Castle Hills Primary Academy
Calculations Policy

At Castle Hills Primary Academy, we want pupils to learn by exploring, questioning, trial and error, spotting patterns, generalising and solve problems in maths. Our mathematics curriculum is designed to be accessible to all in order that we can maximise the development of pupils's understanding, ability and achievement.

We deliver lessons that are creative, engaging and use real life contexts, to help pupils to develop skills they can use in their everyday lives. We want pupils to make rich connections across mathematical ideas to develop fluency, mathematical reasoning and competence in solving increasingly sophisticated problems. Our aim is for our pupils to apply their mathematical skills across the curriculum and we want them to understand that Mathematics is essential for everyday life and necessary for most forms of employment. We teach Maths using a Mastery approach where problem solving is at the heart. The focus is not on rote learning but on relational understanding. Pupils are encouraged to think mathematically and are introduced to new concepts using Concrete, Pictorial and Abstract resources. It gives Maths meaning. It makes Maths more fun.

Aims

Our aim is to provide pupils with a carefully planned, progressive curriculum and high quality teaching which ensures individuals are numerate, creative, independent, inquisitive, enquiring and confident. We also aim to provide a stimulating environment and appropriately resourced so that pupils can develop their mathematical skills to the full and apply mastery. Pupils will:

- Have a well-developed sense of the size of a number and where it fits into the number system.
- Know number facts such as number bonds, multiplication tables, doubles and halves
- Calculate accurately and efficiently, both mentally and written for each operation.
- Draw upon a range of calculation strategies.
- Use a range of informal jottings and diagrams to record their work.
- Explain their methods and reasoning, using correct mathematical terms.

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- Give reasons for their answers and have strategies for checking them where necessary.
- Suggest suitable units for measuring and make sensible estimates of measurements.
- Explain and make predictions from the numbers on graphs, diagrams, charts and tables. Draw their own graphs, diagrams, charts and tables accurately.
- Develop spatial awareness and an understanding of the properties of 2D and 3D shapes

Objectives

To ensure pupils are provided with opportunities to meet their potential in mathematics. We will support the pupils in the following ways:

- Providing engaging, flexible and differentiated teaching that meets the needs of all learners.
- We will ensure consistency across the Academy in our approach to teaching calculations from foundation stage to key stage two.
- The teaching of calculations will show progression between year groups.
- Inclusive practice to allow access to the maths curriculum for all pupils at an appropriate level.
- Provision of a varied range of quality maths activities to allow pupils to work practically, orally and mentally in all four operations.
- Opportunities to work both independently, collaboratively and in guided sessions.
- Ongoing teacher assessment, assessment through split mathematics sessions and same day interventions.
- Providing plenty of opportunity for pupils to deepen their knowledge of mathematics through mastery.
- Next steps to deepen understanding
- GAP Tasks that will ensure that lesson time is not wasted and that pupils are consolidating learning.

Provision

Provision

Pupils are provided with a variety of opportunities to develop and extend their mathematics skills; group work, paired work, whole class teaching and individual teaching through same day intervention.

Pupils will engage in:

- The development of mental strategies
- Written methods
- Practical work
- Investigational work
- Problem solving
- Mathematical discussion
- Consolidation of basic skills and number facts

We recognise the importance of establishing a secure foundation in mental calculation and the fluent recall of number facts before standard written methods are introduced. We also understand the importance of ensuring that pupils know how to look for patterns, make

connections and contextualise the mathematics. We use accurate mathematical vocabulary in our teaching and pupils are expected to use it in their verbal and written explanations. At Castle Hills Primary Academy, we understand the importance of using questioning to develop mathematics and we hold a communication friendly award (ELKLAN) linked to BLANKs level questioning. This is used in each class, from Nursery up Year Six.

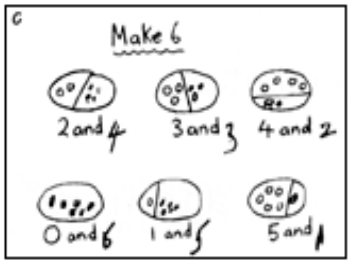
Mathematics contributes to many other subjects across the curriculum, therefore it is important that the pupils are given opportunities to apply and use mathematics in real contexts.

We endeavour at all times to set work that is challenging, motivating and encourages the pupils to think about how they learn and to talk about what they have been learning. Additional enrichment opportunities are provided for pupils to further develop mathematical thinking, for example- 'Zero the Hero' days, 'Magic Mastery' days and 'Maths at the Movies'. Teachers plan mastery problem solving and investigational activities as part of their everyday planning to ensure that pupils develop the skills of mathematical thinking and enquiry.

Addition

Foundation Stage:
Concrete experiences using a range of apparatus. Drawings of actual apparatus. Drawing representations e.g. ||| || Finding one more using: • Actual objects • Beginning of a number line • Knowledge of number system • 2-3 more, number in head and count on 
Key stage 1:

Counting on using fingers and apparatus



Combining groups:
e.g.

ºººº + ºº = 6

Counting on mentally
e.g. 3 in your head and count on 2, biggest number first

Use of number lines to count on in steps of one.

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Building on strategies and mental methods used in Y1

Part-part whole method and bar modelling.

Use of number lines and hundred squares
Informal jottings

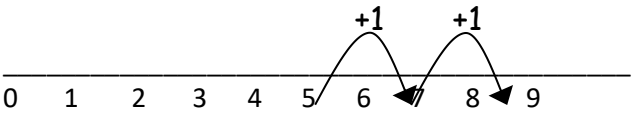
e.g. 12 + 11 = 23

Empty number line, counting on in steps of 10, 1 etc.
Partitioning using informal jottings
e.g.

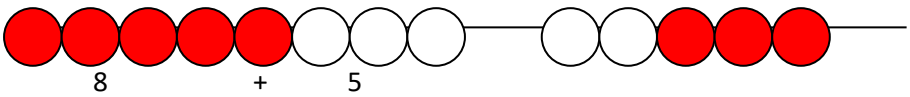
12 + 11 =
10 + 10 =20
2 + 1 = 3
20 + 3 = 23

They use number lines and practical resources to support calculation.

3 + 2 = 5

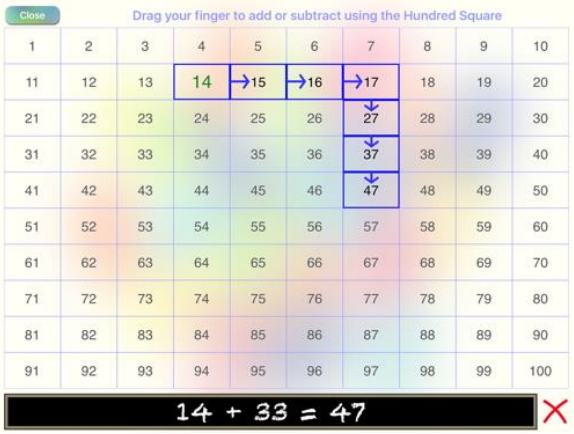


Bead strings or bead bars can be used to illustrate addition including bridging through ten by counting on 2 then counting on 3.



When the pupils are ready and have a good knowledge of place value then introduce column addition without regrouping and then column addition by regrouping.

Addition by using a hundred square. Counting on each individual square then moving on to counting down to add the tens and across for the units.



Column addition (columnar) with exchanging.

Key Stage 2:

Continuation of empty number line and expanded column method as informal methods of calculation. Numbers will become increasingly bigger and calculations more complex.

Formal column method:

Pupils should be secure in knowledge of place value before moving onto this method

Without regrouping moving onto regrouping from units to tens.
(cross out and regroup to ensure they are added on)

Addition in context of £ and pence

e.g. £5.50

e.g.
$$\begin{array}{r} 47 \\ +\ 76 \\ \hline 123 \\ \hline 11 \end{array}$$

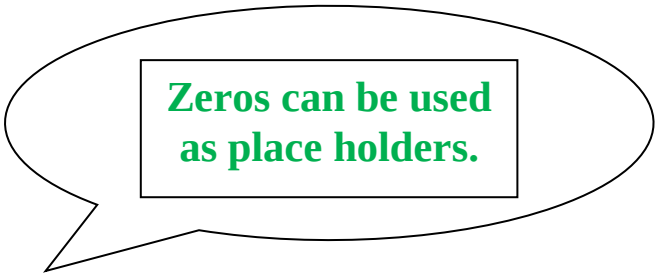
e.g. To find a missing number in a calculation.

73 + ? = 98

Continuation of column addition with regrouping.
(cross out and regroup to ensure they are added on)

Extending to decimals to two decimal places.

23.361
9.080
59.770
1.300
2 1 2
_____
93.511



When writing column addition number sentences pupils must write the number sentence above the written method, so when decomposition is involved the original calculation is clear.

Subtraction

Foundation Stage:

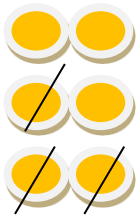
Concrete experiences using a range of apparatus.
Drawings of actual apparatus.
Drawing representations
Finding one less using:

- Actual objects (physically moving objects away)
- Beginning of a number line (cardinal)
- Knowledge of number system
- 2-3 less, number in head and count back

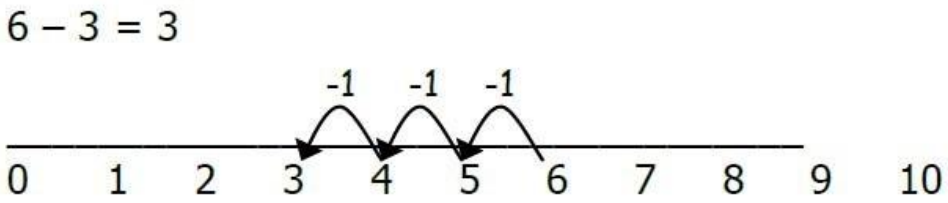
Key Stage 1:

Subtraction meaning take away and difference.
Practical subtraction using objects

Draw pictures and cross to take away to give the left total.
6 – 3 = 5



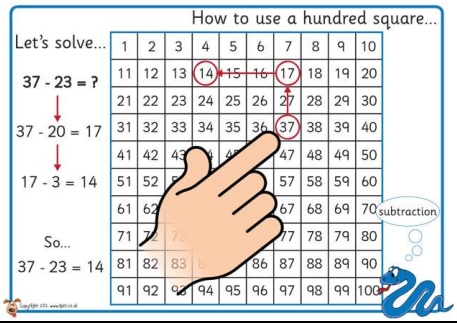
Number in head and count back



Use of a number line to count back (take away/subtract)

Extending to putting smallest number in your head and count on (difference)

Subtract by using a hundred square. Counting back each individual square then moving on to counting up for the tens and across for the units.



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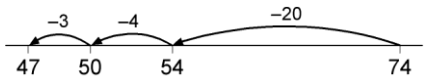
When the pupils are ready and have a good knowledge of place value then introduce column subtraction without regrouping and then column subtraction by regrouping.

Key Stage 2:

In Key Stage 2 we continue to reinforce the column subtraction method as well as counting on as a strategy for close together numbers and also for numbers that are 'nearly' multiples of 10, 100, 1000.

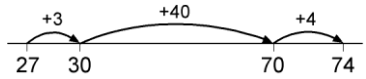
Use of empty number line to count back

e.g.



Use of empty number line to count up

e.g.



Then introduce partitioning (expanded column method)

Start with examples where no partitioning is needed.

Work towards partitioning then **exchanging**.

(if the addition signs confuse the pupils a gap could be left between numbers or the pupils could write 'and')

e.g.

$$\begin{array}{r} 70+4 \\ -\ 20+7 \\ \hline \end{array} \qquad \begin{array}{r} {}^{60}\cancel{70}+{}^{14}\cancel{4} \\ -\ 20+7 \\ \hline 40+7 \end{array} \qquad \begin{array}{r} {}^{6}\cancel{7}\ {}^{14}\cancel{4} \\ -\ 2\ 7 \\ \hline 4\ 7 \end{array}$$

Use of decimal examples e.g. £ . P

When writing column subtraction number sentences pupils must write the number sentence above the written method, so when decomposition is involved the original calculation is clear. Use the terminology 'swop' when decomposition is involved. DO NOT say 'you can't do it' as this will create misconceptions later on.

Partitioning (expanded column method)

Subtraction using three digit numbers with partitioning and exchanging.

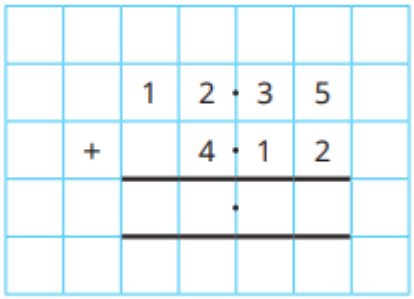
e.g.

$$\begin{array}{r} 700+40+1 \\ -\ 300+60+7 \\ \hline \end{array}$$

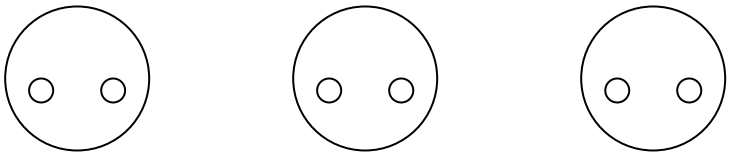
$$\begin{array}{r} \overset{600}{\cancel{700}}+\overset{130}{\cancel{40}}+\overset{11}{\cancel{1}} \\ -\ 300+60+7 \\ \hline 300+70+4 \end{array}$$

$$\begin{array}{r} \overset{6}{\cancel{7}}\ \overset{13}{\cancel{4}}\ \overset{11}{\cancel{1}} \\ -\ 3\ 6\ 7 \\ \hline 3\ 7\ 4 \end{array}$$

Pupils will learn how to subtract 4 and 5 digit numbers including money, measures and decimals.



Multiplication

Foundation Stage:
Count repeated groups of the same size
Year 1:
Develop counting of repeated groups as Foundation Stage. Doubles as start of multiplying by 2, doubles to 10.
Year 2:
Doubling (x2) to 20. Repeated addition done visually using groups.   

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e.g. 3 groups of 2

2 + 2 + 2 = 6

Arrays

5 + 5 + 5 = 15
3 +3 +3 +3 + 3 = 15
3 x 5 = 15
5 x 3 = 15

Year 3:

Repeated addition and arrays continued from Y2

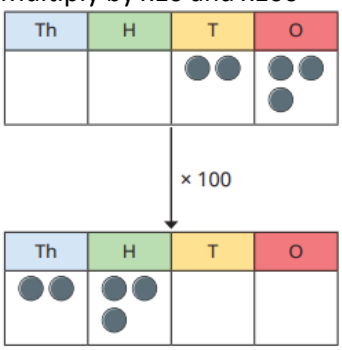
Informal written methods using partitioning

e.g. 23 x 4 =92
20 x 4 = 80
3 x 4 = 12
80 + 12 = 92

Year 4:

Continuation of informal method using larger numbers

Multiply by x10 and x100



Grid method

e.g.

x	30	7	
5	150	35	37 x 5 = 185

Short multiplication method used

		H	T	O	
		2	0	5	
	×			3	

Year 5:

Continuation of grid method using larger numbers

e.g.

×	20	7	
50	1000	350	1350
6	120	42	162
			1512
			1

Short multiplication method

			3	2	4	2	
	×				2	1	
			3	2	4	2	
		6	4	8	4	0	

Year 6:

Grid method as above extended to larger numbers (e.g. 3 digit by 2 digit)

Partitioning
e.g. 35 x 2.5
10 x 2.5
10 x 2.5
10 x 2.5
5 x 2.5
Column method

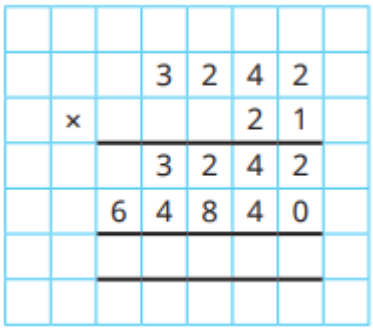
e.g.

When multiplying by 1 digit. Multiply the numbers in the ones column together (7x8 =56) write the six down exchange (carry) the 5 into the tens column. Then multiply the tens column by the ones column (3x7=21) then add the carried 5 on to get the answer.

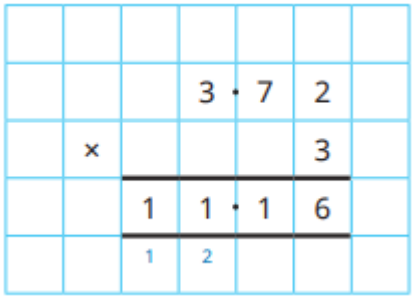
When multiplying by 2 digits use the same process. Multiply all digits by the ones column exchanging (carrying if needed) then multiply all digits by the tens column making sure the pupils understand they are multiplying by a ten. Then use column addition to work out the answer.

$$\begin{array}{r} 38 \\ \times\ 7 \\ \hline 266 \\ {\scriptstyle 5} \end{array}$$

Short multiplication method



Multiplying decimals



Division

Foundation Stage:
Solve practical problems that involve sharing into **equal** groups.
Year 1:
Continuation of practical problems sharing into equal groups from Foundation Stage
Year 2:
Sharing into equal groups developed from Y1 Arrays ○○○○○ ○○○○○ ○○○○○ Repeated subtraction 15 – 3 -3 -3 -3 -3 =0 15 – 5 -5 -5 = 0 15 ÷ 3 = 5

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15 ÷ 5 = 3

Introduction to remainders when sharing into equal groups

Year 3:

Division into equal groups with remainders

Division by repeated subtraction

e.g.

18 ÷ 3 =
18 -3-3-3-3-3-3

Year 4:

Division by chunking (links to knowledge of table facts)

e.g.

84 ÷ 7 = 12

84
- 70 (10 x 7)
14
14(2 x 7)
0

Year 5:

Continuation of chunking using multiples of the divisor.

Introduction of short division ('bus stop') method
(when secure on place value for the individual not the class)
e.g.

$$3\overline{)8^{2}1}\quad 27$$

Year 6:

Secure on chunking using larger multiples of the divisor.

Continue short method from Y5

e.g. $3\overline{)2\ 9^{2}1}\quad 97$

Long division

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e.g.
(could start with smaller multiples such as 10)
How many packs of 24 can we make from 560 biscuits? Start by multiplying 24 by multiples of 10 to get an estimate. As 24 × 20 = 480 and 24 × 30 = 720, we know the answer lies between 20 and 30 packs. We start by subtracting 480 from 560.

$$
\begin{array}{rrl}
24 \overline{)\ 560} & & \\
20 - \underline{480} & & 24 \times 20 \\
\quad 80 & & \\
3 \quad \underline{72} & & 24 \times 3 \\
\quad 8 & &
\end{array}
$$

Answer: 23 R 8

In effect, the recording above is the long division method, though conventionally the digits of the answer are recorded above the line as shown below.

$$
\begin{array}{r}
\quad 23 \\
24 \overline{)\ 560} \\
-\underline{480} \\
\quad 80 \\
-\underline{72} \\
\quad 8
\end{array}
$$

Answer: 23 R 8

Mental mathematics

The ability to calculate mentally underpins all aspects of calculation. Pupils must be given opportunities to develop mental skills and strategies and apply them in different contexts.

The Primary Framework states:

Secure mental calculation requires the ability to:

- *recall key number facts instantly – for example, all addition and subtraction facts for each number to at least 10 (Year 2), sums and differences of multiples of 10 (Year 3) and multiplication facts up to 10 × 10 (Year 4);*
- *use taught strategies to work out the calculation – for example, recognise that addition can be done in any order and use this to add mentally a one-digit number or a multiple of 10 to a one-digit or two-digit number (Year 1), partition two-digit numbers in different ways including into multiples of ten and one and add the tens and ones separately and then recombine (Year 2), when applying mental methods in special cases (Year 5);*
- *understand how the rules and laws of arithmetic are used and applied – for example, to add or subtract mentally combinations of one-digit and two-digit numbers (Year 3), and to calculate mentally with whole numbers and decimals (Year 6).*

Through mathematics lessons, Mega Maths and other cross curricular activities we will provide the opportunities to regularly use and develop these skills.

Times tables

Learning of times tables in particular should be encouraged and pupils should know multiplication facts for all tables up to 10 x 10 by the end of Year 4. These form part of our weekly basic skills of home learning.

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Monitoring and evaluation

The teaching of calculations will be monitored using evidence collected from:

- Planning scrutiny
- Classroom observations
- Scrutiny of pupils's work
- Completion of objective trackers
- Baselines
- AFL opportunities within lessons
- Pupil voice
- Staff voice
- Maths Mastery Training and 'basecamp' platform (Maths Hub)

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