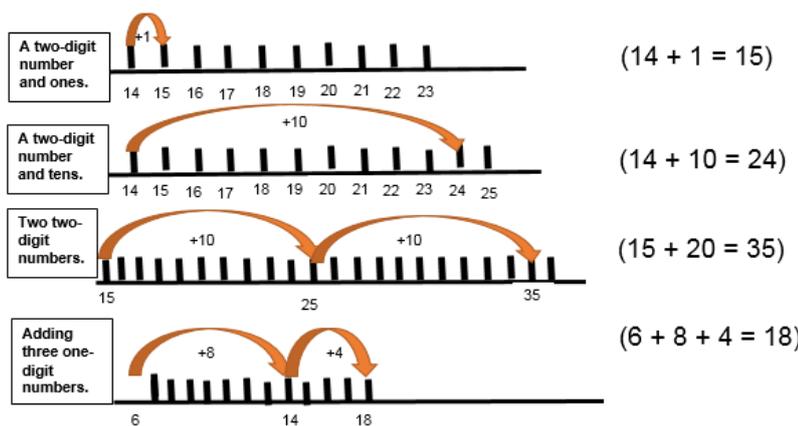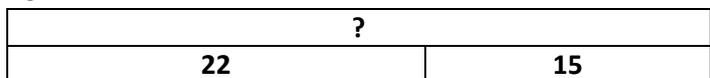
**REASONS FOR USING WRITTEN METHODS**
- To aid mental calculation by writing down some of the numbers and answers involved
- To make clear a mental procedure for the pupil
- To help communicate methods and solutions
- To provide a record of work
- To aid calculation when the problem is too difficult to be done mentally
- To develop and refine a set of rules for calculation

# Year 1

| Numeracy Objective | Example Method |
|---|---|
| Read, write and interpret mathematical symbols (+ =). | Use the pattern to complete the number sentences.<br><br>0 + 5 = 5<br>1 + □ = 5<br>2 + □ = 5<br>3 + □ = 5<br>4 + □ = 5<br>5 + □ = 5<br><br>Now do the same for rows of 6 counters, 7 counters, 8 counters, 9 counters and 10 counters. |
| Recognise and use number bonds within 20. | $11 + 9 = 20$ |
| Add one and two digit numbers to 20 including zero. | Using a number line:<br>14 + 8 = 22<br><br>12 13 14 15 16 17 18 19 20 21 22 23<br><br>Using the bar model:<br>7 + 12 = 19<br><br>| ? | |<br>| 7 | 12 | |
| Solve one-step problems using concrete objects and pictures and solve missing number problems. | I have 2 cupcakes and my friend has 3 cup cakes. How many cupcakes altogether?<br><br>(2 + 3 = 5)<br><br>Missing number problems:<br>4 + □ = 20<br><br>17 = □ + 5 |

# Year 2

| Numeracy Objective | Example Method |
|---|---|
| Show that addition of two numbers can be done in any order (commutative). | 1 + 2 = 3 and 2 + 1 = 3<br><br>6 + 14 = 20 and 14 + 6 = 20<br><br>5 + 2 + 1 = 1+ 5 + 2 = 1 + 2 + 5 |
| Recognise and use the inverse relationship between addition and subtraction to solve problems and to check answers. | 3 + 7 = 10 and 10 - 7 = 3 |
| Recall and use addition facts to 20 and relate these to addition facts to 100. | Use 3 + 7 = 10 to calculate 30 + 70 = 100<br>Use 20 = 8 = 12 to calculate 200 = 80 + 120 |
| Add numbers using concrete objects, pictures and mentally, including: numbers, quantities and measures. | **Using a number line:**<br><br>A two-digit number and ones. (14 + 1 = 15)<br><br>A two-digit number and tens. (14 + 10 = 24)<br><br>Two two-digit numbers. (15 + 20 = 35)<br><br>Adding three one-digit numbers. (6 + 8 + 4 = 18)<br><br>**Using a hundred square:**<br>Add any 2 two-digit numbers (counting over Tens boundary with Units) using a hundred square.<br><br>(18 + 14 =<br>18 + 10 + 4 =<br>28 + 2 + 2 = 32)<br><br>**Using the bar model:**<br>22 + 15 = 37<br><br>? / 22 / 15 |

**Using partitioning:**

10p  10p  10p    30p + 4p = 34p

1p  1p  1p  1p

If each peg on the coat hanger has a value of 10, find three ways to partition the pegs to make the number sentences complete.

?

□ + □ = □

□ + □ = □
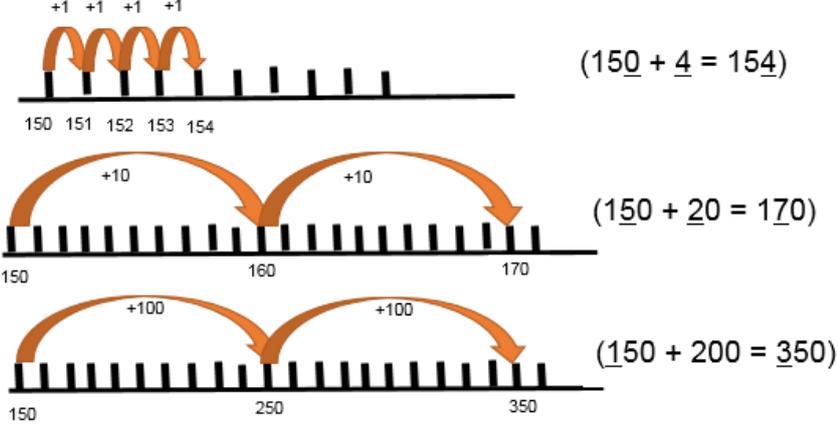
□ + □ = □

# Year 3

| Numeracy Objective | Example Method |
|---|---|
| Add mentally in Units (1's), Tens (10's) or Hundreds (100's), starting from any three digit number. | <br><br>$(150 + 4 = 154)$<br><br>$(150 + 20 = 170)$<br><br>$(150 + 200 = 350)$ |
| Add numbers with up to three digits, using formal written methods of columnar addition. | 52 + 34 =      316 + 45 =<br><br>  T U        H T U<br>  5 2         3 1 6<br>+ 3 4        + 4 5<br>  9 6         3 6 1<br>                   1 |
| Solve problems involving missing numbers, place value and number facts | Flo and Jim are answering a problem:<br>Danny has read 62 pages of the class book, Jack has read 43. How many more pages has Danny read than Jack?<br>Flo does the calculation 62 + 43. Jim does the calculation 62–43.<br>Who is correct?<br><br>Explain how you know. |

# Year 4

| Numeracy Objective | Example Method |
|---|---|
| Add numbers with up to 4 digits using the formal written method. | 4274 + 3365 =<br><br>   Th  H  T  U<br>   4   2  7  4<br>+  3   3  6  5<br>   7   6  3  9<br>      1 |
| Solve addition two-step problems in contexts, deciding which operations to use and why. | Marcus buys a hoodie and a shirt in a sale for **£22**.<br><br>How much money does he **save** compared to the normal price?<br><br>SALE<br>Any 2 items for £22<br><br>£11.75    £12.55 |
| Estimate calculations and use the inverse to check your final answers. | £32.40 + £09.98<br><br>Estimate:                    Calculation:                   Inverse:<br>30.00 + 10.00 = 40.00        £32.40                        £42.38<br>                          +  £09.98                    -  £32.40<br>                             £42.38                        £09.98<br>                             11 |

# Year 5

| Numeracy Objective | Example Method |
|---|---|
| Add whole numbers with more than four digits, including using formal written methods.<br><br>Add numbers mentally with increasingly large numbers.<br><br>Use rounding to check the accuracy of a calculation. | 13484 + 2400 =<br>13000 + 2000 = 15000<br>484 + 400 = 884<br>15000 + 884 = 15884<br><br>$$\begin{array}{r} 5\ 8\ 7\ 6\ 5 \\ +\ 2\ 9\ 6\ 4\ 8 \\ \underline{1\ 1\ 1\ 1\ \ } \\ 8\ 8\ 4\ 1\ 3 \end{array}$$<br><br>57.89 + 46.6 + 23.785<br><br>$$\begin{array}{r} 2\ 3\ .\ 7\ 8\ 5 \\ 5\ 7\ .\ 8\ 9\ 0 \\ +\ 4\ 6\ .\ 6\ 0\ 0 \\ \underline{1\ 2\ \ \ 1\ \ \ } \\ 1\ 2\ 8\ .\ 2\ 7\ 5 \end{array}$$ include 0 as placeholder where necessary |
| Solve addition multi-step problems in contexts, deciding which operations and methods to use and why. | Use this number sentence to write down three more pairs of decimal numbers that sum to 3:<br><br>1·6 + 1·4 = 3<br><br>The table shows the cost of train tickets from different cities.<br><br>What is the total cost for a return journey to York for one adult and two children?<br>How much more does it cost for two adults to make a single journey to Hull than to Leeds?<br><br><table><tr><td></td><td></td><td>York</td><td>Hull</td><td>Leeds</td></tr><tr><td>Adult</td><td>Single</td><td>£13·50</td><td>£16·60</td><td>£11·00</td></tr><tr><td></td><td>Return</td><td>£24·50</td><td>£30·00</td><td>£20·00</td></tr><tr><td>Child</td><td>Single</td><td>£9·75</td><td>£11·00</td><td>£8·00</td></tr><tr><td></td><td>Return</td><td>£15·00</td><td>£18·50</td><td>£13·50</td></tr></table><br><br>Captain Conjecture says, 'When working with whole numbers, if you add two 2-digit numbers together the answer cannot be a 4-digit number.'<br><br>Do you agree?<br>Explain your reasoning. |

# Year 6

| Numeracy Objective | Example Method |
|---|---|
| Solve addition multi-step problems in contexts, deciding which operations and methods to use and why.<br><br>Use estimation to check the accuracy of a calculation. | Can you use five of the digits 1 to 9 to make this number sentence true?<br><br>$\square\square\cdot\square + \square\cdot\square = 31{\cdot}7$<br><br>Can you find other sets of five of the digits 1 to 9 that make the sentence true?<br><br><br>$x$ and $y$ represent whole numbers.<br>Their sum is 1000.<br>$x$ is 250 more than $y$.<br><br>What are the values of $x$ and $y$?<br><br><br><br>$x$ and $y$ represent whole numbers. Their sum is 1000.<br><br>Can the difference between $x$ and $y$ be:<br>■ 100?<br>■ any whole number?<br>■ greater than $x$? |