## 'Together we learn - United we achieve'

TOWNVILLE INFANTS' SCHOOL<br>Maths calculation policy

## Calculation Policy

This policy is a working document and will be revised and amended as necessary. It includes some examples of children's work. Some images have been copied from the NCETM PD materials.

| Year 1 - Addition |  |  |  |
| :---: | :---: | :---: | :---: |
| Objective, Strategy \& Key Vocabulary | Concrete | Pictorial | Abstract |
| Comparing Objects, groups of objects Length, weight, mass, heavier, lighter, same, equal | People's height, distance, mass. <br> Use of pan balances using numicon to show equivalence, < > <br> Comparing multiple objects <br> Use of concrete materials eg. Compare bears, jewels, cubes etc to create groups of different sizes to compare |  |  |
| Using < > and = Fewer, more, less than, more than, equal to, fewer than | Use a multilink staircase in two colours. |  | Use variation with missing boxes and missing symbols. $\begin{array}{ll} 3 \bigcirc 4 & 4>\square \\ 2 \bigcirc 2 & \square<6 \end{array}$ |
| Finding one more, finding one less |  | (less | One more/less sentences - example one: <br> 1 more than 3 is <br> 1 less than 2 is $\square$ <br> 1 more than $\square$ is 1 <br> 1 less than $\square$ is 1 |


| Year 1 - Addition |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
| Objective, Strategy \& Key Vocabulary | Concrete | Pictorial |  | Abstract |
| Adding 1 gives 1 more |  |  | 6 | $\xrightarrow[6+1=7]{+1}$ |
| Increasing an amount Augmentation | Use FIRST, THEN, NOW and range of practical situations for showing augmentation. <br> E.g. first there were three children on carpet then 2 more came. Now there are 5 children on the carpet. |  |  |  |
| Stories of numbers within 10 | Children should work with doubled sided counters and ten frame. <br> Start with 7 red, turn one over, tell me the 'story'? <br> Turn one more over. What is the 'story'? <br> Continue. <br> Complete this for stories of all numbers up to 10. |  |  | $\begin{aligned} & 7+0=7 \\ & 6+1=7 \\ & 5+2=7 \\ & 4+3=7 \\ & 3+4=7 \\ & 2+5=7 \\ & 1+6=7 \\ & 0+7=7 \end{aligned}$ |

## Year 1 - Addition

| Objective \& Strategy <br> \& Key Vocabulary | Concrete | Pictorial | Abstract |
| :---: | :---: | :---: | :---: |
| Combining two parts to make a whole: part- whole model | Use part part whole model. <br> Use cubes to add two numbers together as a group or in a bar. <br> 000000 $\square$ | Use pictures to add two numbers together as a group or in a bar. | Use the part-part whole diagram as shown below to move into the abstract. |
| Regrouping to make 10. <br> This is an essential skill for column addition later. | $6+5=11$ <br> 2 more than 5. | Start at the larger number on the number line and count on in ones or in one jump to find the answer. | If I am at seven, how many more do I need to make 10. <br> How many more do I add on now? $7+4=11$ |
| Represent \& use number bonds and related subtraction facts within 20 | Start with the bigger number and use the smaller number to make 10. <br> Use tens frames. | Use pictures or a number line. Regroup or partition the smaller number using the part part whole model to make 10. $9+5=14$ | Emphasis should be on the language <br> '1 more than 5 is equal to $6 . '$ <br> ' 2 more than 5 is $7 .{ }^{\prime}$ <br> '8 is 3 more than 5.' |


| Year 1 - Addition |  |  |  |
| :---: | :---: | :---: | :---: |
| Objective \& Strategy <br> \& Key Vocabulary | Concrete | Pictorial | Abstract |
| Combining two parts to make a whole: part- whole model | Use part part whole model. <br> Use cubes to add two numbers together as a group or in a bar. <br> 0000000 | Use pictures to add two numbers together as a group or in a bar. | Use the part-part whole diagram as shown below to move into the abstract. $4+3=7$ <br> 5 $10=6+4$ |
| Regrouping to make 10. <br> This is an essential skill for column addition later. | $6+5=11$ <br> 2 more than 5. | Start at the larger number on the number line and count on in ones or in one jump to find the answer. | If I am at seven, how many more do I need to make 10. <br> How many more do I add on now? $7+4=11$ |
| Represent \& use number bonds and related subtraction facts within 20 | Start with the bigger number and use the smaller number to make 10. <br> Use tens frames. | Use pictures or a number line. Regroup or partition the smaller number using the part part whole model to make 10. | Emphasis should be on the language <br> '1 more than 5 is equal to 6 .' <br> '2 more than 5 is $7 .{ }^{\prime}$ <br> '8 is 3 more than 5.' |

Adding 10

| Bridging/ |
| :---: |
| compensating |



| + | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 0 | $0+0$ | $0+1$ | $0+2$ | $0+3$ | $0+4$ | $0+5$ | $0+6$ | $0+7$ | $0+8$ | $0+9$ | $0+10$ |
| 1 | $1+0$ | $1+1$ | $1+2$ | $1+3$ | $1+4$ | $1+5$ | $1+6$ | $1+7$ | $1+8$ | $1+9$ | $1+10$ |
| 2 | $2+0$ | $2+1$ | $2+2$ | $2+3$ | $2+4$ | $2+5$ | $2+6$ | $2+7$ | $2+8$ | $2+9$ | $2+10$ |
| 3 | $3+0$ | $3+1$ | $3+2$ | $3+3$ | $3+4$ | $3+5$ | $3+6$ | $3+7$ | $3+8$ | $3+9$ | $3+10$ |
| 4 | $4+0$ | $4+1$ | $4+2$ | $4+3$ | $4+4$ | $4+5$ | $4+6$ | $4+7$ | $4+8$ | $4+9$ | $4+10$ |
| 5 | $5+0$ | $5+1$ | $5+2$ | $5+3$ | $5+4$ | $5+5$ | $5+6$ | $5+7$ | $5+8$ | $5+9$ | $5+10$ |
| 6 | $6+0$ | $6+1$ | $6+2$ | $6+3$ | $6+4$ | $6+5$ | $6+6$ | $6+7$ | $6+8$ | $6+9$ | $6+10$ |
| 7 | $7+0$ | $7+1$ | $7+2$ | $7+3$ | $7+4$ | $7+5$ | $7+6$ | $7+7$ | $7+8$ | $7+9$ | $7+10$ |
| 8 | $8+0$ | $8+1$ | $8+2$ | $8+3$ | $8+4$ | $8+5$ | $8+6$ | $8+7$ | $8+8$ | $8+9$ | $8+10$ |
| 9 | $9+0$ | $9+1$ | $9+2$ | $9+3$ | $9+4$ | $9+5$ | $9+6$ | $9+7$ | $9+8$ | $9+9$ | $9+10$ |
| 10 | $10+0$ | $10+1$ | $10+2$ | $10+3$ | $10+4$ | $10+5$ | $10+6$ | $10+7$ | $10+8$ | $10+9$ | $10+10$ |


| Objective \& Strategy <br> \& Key Vocabulary | Concrete | Pictorial | Abstract |
| :---: | :---: | :---: | :---: |
| Adding multiples of ten | Model using dienes and bead strings. $50=30+20$ | Use representations for base ten. $\qquad$ tens and $\qquad$ tens makes $\qquad$ tens | $\begin{aligned} & 20+30=50 \\ & 70=50+20 \\ & 40+\square=60 \\ & \square+30=50 \end{aligned}$ |
| Use known number facts <br> Part part whole | Children explore ways of making numbers within 20. | $\begin{gathered} 20=\square \\ \square+\square=20 \quad 20-\square=\square \\ \square+\square=20 \quad 20-\square=\square \end{gathered}$ | $\begin{array}{ll} \square+1=16 & 16-1=\square \\ 1+\square=16 & 16-\square=1 \end{array}$ |
| Using known facts |  | Children draw representations of $H, T$ and $O$. $\begin{aligned} \because+\therefore & =\therefore \\ \\|\\|+\\|\\| & =\\| \\|\\| \\| \\ \square+\text { 晫 } & =\\| \end{aligned}$ | $3+4=7$ <br> Leads to... $\begin{gathered} 30+40=70 \\ \text { Leads to... } \end{gathered}$ $300+400+700 \ldots$ <br> ' 3 things and 4 things is always 7 things' |
| Bar model | $3+4=7$ | $3+5=8$ | $14+16=30$30  <br> 14 16 |


| Year 2 - Addition |  |  |  |
| :---: | :---: | :---: | :---: |
| Objective \& Strategy <br> \& Key Vocabulary | Concrete | Pictorial | Abstract |
| Add a two digit number and ones | $17+5=22$ <br> Use ten frame to make 'magic ten'. <br> Children explore the pattern. $\begin{aligned} & 17+5=22 \\ & 27+5=32 \end{aligned}$ | Use part-part-whole and number line to model. $17+5=22$ <br> 20 $17$ | Explore related facts |
| Add a 2-digit number and tens | Explore that the ones digit does not change. $25+10=35$ |  | $\begin{aligned} & 27+10=37 \\ & 27+20=47 \\ & 27+\square=57 \\ & \square+30=67 \end{aligned}$ |
| Add two 2-digit numbers without bridging. <br> 'Friendly numbers' | Model using base 10, place value counters and numicon. | Use number line and bridge ten using part whole if necessary. | $\begin{gathered} 25+47 \\ 20+5 \quad 40+7 \\ 20+40=60 \\ 5+7=12 \\ 60+12=72 \end{gathered}$ |

Year 2 - Addition

| Objective \& Strategy <br> \& Key Vocabulary | Concrete | Pictorial | Abstract |
| :---: | :---: | :---: | :---: |
| Add any two 2-digit numbers | Base 10 and part-part- whole models. | $26+30+7$  | $24+38=$ $\square$ $29+$ $\square$ $=51$ $38+24=$ $\square$ $\square+22=51$ |
| Add three 1-digit numbers | Combine to make magic 10 first where relevant, or bridge 10 then add third. | Use language of first, then, then, now. <br> Pictorial: <br> Use part-part-whole to show magic ten | Combine the two numbers that make/ bridge ten then add on the third. $\begin{aligned} \frac{4+7+6}{10} & =10+7 \\ & =17 \end{aligned}$ |
| Adding two numbers that bridge 10. | Use double sided counters and ten frames. Move counters to fill the ten frame and make Magic 10 | Show on a number line how 5 is portioned into adding three, then adding 2. |  |

Year 2 - Addition

| Objective \& Strategy <br> \& Key Vocabulary | Concrete | Pictorial | Abstract |
| :---: | :---: | :---: | :---: |
| Column Addition-no regrouping (friendly numbers) <br> Add two or three 2 or 3digit numbers. | Model using Dienes or numicon. <br> Add together the ones first, then the tens. Move to using place value counters. | Children move to drawing the counters using a tens and one frame. | Add the ones first, then the tens, then the hundreds $\begin{array}{r} 248 \\ +131 \\ \hline 379 \end{array}$ |
| Column Addition with regrouping. <br> Use language of 'take and make' to describe carrying | Exchange ten ones for a ten. Model using numicon and place value counters. | Children can draw a representation of the grid to further support their understanding, carrying the ten underneath the line. | Use expanded method only when needed. <br> Start by partitioning the numbers before formal column to show the exchange $\begin{aligned} & 20+5 \\ & 40+8 \\ & 60+13 \end{aligned}=73 \begin{aligned} & 536 \\ & +85 \\ & \frac{621}{11} \end{aligned}$ |

Year 1 - Subtraction

| Objective \& Strategy <br> \& Key Vocabulary | Concrete | Pictorial | Abstract |
| :---: | :---: | :---: | :---: |
| Represent and use number bonds and related subtraction facts within 20 Part-Part-Whole model | Link to addition. Use part-part-whole model to model the inverse. <br> If 10 is the whole and 6 is one of the parts, what is the other part? $10-6=4$ | Use pictorial representations to show the part. | Move to using numbers within the part whole model. $\begin{aligned} & 12-5=7 \\ & 12-7=5 \\ & 7=12-5 \\ & 5=12-7 \end{aligned}$ |
| Subtract by making ten | Make 15 on the tens frame. <br> Take 5 away to make ten, then take 4 more away so that you have taken 9. $15-9$ $\begin{gathered} 15-9 \\ / \backslash 4 \end{gathered}$ <br> $15-5=10$ <br> $10-4=6$ <br> $15-9=6$ | Jump back 5 first, then another 4. <br> Use ten as the stopping point. | How many do we take off first to get to 10? <br> How many are left to take off?$16-9$11  <br> $?$ 6 |
| Compare numbers by finding the difference. | There are 2 more pencils than erasers. <br> There are 2 more red cars than blue cars. | Use a number line to count on.. | Erin has 12 sweets and her sister has 5. <br> How many more does Erin have than her sister? |

Year 1 - Subtraction

| Objective \& Strategy <br> \& Key Vocabulary | Concrete | Pictorial | Abstract |
| :---: | :---: | :---: | :---: |
| Counting on to next ten <br> Progression should be crossing one ten, crossing more than one ten, crossing the hundreds. | Use a bead bar or bead strings to model counting to next ten and the rest. $34-28$ <br> 28 to 30 is 2,30 to 34 is 4 . So, $34-28=6$ | Use a number line to count on to next ten and then the rest. <br> Begin with bead line, move to landmarked line then to ENL. | $\begin{gathered} 93-76=17 \\ 76 \longrightarrow 80=4 \\ 80 \longrightarrow 93=13 \\ 13+4=17 \end{gathered}$ |
| Subtractions as difference | Ben is ten years old. Charlotte is three years old. What is the difference? <br> Ben is ten years old <br> Charlotte is three years olc $\square$ <br> 10 years old <br> 3 years old |  | The difference between 24 and 16 is 8. |


| Year 2 - Subtraction |  |  |  |
| :---: | :---: | :---: | :---: |
| Objective \& Strategy <br> \& Key Vocabulary | Concrete | Pictorial | Abstract |
| Subtracting a multiple of 10 | Children use dienes, PV counters or Numicon. <br> They remove the correct number of tens. <br> $32-10=22$ | Children draw rods and cubes and cross off multiples of ten. | $64-10=$ $\square$ <br> $64-20=$ $\square$ <br> $64-30=$ $\square$ <br> $64-\square=24$ <br> $\square-50=14$ |
| Subtract a single digit from a two-digit number <br> No regrouping | Explore that $9-3=6$ so 29-3 $=26$ | $9-3=6$ <br> $19-3=16$ | $\begin{aligned} & 9-3=6 \\ & 19-6=13 \\ & 29-6=23 \mathrm{etc} \end{aligned}$ |
| Regroup a ten into ten ones | Use a place value chart to show how to change a ten into ten ones, use the term 'take and make'. | $20-4=16$ | $20-4=16$ |
| Partitioning to subtract without regrouping. 'Friendly numbers' | Use base 10 to show how to partition the number when subtracting without regrouping. $34-13=21$ | Children draw representations of Dienes and cross off. $43-21=22$ | $43-21=22$ |


| Year 1 - Multiplication |  |  |
| :---: | :---: | :---: |
| Objective \& Strategy <br> \& Key Vocabulary | Concrete | Pictorial |
| Double numbers to 10 | Use practical activities using manipulatives including cubes and Numicon to demonstrate doubling | Draw pictures and bar models to show how to double numbers <br> Double 4 is 8 |
| Counting in groups of 2 | Count in 2s using real life objects and contexts. <br>  <br>  | Children make representations to show counting in multiples of 2. Count in multiples of a number aloud. Show jumps of 2 on a number line. |
| Counting in groups of 10 | Use real life objects and contexts to count in groups of 10 | Use and draw representations for counting in multiples of 10. Count in multiples of 10 aloud <br> Show jumps of 10 on a number line. |
| Counting in groups of 5 | Use real life objects and contexts to count in groups of 5 | Use and draw representations for counting in multiples of 5. <br> Count in 5 s aloud. |


| Year 1 - Multiplication |  |  |
| :---: | :---: | :---: |
| Objective \& Strategy <br> \& Key Vocabulary | Concrete | Pictorial |
| Understand and use arrays | Use objects laid out in arrays to find the answers to 2 lots of 5, 3 lots of 2 etc. | Make and draw representations of arrays to show understanding |
| Equal/non equal groups | Use real life objects and contexts to examine equal and non-equal groups. <br> There are 3 equal groups. There are 5 in each group. | Children make/match representations of real-life problems to show equal groups and find the total. <br> There are 4 equal groups. <br> There are $\mathbf{2}$ in each group. <br> There are 8 altogether. |


| Year 1 - Multiplication |  |  |  |
| :---: | :---: | :---: | :---: |
| Objective \& Strategy <br> \& Key Vocabulary | Concrete | Pictorial | Abstract |
| Double a 2-digit number | Model doubling using dienes and PV counters | Draw pictures and representations to show how to double numbers | Partition a number and then double each part before recombining it back together. |
| Understand equal and non equal groups | These are non- equal groups <br> These are equal groups. <br> There are 5 equal groups. Each group has 3 cakes. | Make representations and drawings of equal groups <br> I have 4 groups of 3 . |  |

Year 2 - Multiplication

| Objective \& Strategy <br> \& Key Vocabulary | Concrete | Pictorial | Abstract |
| :---: | :---: | :---: | :---: |
| Use repeated addition for multiplication | Use objects and real-life contexts. <br> There are 5 groups of 2 . There are 10 socks altogether. <br> There are 3 groups of 3 . There are 9 altogether. | Make and draw representations to show repeated addition <br> There are 3 sweets in one bag. <br> How many sweets are in 5 bags altogether? <br> Use bar models for representations of repeated additions. | Create number sentences using re-peated addition to match representations. $3+3+3+3=12$ |
| Relate repeated addition to multiplication using the $x$ sign. | Write multiplication sentences to match repeated addition. $\begin{gathered} 2+2+2+2 \\ 4 \times 2 \end{gathered}$ | Children make and draw representations and record both an addition sentence and a multiplication sentence. $\begin{gathered} 1+1+1+1+1+1=6 \\ 6 \times 1=6 \end{gathered}$ | Write multiplication sentences to match repeated addition, without the support of representations. $\begin{gathered} 2+2+2+2+2=10 \\ 5 \times 2=10 \end{gathered}$ |

Year 2 - Multiplication

| Objective \& Strategy <br> \& Key Vocabulary | Concrete | Pictorial | Abstract |
| :---: | :---: | :---: | :---: |
| Understand the 2, 5 and 10 times table | Use objects and real-life contexts for multiples of 2, 5 and 10 $\begin{aligned} & 3 \times 2=6 \\ & 6=3 \times 2 \end{aligned}$ | Make and draw representations for 2, 5 and 10 times tables $4 \times 10=40$ <br> Number lines, bead strings, counting sticks and bar models should be used to show representation of counting in multiples. $5 \times 2=10$ | Understand the terms factor and product <br> Count in multiples of a number aloud. |

## Year 2 - Multiplication

| Objective \& Strategy <br> \& Key Vocabulary | Concrete | Pictorial | Abstract |
| :---: | :---: | :---: | :---: |
| Multiplication is commutative | Create arrays using counters and cubes and Numicon. <br> Pupils should understand that an array can represent different equations and that, as multiplication is commutative. The order of the multiplication does not affect the answer. | Use representations of arrays to show different calculations and explore commutativity. <br> 5 groups of 22 groups of 5 <br> 2, five times 5, two times | $\begin{aligned} & 12=3 \times 4 \\ & 12=4 \times 3 \end{aligned}$ <br> Use an array to write multiplication sentences and reinforce repeated addition. $\begin{aligned} & 5+5+5=15 \\ & 3+3+3+3+3=15 \\ & 5 \times 3=15 \\ & 3 \times 5=15 \end{aligned}$ |

Year 1 - Division

| Objective \& Strategy <br> Key Vocabulary | Concrete | Pictorial |  |
| :---: | :---: | :---: | :---: |
| Find half of numbers to 20. | Real life and practical contexts are used to find half of numbers up to 20. | Children use manipulatives to represent real life problems. | 6  <br> 3 3 <br> half of $6=3$ double $3=6$ |
| Understand division as sharing into equal groups <br> Use Gordon ITPs for modelling | Children solve real life problems using real objects. <br> There are eight sweets. Daisy and Will share these equally. How many do they get each? <br> I have 10 cubes, can you share them equally in 2 groups? <br> There are 2 equal groups. Each group has 5. | Children use pictures or shapes to sharequantities. <br> 8 shared between 2 is 4 <br> 10 shared between 2 is 5 |  |


| Year 2 - Division |  |  |  |
| :---: | :---: | :---: | :---: |
| Objective \& Strategy <br> \& Key Vocabulary | Concrete | Pictorial | Abstract |
| Division as sharing (partitive) | There are 20 conkers shared equally be- tween 5 children. <br> Each child gets 4 conkers. | Children use pictures or shapes to share quantities. They may use bar modelling to show and support understanding. <br> Number lines are used to show skip counting (counting forwards) and repeated subtraction (counting backwards). | $20 \div 5=4$ |
| Division as grouping (quotitive) | Use cubes, counters or real objects or to aid understanding. <br> There are 15 biscuits, there are 5 in each bag. How many bags? |  | 15 divided into groups of 5 is 3 . $15 \div 5=3$ |



