

# Hurst Green Primary School



## Mental Calculations Policy

## Purpose of study

Mathematics is a creative and highly inter-connected discipline that has been developed over centuries, providing the solution to some of history's most intriguing problems. It is essential to everyday life, critical to science, technology and engineering, and necessary for financial literacy and most forms of employment. A high-quality mathematics education therefore provides a foundation for understanding the world, the ability to reason mathematically, an appreciation of the beauty and power of mathematics, and a sense of enjoyment and curiosity about the subject.

## Aims

The national curriculum for mathematics aims to ensure that all pupils:

- become **fluent** in the fundamentals of mathematics, including through varied and frequent practice with increasingly complex problems over time, so that pupils develop conceptual understanding and the ability to recall and apply knowledge rapidly and accurately.
- **reason mathematically** by following a line of enquiry, conjecturing relationships and generalisations, and developing an argument, justification or proof using mathematical language
- can **solve problems** by applying their mathematics to a variety of routine and non-routine problems with increasing sophistication, including breaking down problems into a series of simpler steps and persevering in seeking solutions.

## (National Curriculum, 2014

[https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/335158/PRIMARY\\_national\\_curriculum\\_-\\_Mathematics\\_220714.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/335158/PRIMARY_national_curriculum_-_Mathematics_220714.pdf) )

The teaching of Mathematics within school aims to follow the three primary aims of the National Curriculum by delivering lessons which initially develop a strong sense of fluency of a particular topic before allowing children to apply those skills to reasoning and problem solving based tasks.

Without a strong understanding of Place Value and Number, a child cannot be expected to manipulate facts to explore more challenging concepts. Therefore, as a school, we place great emphasis upon these topics and continually revisit them throughout the child's learning journey at Hurst Green.

The fluent recall of Times Table facts is key to success within Maths. Throughout Years 2,3 and 4, children will be explicitly taught their times table facts for these particular tables whilst gradually being introduced to problems which these can be applied to. Throughout Years 5 and 6, Times Tables aren't explicitly taught (as per curriculum guidelines) but rather it is expected that children have a sufficient fluency with them so as to apply their knowledge to more demanding topics i.e. Fractions, Decimals and Percentages.

As such is the importance of Times Table recall and understanding, the Government have introduced the MTC (Multiplication Tables Check) - a statutory, online test, assessing children's recall of tables up to  $12 \times 12$ . The test is mandatory for all pupils in Year 4 beginning in 2020. Results from the test will not be published in league tables, but rather be used by teachers and senior leaders to implement support for the children who are not yet fluent with the times table facts that will ensure their mathematical success in Years 5 and 6.

### Why do we need this policy?

- To ensure consistency in methods taught throughout the school.
- To develop progression from informal / practical methods of recording to written methods for each of the four operations.
- To provide an aid to help parents understanding of how the four operations are taught at Hurst Green.

## Things to remember

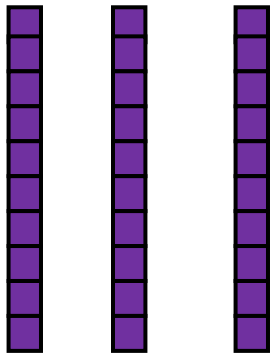
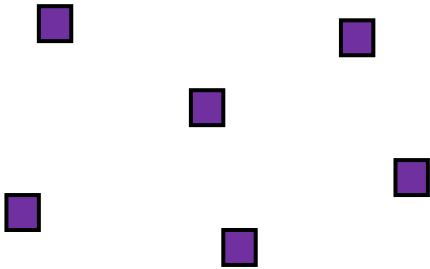
- Children need to know number and multiplication facts by heart.
- Practical equipment should be used (where appropriate) when introducing or reviewing a concept.
- Make sure that all mathematical vocabulary for all topics is introduced and recapped throughout the year, e.g. subtraction is also known as take away, counting back and difference. This understanding will be especially useful for **reasoning** and **problem solving** based activities.
- Children who make persistent mistakes should return to the method that they can use accurately until ready to move on.
- When revising or extending to harder numbers, refer back to expanded methods. This helps reinforce understanding and reminds children that they have an alternative to fall back on if they are having difficulties.
- Children should be introduced to calculators from Foundation stage, developing skills to use them effectively in Years 4 to 6.
- Always decide first whether a mental method is appropriate/more efficient than a written method.
- Always check the answer, preferably using a different method e.g. the inverse operation.
- Children should be encouraged to estimate their answers before calculating them.

## Addition

### Partitioning:

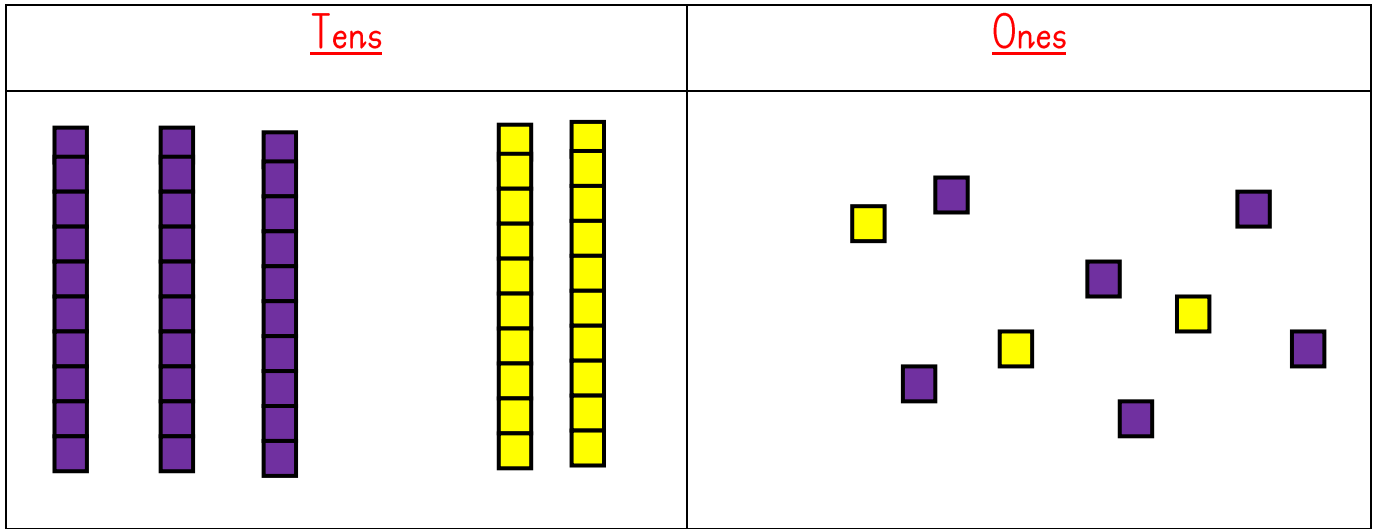
Once the children are secure in using a number line and number square to total two numbers within 100, they should then progress to partitioning before exploring the column method.

a) Practically introduce partitioning of numbers into tens and ones, using a 'tens and ones' sheet. Diennes squares are excellent for this.

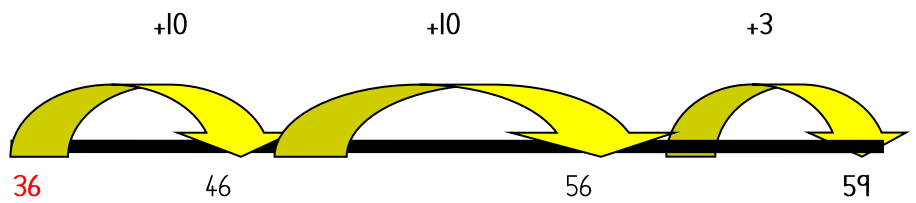
<u>Tens</u>	<u>Ones</u>
	

b) Practically add two 2 digit numbers within 100 using the grid.

$$36 + 23 = 59$$

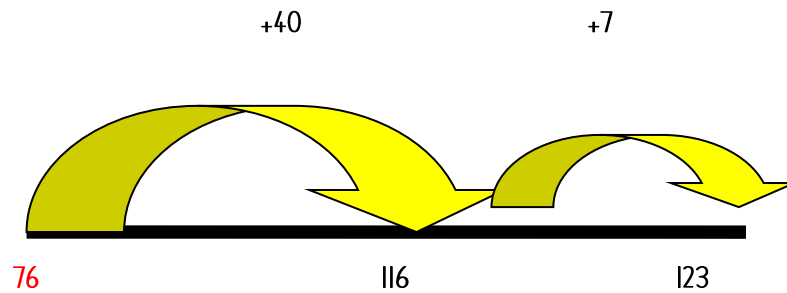


\*Alongside this, count on in tens on the number line.

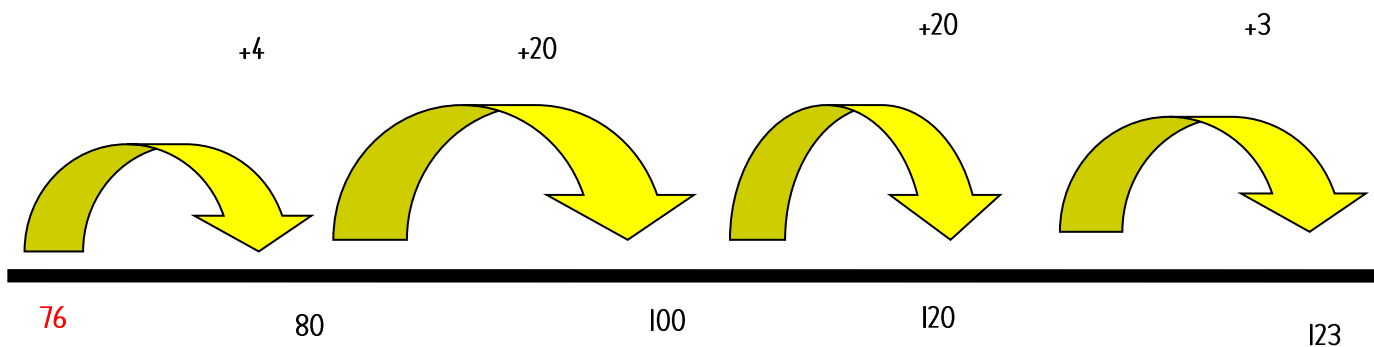


c) Progress onto counting in multiples of 10.

$$76 + 47 =$$



d) Counting on to the nearest multiple of ten/hundred using a number line.



These are examples of jumps that could be made. However, children should be allowed to choose jumps that they themselves feel comfortable with.

### Partitioning (Written Method):

a)

$$\begin{aligned} 76 + 47 &= \\ 70 + 40 &= 110 \\ 6 + 7 &= 13 \\ 110 + 13 &= 123 \end{aligned}$$

- b) Progress onto the extended column method before introducing the compact column method  
(see written calculations policy).

$$\begin{array}{r} 47 \\ + 76 \\ \hline \end{array} \quad \begin{array}{l} \longrightarrow \\ \longrightarrow \end{array} \quad \begin{array}{r} 40 + 7 \\ 70 + 6 \\ \hline 110 + 13 = 123 \end{array}$$

This method will help to secure the children's understanding of partitioning, whilst also providing the framework for developing this method further.

## Compensating

Round a number up or down to the nearest 10 to perform calculations more quickly, and then subtract or add the additional ones.

### Compensating involving addition:

$$23 + 19 =$$

$$23 + 20 = 43 \text{ (added an extra one)}$$

$$43 - 1 = 42$$

### Compensating involving subtraction:

$$24 + 22 =$$

$$24 + 20 = 44 \text{ (subtracted 2)}$$

$$44 + 2 = 46$$

### Using near doubles:

Children can also adapt the compensation method to total near doubles using their known number facts.

$$16 + 15 = \quad 15 + 15 = 30 \quad 30 + 1 = 31$$

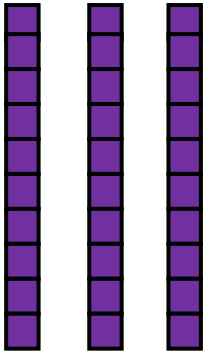
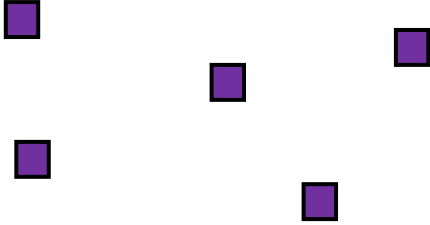


## Subtraction

### Partitioning

Once the children are secure in using a number line and number square to total two numbers within 100, they should then progress to partitioning before exploring the column method.

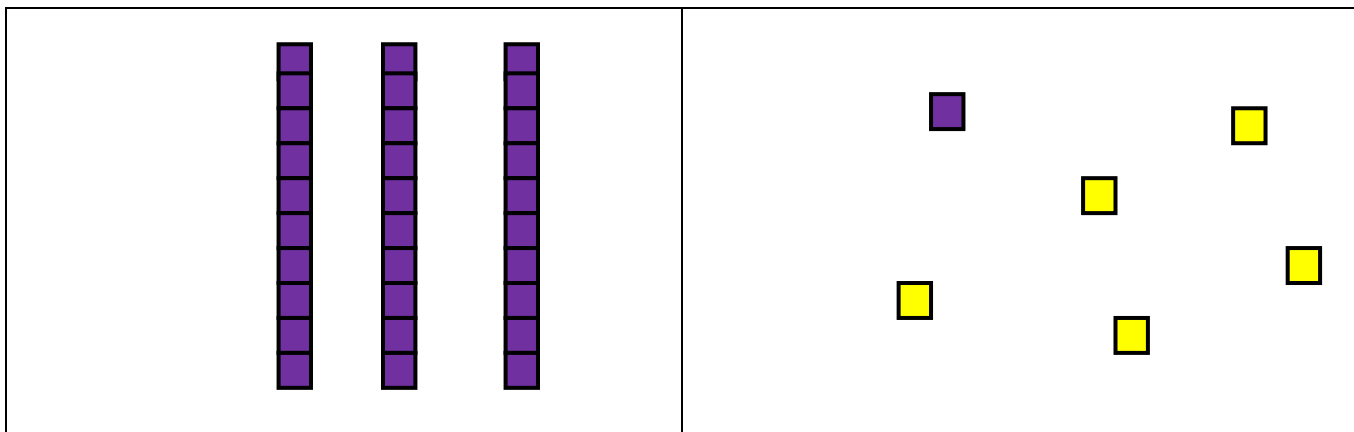
a) Practically introduce partitioning of numbers into tens and ones using a 'tens and ones' sheet. Diennes squares are excellent for this.

<u>Tens</u>	<u>Ones</u>
	

b) Use the same grid to practically subtract a 1 digit number from a 2 digit number.

$$36 - 5 = 31$$

<u>Tens</u>	<u>Ones</u>
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c) Practically subtract two 2 digit numbers within 100 using the grid.

### Partitioning (Written Method):

a)  $29 - 13 =$

$$20 - 10 = 10$$

$$9 - 3 = 6$$

$$10 + 6 = 16$$

$$29 - 13 = 16$$

b) Progress onto the extended column method before introducing the compact column method (see written calculations policy).

$$\begin{array}{r}
 47 \\
 - 13 \\
 \hline
 \end{array}
 \begin{array}{l}
 \longrightarrow 40 + 7 \\
 \longrightarrow 10 + 3 \\
 \hline
 30 + 4 = 34
 \end{array}$$

This method will help to secure the children's understanding of partitioning, whilst also providing the framework for developing this method further.

**DO NOT INTRODUCE EXCHANGE AT THIS POINT.** See written calculations policy for this.

## Compensating

Round a number up or down to the nearest 10 to perform calculations more quickly, and then subtract or add the additional ones.

### Compensating involving addition:

$$23 - 19 =$$

$$23 - 20 = 3 \text{ (added 1)}$$

$$3 + 1 = 4$$

### Compensating involving subtraction:

$$24 - 22 =$$

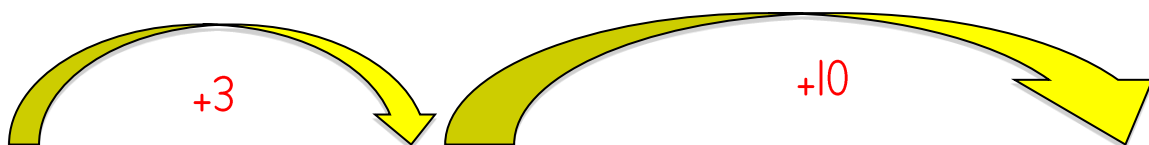
$$24 - 20 = 4 \text{ (subtracted 2)}$$

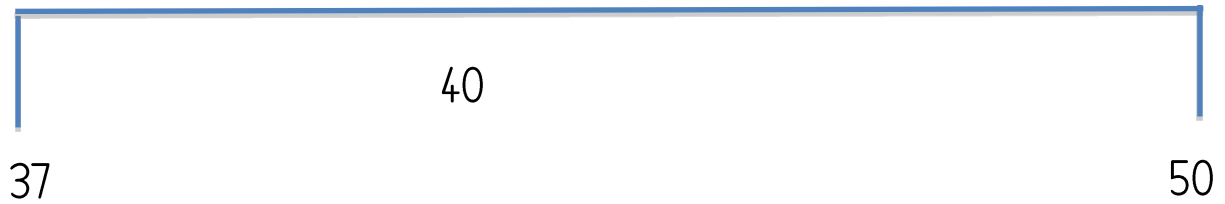
$$4 - 2 = 2$$

## Counting on

This can be taught using either a blank number line or jottings, though it is best to introduce using a blank number line to begin with so as the children can see the link between counting on and subtraction.

$$50 - 37 = 13$$





Using jottings:  $37 + 3 = 40$   
 $40 + 10 = 50$   
 $10 + 3 = 1$

### Multiplication and Division

Being able to recall times table facts up to  $12 \times 12$ , in addition to understanding the link between multiplication and division, is a core feature of the National Curriculum.

The rapid recall of both multiplication and division facts is a skill which will be explicitly taught in the following order:

- Year 2 – teaching of the 2,5 and 10 times tables
- Year 3 – teaching of the 3,4 and 8 times tables.
- Year 4 – teaching of the 6,7,9,11 and 12 times tables

Children in these year groups will develop their rapid recall through regular practice both within and outside of lessons. This will be in conjunction with any practice they undertake at home, both with parents and individually (by accessing programs such as TT rockstars).

It is also vital that children are able to understand the link between multiplication and division as **inverse operations**. This will allow them to manipulate numbers with greater efficiency and accuracy, whilst also being able to confidently check answers to calculations.

### Partitioning to multiply

This should be taught in conjunction with the grid method (see written calculations policy) so that the children understand how to use it as an informal written method. Use this

method for a two digit number multiplied by a single digit number:

$$\begin{array}{ccc} & 38 \times 2 & \\ \swarrow & & \searrow \\ 30 \times 2 = 60 & & 8 \times 2 = 16 \end{array}$$

Division will be taught as mental  $60 + 16 = 72$  recall for facts up to  $12 \times 12$ . It will be initially be taught practically so that children understand the concept of division as sharing and grouping.

When the division calculations become more demanding and exceed the required knowledge of  $12 \times 12$ , it will be introduced as a written method (see Written Calculations policy).