Scotforth St. Paul’s Church of England Primary and Nursery School



Progression in Mental Calculations

A guide for Year 6 parents

This policy aims to summarise the number facts, mental calculation strategies and the stage(s) of the progression towards the written methods for each of the four operations. The strategies used within this document are taken from the Lancashire Mathematics Team Progression in Mental Calculation Strategies Policies and the Progression Towards Written Methods Policies.

**Arithmetic Expectations – Year 6**

|  |  |
| --- | --- |
| **Skills** | **Examples** |
| **Counting** | |
| **Count forwards and backwards in steps of integers, decimals and powers of 10.** | Count from 0 in steps for multiplication facts for up to 12x tables  What number would come next in this counting sequence? 0, 10, 100, 1000, \_\_, \_\_  What number is missing from this counting sequence? 0, 0.01, 0.02, 0.04, 0.05 |
| **Find 0.001, 0.01, 0.1, 1 10 and powers of 10 more/less than a given number.** | 500 +/- 0.001 =  9.46 +/- 0.01 =  What is 1000 more than \_\_\_\_?  What is 0.1 less than \_\_\_\_? |
| **Number Facts** | |
| **Recall and use addition and subtraction facts for 1 (with decimals to two decimal places)** | 1 = 0.05 + \_\_ 0.95 + \_\_ = 1 \_\_ + 0.8 = 1  0.09 + \_\_ = 1 0.23 + \_\_ = 1 \_\_ + 0.4 = 1 |
| **Multiply and divide numbers by 10, 100, 1000 giving answers up to three decimal places** | 345 x 10 = 4598 ÷ 10 = 452 ÷ \_\_ = 4.52  894 x 100 = 2098 ÷ 100 = 109 x \_\_ = 10900 |
| **Mental Calculation Strategies – Addition and Subtraction** | |
| **Partition and combine multiples of thousands hundreds, tens and ones**  *Concrete (if necessary) – place value counters Pictorial – number line* | 5800 + 2400 5800 add 2000 and 400 = 5800 add 2000 add 400  873 + 350 873 add 300 and 50 = 873 add 300 add 50  4100 - 1600 4100 take away 1000 and 600 = 4100 take away 1000 take away 600  2132 - 440 2132 take away 400 and 40 = 2132 take away 400 take away 40  5124 + 1352 5124 add 1000 and 300 and 50 and 2 = 5124 add 1000 add 300 add 50 add 2 (crossing no boundaries)  7584 - 2351 7584 take away 2000 and 300 and 50 and 1 = 7584 take away 2000 take away 300 take away 50 take away1 (crossing no boundaries) |
| **Partition and combine multiples of ones and tenths**  *Concrete (if necessary) – place value counters Pictorial – number line* | 8.4 + 3.8 8.4 add 3 and 0.8 = 8.4 add 3 add 0.8  13.2 – 4.5 13.2 take away 4 and 0.5 = 13.2 take away 4 take away 0.5 |
| **Identify and use knowledge of number bonds within a calculation and identify related facts, e.g. 680 + 430, 6.8 + 4.3, 0.68 + 0.43 can all be worked out using the related calculation 68 + 43**  *Concrete (if necessary) – place value counters Pictorial – related facts addition trios* | 0.62 + 0.38 using knowledge of 62 + 38 = 100  0.75 + 0.56 using knowledge of 75 + 56 = 131  2.8 + 0.43 using knowledge of 280 + 43 = 323  1 – 0.41 using knowledge of 100 – 41 = 59  0.92 – 0.35 using knowledge of 92 – 35 = 57  8.3 – 0.52 using knowledge of 830 – 52 = 778 |

|  |  |
| --- | --- |
| **Find differences by counting up through the next multiple of 0.1, 1, 10, 100 or 1000**  *Pictorial – number line* | 8.2 – 3.46  14.23 – 7.58 |
| **Bridge through 10 when adding or subtracting a single digit number (partitioning, e.g. 58 + 5 = 58 + 2 + 3 or 76 – 8 = 76 – 6 – 2)**  *Pictorial – number line* | 1.5 + 1.7 as 1.5 + 0.5 + 1.2  0.7 + 0.56 as 0.7 + 0.3 + 0.26  8.3 – 2.7 as 8.3 – 2.3 – 0.4 |
| **Add or subtract a multiple of 1 or 10 and adjust (for those numbers close to multiples of 1 or 10)**  *Pictorial – number line* | 5.6 + 3.9 as 5.6 + 4 – 0.1 7.5 – 4.8 as 7.5 – 5 + 0.2 |
| **Mental Calculation Strategies – Multiplication and Division** | |
| **Multiply whole numbers and decimals to three decimal places by 10, 100 and 1000** *Pictorial – place value chart* | 4562 x 1000 9.682 x 10 25.784 x 100  Th H T U t h th  4 3 7 2 1  4 3 7 2 1  Th H T U t h th  4 3 7 2 1  4 3 7 2 1 |
| **Use partitioning to double or halve any number** *Concrete (if necessary) – place value counters Pictorial – partitioning diagram* | What is double 34.7?  What is half of 456?  34.5 ÷ 2 =  409 x 2 = |
| **Identify and use all related facts that link to tables** *Pictorial – related facts multiplication trios* | 7000 x 6 becomes 7 x 1000 x 6 reordered as 7 x 6 x 1000 500 x 40 becomes 5 x 100 x 4 x 10 reordered as 5 x 4 x 100 x 10 900 x 300 becomes 9 x 100 x 3 x 100 reordered as 9 x 3 x 100 x 100 3000 x 80 becomes 3 x 1000 x 8 x 10 reordered as 3 x 8 x 1000 x 10 |
| **Use related facts to multiply 0.0t by a one-digit number** *Pictorial – related facts multiplication trios* | 0.03 x 7 related to 3 x 7 = 21 0.06 x 9 related to 6 x 9 = 54 0.05 x 4 related to 5 x 4 = 20 |
| **Use related facts to divide TU by 0.t** *Pictorial – related facts multiplication/division trios* | 56 ÷ 0.8 related to 56 ÷ 8 = 7 21 ÷ 0.7 related to 21 ÷ 7 = 3 36 ÷ 0.9 related to 36 ÷ 9 = 4 48 ÷ 0.4 related to 48 ÷ 4 = 12 |
| **Use related facts to divide 0.th by 0.t** *Pictorial – related facts multiplication/division trios* | 0.32 ÷ 0.4 related to 32 ÷ 4 = 8 0.64 ÷ 0.8 related to 64 ÷ 8 = 8 0.45 ÷ 0.9 related to 45 ÷ 9 = 5 |

|  |  |
| --- | --- |
| **Use compensation to multiply U.9 and U.99 by a one-digit number** *Pictorial – rectangle with given dimensions* | 5.9 x 4 understood as 6 x 4 – 0.1 x 4 3.99 x 7 understood as 4 x 7 – 0.01 x 7 9.99 x 6 understood as 10 x 4 – 0.01 x 6 |
| **Use partitioning to multiply 0.th by a one-digit number** *Pictorial – partitioning diagram* | 0.76 x 3 0.28 x 7 0.54 x 6 |
| **Use partitioning to double numbers including those with three decimal places** *Concrete (if necessary) – place value counters Pictorial – partitioning diagram* | Double 3.421 Double 6.705 Double 12.594 Double 54 672 Double 674 960 |
| **Divide whole numbers and decimals to three decimal places by 10, 100 and 1000** *Pictorial – place value chart* | 356.7 ÷ 100 9.83 ÷ 10 7.04 ÷ 10 860.2 ÷ 100 56 789 ÷ 1000 |
| **Use related facts to divide by 50** *Pictorial – place value chart if necessary for initial step of ÷ 100* | 4100 ÷ 50 understood as (4100 ÷ 100) x 2 7800 ÷ 50 understood as (7800 ÷ 100) x 2 530 ÷ 50 understood as (530 ÷ 100) x 2 |
| **Use related facts to divide by 25** *Pictorial – place value chart if necessary for initial step of ÷ 100* | 3200 ÷ 25 understood as (3200 ÷ 100) x 4 7600 ÷ 25 understood as (7600 ÷ 100) x 4 360 ÷ 25 understood as (360 ÷ 100) x 4 |
| **Use partitioning to divide ThHTU by a one-digit number** *Concrete (if necessary) – place value counters  Pictorial – partitioning diagram* | 5035 ÷ 5 by partitioning into 5000 and 35 (multiples of 5 totalling 5035) 1236 ÷ 4 by partitioning into 1200 and 36 (multiples of 4 totalling 1236) 9240 ÷ 6 by partitioning into 6000 and 3000 and 240 (multiples of 6 totalling 9240) |

|  |  |
| --- | --- |
| **Decision Making** | **Concrete🡺Pictorial🡺Abstract** |
| When calculating, children should ask themselves:  - do I know the answer because it is a fact I have learnt? - can I work it out easily in my head? - can I use some equipment or a jotting? - do I need to use the written method? | All new concepts are introduced using concrete apparatus eg. cubes, counters, bead strings, Diennes (hundreds, tens and ones equipment). When children are ready, we then move on to representing the concept using pictures or jottings eg. numberlines, bar models, arrays, part/whole diagrams. The final stage is using abstract forms (numbers and symbols). |