**Itchen Abbas Primary School Calculations Policy**

At all times we must ensure that we are developing understanding and not teaching an algorithm that some children will and can remember but many will forget.

* Because a child moves from one year group to another and one Key Stage to another it does not mean that they will move from one strategy to the next.
* Some children will arrive at a stage in calculation that is efficient for them. They must not be forced to move on if it is not accessible for them to do so.
* This means that as we go through the school, each successive year will arrive with many children using different strategies from different stages:
  + We must understand the progression in strategies.
  + Know our children; their ability to move forward and how to support them.
* The understanding of place value and the position of a number is vital in enabling children to develop calculation strategies.
  + Classrooms should have clearly displayed a variety of number lines, extending to negative numbers when appropriate
  + Counting sticks and number lines should be used to develop understanding of sequence and counting on and back in specific intervals.
  + In KS1 and lower KS2, children must use a number line to calculate, not a hundred square, to show that number is linear.
  + Hundred squares should be used to explore patterns in numbers.
* Mental calculations are vital in developing written strategies.
* Children should be taught to choose and use the most appropriate strategy for the calculation they are working on.
* Children should be taught concepts with concrete objectives and alongside a variety of models and images.
* Avoid simplification to the point of inaccuracy. This will only develop misconceptions and cause problems later. E.G:
  + When we divide two numbers we divide the largest by the smallest.
  + When we multiply by 10 we add a nought on the end.
* The links between the operations must always be explored.
* Adults should model the correct use of language / terms when working with the children and correct their use of language when needed, i.e. use of the word ‘sum’ or ‘when x by 10 we add a zero’.

**Addition**

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|  | Stage 0 | Stage 1 | Stage 2 | Stage 3 | Stage 4 | Stage 5 | **Stage 6** | **Stage 7** |
| + | Say number names 1-5 leading to 1-9 in a range of context e.g. rhymes and songs.  Count forwards by rote also with objects.  Find one or more from a group of 1-5.  Compare two groups of identical objects and recognise which has more.  Use a range of objects to add, including some maths resources. | Practical activities and discussion leading to pictorial representations e.g.  Begin to relate to combining two groups through practical activities.  Find one more than a number.  Use of a structured number line with object to count | Begin to use + and = signs to record calculations.  Know number bonds to 10.  Know that addition can be done in any order and show this.  e.g.  10 + 6 = 16  So  6 + 10 = 16 | Know number bonds to 20.  Use a number line to make informal jottings  **\***See below  Children starts to use Dienes blocks to add and begin to use pictures to represent these.  \*See below | Use informal pencil and paper methods (jottings)  Use partitioning to reflect mental methods  76 + 47=  70 + 40 = 1 1 0  6 + 7 = 1 3    1 2 3  \*use place value awareness to support final addition\*  Use of arrow cards, Dienes and place value charts are important at this stage to allow children to manipulate the numbers. | Introducing vertical addition   1. 3   + 4 2  5  1 2 0  1 2 5 | Use compact layout involving carrying.  3 6 8  + 4 9 1  7 5 9  1  Exchanged digits are recorded below the line and children are taught to exchange ‘ten’ or ‘one hundred’ rather than “carry one”.  Children use dienes blocks to exchange.  Decimals are explored with resources then pictorial representations. | Compact addition used for thousands, hundred, tens, ones and decimals. |
|  | \*Stage 3: Use a number line to make informal jottings  Calculations may also be supported using the number line: \*Stage 3: Adding with Dienes blocks.  42 + 35  30 5    42 72 77  427 + 358  300 50 3 5  427 727 777 780 785 | | | | | | | |

**Subtraction**

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|  | Stage 0 | Stage 1 | Stage 2 | Stage 3 | Stage 4 | Stage 5 | **Stage 6** | **Stage 7** |
| - | Say the vocabulary of subtraction for 1-5 leading to 1-9 in a range of contexts.  Count backwards.  Use subtraction in songs and rhymes. | Find one less than a number 1-10.  Begin to relate subtraction to taking objects away e.g.  Oral 3-2 = | Know by heart all subtraction facts to 5.  Begin to use the – and = sign to record practical, visual and mental calculations.  4 – 3 = 1 | Know by heart all subtraction facts to 10.  Use a number line to count on and back. | Use informal pencil and paper methods (jottings)  The use of number lines builds on the understanding of subtraction as:  Difference or complementary addition.  Taking the number away.  \*See below  Use of counting on or back to support subtraction, where appropriate.  Use of Dienes blocks, arrow cards and place value charts to represent numbers. | Record subtraction using partitioning  74 – 27  74-20 = 54  54- 7 = 47 | Expanded layout Partitioned numbers are now written under one another  84 – 58  70 14  80 + 4  - 50 + 8  20 + 6  Use of arrow cards and Dienes alongside this method are important at this stage to allow children to manipulate the numbers. \*See below | Column method (decomposition)  7 1   1. 4   - 5 8  2 6 |
|  | \*Stage 4: The use of number lines and counting on and back build on the understanding of subtraction as difference, complementary addition and taking away.  Complementary addition supports the development of place value and mental calculation where a written strategy may only confuse. EG. 1017-989 and and many practical activities such as working with money and counting on to give change. Eventually children will visualise the number lines to support simple mental calculations.  E.G.  74 − 27  +3 +40 +4  0 27 30 70 74  +3 +44      0 27 30 74  74 − 27 = 47  Check 47 + 27 = 74  This strategy is also supportive in the subtraction of decimals. \*Stage 6: using resources alongside the expanded method:  32.4 – 13.8  + 0.2 + 6 +12.4  0 13.8 14 20 32.4  32.4 – 13.8 = 18.6  Check 18.6 + 13.8 = 32.4  **Counting back.**  Use a number line to make informal jottings using multiples of 10 to help.  54 – 25 =  -5 -10 -10  29 34 44 54  **Once again it is important that children use a strategy that is efficient for them.** | | | | | | | |

**Multiplication**

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|  | Stage 0 | Stage 1 | Stage 2 | Stage 3 | Stage 4 | Stage 5 | **Stage 6** | **Stage 7** |
| X |  | Working at a practical level to gain experience of doubling and halving  Become familiar with appropriate language  Know, by heart, addition doubles to least 5  Explore repeated patterns using a range of resources. | Understand multiplication as repeated addition  Arrays – children may use these alongside objects or pictures.  3x2=6  3+3=6  2+2+2=6  Drawing pictures of objects. | Tables must be taught and strategies given to support  Use number lines to show repeated addition / multiples  +5 +5 +5 +5  0 5 10 15 20  4 x 5 = 20  Links must be stressed between multiplication and division.  \*See supplementary example | Substantial time must be given to the understanding of:   * Multiplying by multiples of 10 and the impact on a number. * Using known facts to develop new ones.   \*See supplementary examples | Record multiplication using partitioning  43 x 3 =  *40 x 3 =* 120  *3 x 3 =* 9  129  The part of the calculation in italics can be worked out mentally and just the jottings used.  Whole part model \*See below Arrow cards and Dienes are useful at this stage.  \*use place value awareness to support final addition\* | Introduction of the grid method to show expanded working out   |  |  | | --- | --- | | × | 7 | | 50 | 350 | |  |  | | 6 | 42 | |  | 392 |   This method can be extended to TU X TU, etc, or to decimals. | Introduction of compact methods.  Short multiplication  3 8  X 7    2 6 6  5  Long multiplication  5 6  X 2 7    3 9 2 (56x7)  1 1 2 0 (56x20)  1 5 1 2  1 |
| \*Stage 4: Making the links between multiplication and division allows us to see that: \*Stage 5 – Whole-part model.  If 6 x 8 = 48 Then 43 x 3 = 129  **48 ÷ 8 = 6**  **8 x 6 = 48**  **48 ÷ 6 = 8**  40 x 3 = 120 3 x 3 = 9  120 + 9 = 129    \*Stage 4:Multiplying and dividing by 10  It is also vital that the children understand that when we multiply and divide by 10, 100 etc. the numbers move to the left or right and we don’t add 0’s or move the decimal point.  45 x 10 =   |  |  |  | | --- | --- | --- | | 100’s | 10’s | 1’s | |  | 4 | 5 | | 4 | 5 | 0 | |  |  |  |   The numbers have moved one place to the left  45 ÷ 10 =   |  |  |  |  |  | | --- | --- | --- | --- | --- | | 100’s | 10’s | 1’s |  | 1/10 | |  | 4 | 5 | . |  | |  |  | 4 | . | 5 | |  |  |  |  |  |   The numbers have moved one place to the right.  An excellent activity to encourage children to use known facts to develop new ones is a spider diagram.  **56 × 27**  **Estimate: 60 × 30 = 1800**   |  |  |  |  | | --- | --- | --- | --- | | **×** | **50** | **6** |  | | **20** | **1000** | **120** | **1120** | | **7** | **350** | **42** | **392** | |  |  |  | **1512** |   **This is extended to larger numbers and decimals - 73.5 x 17 - Estimate: 70 x 20 = 1400**   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **×** | **70** | **3** | **0.5** |  | | **10** | **700** | **30** | **5** | **735** | | **7** | **490** | **21** | **3.5** | **514.5** | |  |  |  |  | **1249.5** | | | | | | | | | |

**Division**

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|  | Stage 0 | Stage 1 | Stage 2 | Stage 3 | Stage 4 | Stage 5 | **Stage 6** | **Stage 7** |
| ÷ |  | Working at a practical level to gain experience of sharing  Become familiar with appropriate language such as equally and fair. | Separate a given number of objects into equal groups and record results informally  Use pictures of everyday objects to support.   Explore remainders with odd numbers – how many are left over? | Understand division as groups, repeated subtraction or sharing and record informally  8 ÷ 2 =  Revisit arrays to explore the links between multiplication and division    4 x 2 = 8  2 x 4 = 8  8 ÷ 2 =4  8 ÷ 4 = 2  8 – 2 – 2- 2- 2 = 0  Continue to use language of groups, sharing equally, dividing – think carefully about which aspect you are using and teach them separately. | Substantial time must be given to the understanding of:  \*Multiplying by multiples of 10 and the impact on a number.  \*Using known facts to develop new ones. | Use the ÷ and = signs to record division horizontally  Repeated addition and subtraction.  25 ÷ 5 =  -5 -5 -5 -5 -5     1. 5 10 15 20 25   Continue with the use of the number line for larger numbers.\*See below  Begin to use number lines to show remainders.   Use of Dienes or others resources to support complex questions.  Use of pictures or supporting resources visually to make groups. | Using chunking to support understanding.  Continue with use of I Know box.    6 1 9 6   1. 0 (10x6)   1 3 6  1 2 0 (20x6)  1 6  1 2 (2x6)  4  196 ÷ 6 = 32 r 4  324/6  Simplify the fraction..  322/3  The use of a number line method used alongside this when introducing it, provides a powerful link. | Using short division introduced as a more compact recording method  0 3 2  6 1 ¹9 ¹6  Introduce HTU ÷ TU  0 3 2 r 6  15 4 ⁴8 ³6 |

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|  | \*Stage 5 The understanding of division begins with the number line. By making links between subtraction and division as well as multiplication and division, we can build on prior knowledge.  Stage 3: 8 ÷ 2 = 4  48 ÷ 6 = 8 Children use resources to represent this first before drawing the visual images.  How many times can I take 6 away from 48?  8 times.  How many jumps of 6 are there in 48?  8 jumps of 6  0 6 12 18 24 30 36 42 48  In later stages the the number line can also help to develop the understanding of remainders.  0 6 12 18 24 30 36 42 48  49  1/6  **49 ÷ 6 = 8 with a remainder of 1**  **or**  **81/6**  Number lines can also be used for more complex calculations, where children are working with multiples  E.G  149 ÷ 6  6 x 20 6 x 4 5/6    0 120 144  149  An ‘I Know Box’ is useful to recall facts  I know  6 x 10 = 60  6 x 20 =120  6 x 4 = 24  149 ÷ 6 = 24 remainder 5    149 ÷ 6 = 245/6 |