

HAZELDENE LOWER SCHOOL



CALCULATION POLICY WRITTEN FEBRUARY 2015

SIGNED DATE.....
HEADTEACHER

SIGNED DATE

CHAIR OF GOVERNORS

TO BE REVIEWED FEBRUARY 2017

Hazeldene Lower School Calculation Policy

Rationale

At Hazeldene Lower, we understand that children require a wide range of concrete learning opportunities to acquire mathematical understanding. Therefore, each classroom is equipped with a wide array of resources to support children's representations in mathematics.

The following are highlighted resources although this list is not exhaustive and any concrete resource could be used.

Numicon
Bead strings
Abacus
Small world toys
Multilink
Coins
Counting sticks
Beads
Play dough
Dienes Rods and cubes

Using professional judgement, teachers will decide when to facilitate the process of jottings to support mathematical thinking. The use of number lines should be used as a pedagogical tool.

At Hazeldene Lower, we believe that all calculations should have a contextual basis. Further, although a range of calculations methods are referenced, (both sequential and partitioning methods) the children should make decisions with regard to their preferred methods and opportunities should be sought to discuss the advantages and disadvantages of these.

Addition

Before children move to recording $3+1$ they will need lots of experience of practical addition, and an ability to respond to mathematical vocabulary practically. For instance, if you ask a child to show you 5 and 2 more, or 3 plus 1, or 1 add 4, they can use the teddies, counters or number tracks to do it. They will also be developing their use of mathematical vocabulary to explain what they have done.

From this it will be possible to develop an understanding of the + sign, which will enable children to begin to record in the form $5+2$.

Children then need to understand the concept of equality before using the = sign. This means they can see an example such as $7=6+1$, or $5=5$, as well as the more common arrangement $3+1=4$, and know that it makes sense.

Recording number sentences

Children will still work practically with equipment and real objects, but now can record their explanation of what they have done as a conventional number sentence:

$$3+1=4 \text{ or } 4=3+1$$

However, children will still record with drawings and number lines on a frequent basis, and whenever they are learning new concepts or starting to use a wider range of numbers they will need to return to using these easily understood and explained methods of recording.

Mental methods

Children need to develop their use of jottings to support mental calculation. These jottings may be as drawings, number lines or number sentences.

For instance partitioning may be recorded in numbers as:

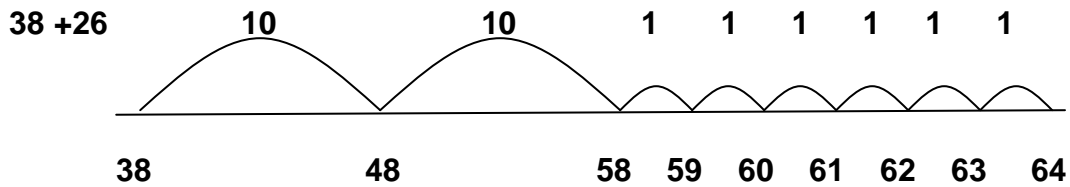
$$\begin{aligned} 36 + 45 &= 30 + 40 + 6 + 5 \\ &= 70 + 11 \\ &= 81 \end{aligned}$$

Or

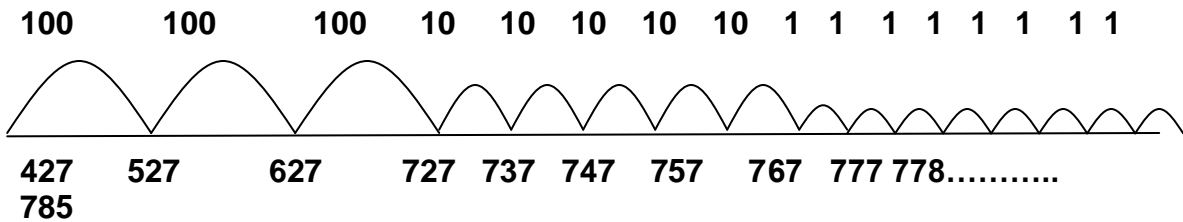
$$\begin{aligned} 36 + 45 &= 36 + 40 + 5 \\ &= 76 + 5 \\ &= 81 \end{aligned}$$

These jottings for partitioning would be used with 2-digit and some simple 3-digit calculations.

Partitioning to count on in multiples of 100, 10 or 1, is one of many examples which work well on a number line.

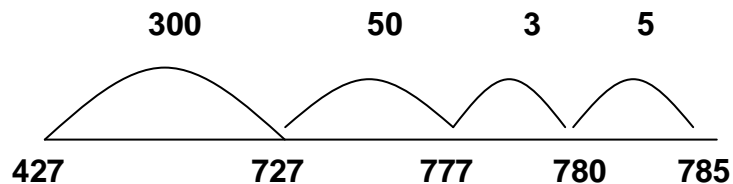


$427 + 358$



or

$427 + 358$



or

any jumps on the number line, in steps of 100, 10, 1 or multiples of these, depending on the pupil's mental strategies and ability

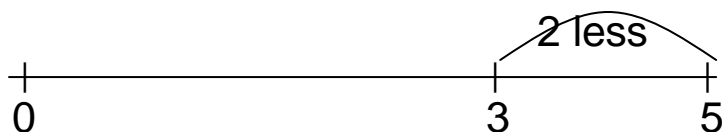
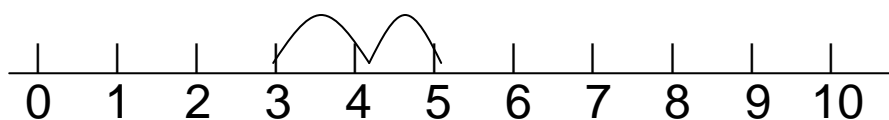
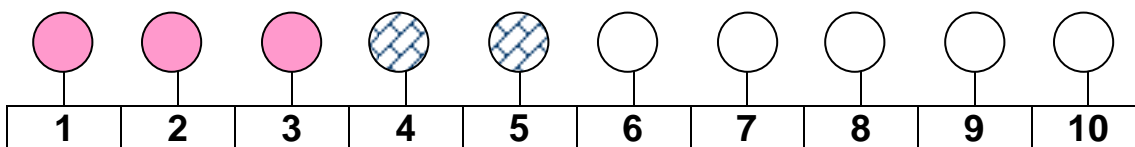
Following guidance from new curriculum (Sept '14) children towards the end of Year 2 will be introduced to column addition if they have sufficient practical understanding. This will always be modelled alongside the use of practical resources to ensure the understanding of place value is embedded. (See **appendix 1 addition** for progression)

Once children are very confident with this method of recording they may extend it to 3/4-digit numbers, providing their understanding of place value is sufficient to support this.

Subtraction

As with addition, subtraction is initially recorded as drawing the result of a practical activity, moving on to record this using numbers, on number tracks or lines or as number sentences.

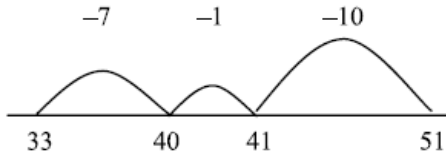
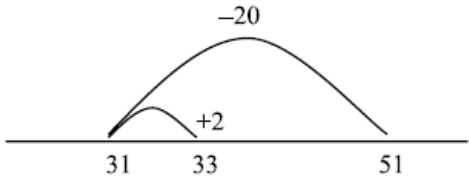
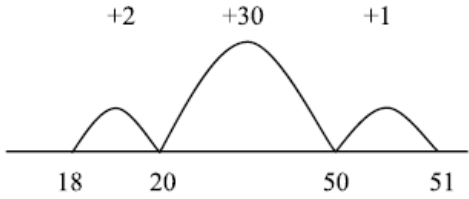
Initially number tracks or lines will be used to subtract small numbers such as $5 - 2$



When children move on to use jottings the number line will become especially important. Jottings as number sentences are less useful for subtraction as partitioning cannot generally be used.

In the example $73 - 26$ it is possible to start with $70 - 20$, but $3 - 6$ is less useful! Children need to realise that partitioning is not appropriate for subtraction.

Subtraction can be taught as count back and count on to find the difference. Examples of methods are shown below. Children may modify these methods to support their own understanding and the advantages and disadvantages of these should be discussed.

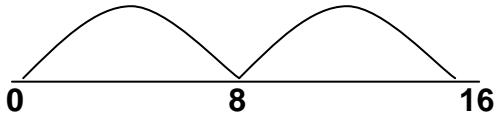
 <p>A number line starting at 33 and ending at 51. Three jumps are shown: a jump from 33 to 40 labeled -7, a jump from 40 to 41 labeled -1, and a jump from 41 to 51 labeled -10.</p>	<p>51 - 18</p> <p>Normal jump method, starting with jump of 10</p>
 <p>A number line starting at 31 and ending at 51. Two jumps are shown: a jump from 31 to 33 labeled +2, and a jump from 33 to 51 labeled -20.</p>	<p>51 - 18</p> <p>Jump further method</p>
 <p>A number line starting at 18 and ending at 51. Three jumps are shown: a jump from 18 to 20 labeled +2, a jump from 20 to 50 labeled +30, and a jump from 50 to 51 labeled +1.</p>	<p>51 - 18</p> <p>Finding the difference method</p>

Following guidance from new curriculum (Sept '14) columnar subtraction is now introduced at an earlier stage (from the end of Year 2). As with columnar addition it should be modelled alongside the use of practical resources, and should only be introduced to children when there is sufficient understanding of place value. (See **appendix 1 subtraction** for progression)

Multiplication

Concepts of multiplication begin with doubling and are extended using the array. Arrays and number lines and number sentences will be the initial methods of recording.

$$8 \times 2 = 16$$



(I count on 8 twice)

When introducing multiplication the vocabulary 'times' will be used to help children understand that it is an operation being done to a number.

E.g. 4×6

You have the number 4 and you are making it 6 times bigger, you are counting in 4 six times. This makes the link to repeated addition explicit.

Once children begin to multiply one-digit by two-digit numbers this will be by using partitioning. Children will be unlikely to have used brackets at this stage and it is best to let them record without brackets, but with a clear understanding of what they are doing, based on an understanding of arrays.

$$8 \times 23$$

$$\begin{aligned} 8 \times 23 &= 8 \times 10 + 8 \times 10 + 8 \times 3 \\ &= 80 + 80 + 24 \\ &= 184 \end{aligned}$$

This develops into the grid method.

$$8 \times 23 =$$

X	10	10	3	
8	80	80	24	=184

Leading to

X	20	3	
8	160	24	= 184

The grid method can then be used for 2-digit by 2-digit multiplication.

66 x 34 =

X	60	6	
30	1800	180	
4	240	24	
	= 2040	= 204	= 2244

Or

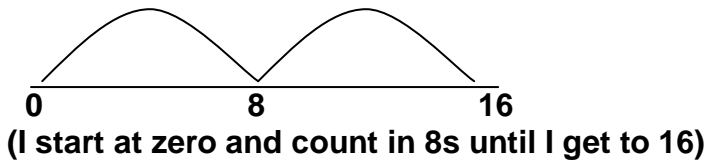
X	60	6	
30	1800	180	= 1980
4	240	24	= 264
			= 2244

In Year 4 the children will be taught to use the formal written layout (see **appendix 1 multiplication** for progression)

Division

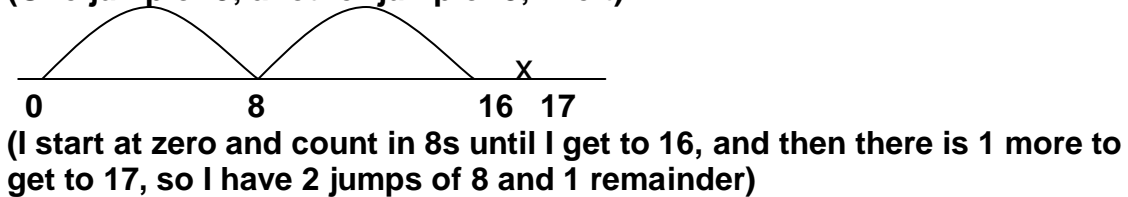
As with multiplication, division is recorded as arrays, number lines or number sentences.

***** $16 \div 8 = 2$



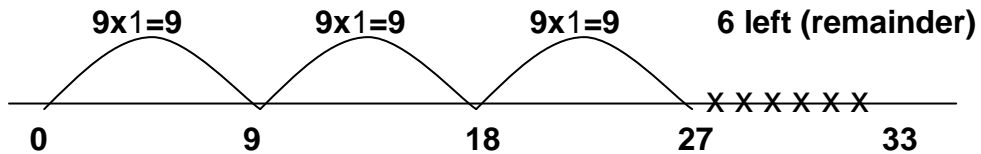
Calculations with remainders in the quotient can also be recorded on a number line.

(One jump of 8; another jump of 8; 1 left)



Number lines can also be used for more complex calculations, where the pupil is working with multiples of the divisor.

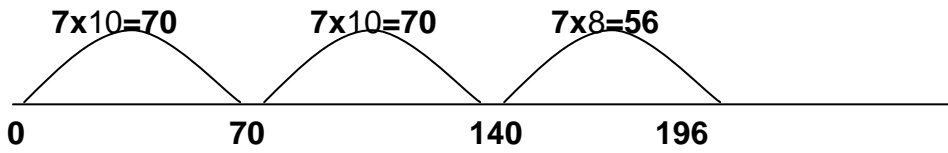
$33 \div 9 =$



so $33 \div 9 = 3 \text{ r } 6$

$$196 \div 7 =$$

Chunking



so $196 \div 7 = 28$

Place value understanding is needed to count on in multiples of the divisor.

(See **appendix 1** division for progression)