

Conisbrough Ivanhoe Primary Academy



Calculation Policy for Mathematics 2020

YEAR 1

ADDITION

End of Year Objective:

Add one-digit and two-digit numbers to 20, including zero using concrete objects and pictorial representation.

Children should continue to use physical objects for counting and combining initially.

Children need to understand the concept of equality before using the '=' sign.

Calculations should be written either side of the equality sign so that the sign is not just interpreted as 'the answer'.

$$2 = 1 + 1$$

$$2 + 3 = 4 + 1$$

$$3 = 3$$

$$2 + 2 + 2 = 4 + 2$$

Missing numbers need to be placed in all possible places.

$$3 + 4 = \blacktriangleright \quad \blacktriangleright = 3 + 4$$

$$3 + \blacktriangleright = 7 \quad 7 = \blacktriangleright + 4$$

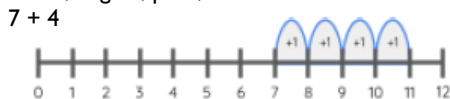
$$\blacktriangleright + 4 = 7 \quad 7 = 3 + \blacktriangleright$$

$$\square + \blacktriangleright = 7 \quad 7 = \blacktriangleright + \square$$

Children should have access to a wide range of counting equipment. Number lines, 100 squares, counters, beads

Draw jumps on numbered number lines to support understanding of the mental method

Children can create their own jumps using rulers, fingers, pens, bodies etc.



Use the vocabulary related to addition and symbols to describe and record addition number sentences

Recording by

- drawing jumps on prepared lines
- constructing own lines
- Using a 100 square

SUBTRACTION

End of Year Objective:

Subtract one-digit and two-digit numbers to 20, including zero (using concrete objects and pictorial representations).

Number sentences and missing number

$$7 - 3 = \blacktriangleright \quad \blacktriangleright = 7 - 3$$

$$7 - \blacktriangleright = 4 \quad 4 = \blacktriangleright - 3$$

$$\blacktriangleright - 3 = 4 \quad 4 = 7 - \blacktriangleright$$

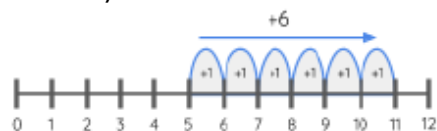
$$\square - \blacktriangleright = 4 \quad 4 = 7 - \blacktriangleright$$

Understand subtraction as 'take away'

E.g. $6 - 1 = 5$



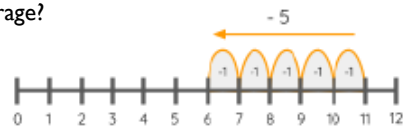
Find a 'difference' by counting up;
I have saved 5p. The socks that I want to buy cost 11p. How much more do I need in order to buy the socks?



$$5p + \square = 11p$$

Use practical and informal written methods to support the subtraction

I have 11 toy cars. There are 5 cars too many to fit in the garage. How many cars fit in the garage?



Use the vocabulary related to subtraction and symbols to describe and record subtraction number sentences

Recording by

- drawing jumps on prepared lines
- constructing own lines
- Using a 100 square

MULTIPLICATION

End of Year Objective:

Solve one-step problems involving multiplication by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher.

Multiplication is related to doubling and counting groups of the same size.



From the above pictorial representation:

Looking at columns Looking at rows

$$2 + 2 + 2 + 2 \quad 4 + 4$$

$$4 \text{ groups of } 2 \quad 2 \text{ groups of } 4$$

Counting using a variety of practical resources

Counting in 2s

e.g. counting socks, shoes, animal legs...

Counting in 5s

e.g. counting fingers, fingers in gloves, toes...

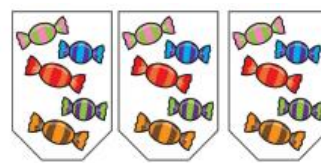
Counting in 10s

e.g. fingers, toes...

Pictures / mark making

There are 5 sweets in one bag.

How many sweets are there in 3 bags?



DIVISION

End of Year Objective:

Solve one-step problems involving division by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher.

Once children are confident at sharing objects practically they can be encouraged to make simple jottings.

Initially this could be using physical objects but requiring children to draw the correct number of circles to share between.

Next children should be encouraged to make simple drawings to help solve their problems. *Checking by counting that all groups are the same.*

E.g.

Sharing – 6 sweets are shared between 2 people. How many do they have each?



12 pound coins are shared between 4 people. How many do they have each?



The number sentence can be modelled alongside. E.g. $12 \div 4 = 3$

Children use physical objects > simple drawings > circle representations

YEAR 2

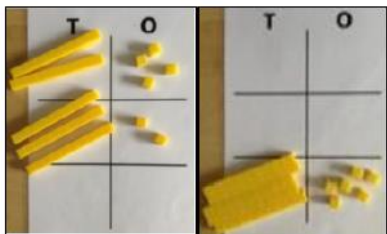
ADDITION

End of Year Objective:

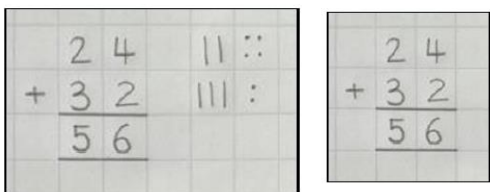
Add numbers using concrete objects, pictorial representations, and mentally, including: a two-digit number and ones; a two-digit number and tens; two two-digit numbers; three one-digit numbers.

Continue using a range of equations but with appropriate, larger numbers. E.g. $13 + 4 = \nabla$
Children also need to be confident in bridging through 10.

Children to partition numbers and begin to use ten sticks and ones to add numbers together. e.g. $24 + 32 = 56$



The number sentence can also be modelled alongside and formal recording when place value is secure.



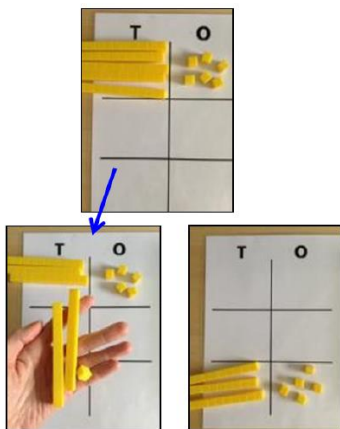
SUBTRACTION

End of Year Objective:

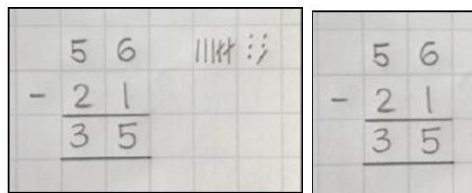
Subtract numbers using concrete objects, pictorial representations, and mentally, including: a two-digit number and ones; a two-digit number and tens; two two-digit numbers.

Continue using a range of equations as at year 1 but with appropriate numbers. E.g. extend to $14 + 5 = 20 - \nabla$

Children to partition numbers and begin to use ten sticks and ones to subtract numbers from each other. e.g. $56 - 21 = 35$



The number sentence can also be modelled alongside and formal recording when place value is secure.



MULTIPLICATION

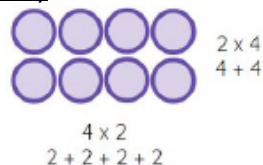
End of Year Objective:

Calculate mathematical statements for multiplication (using repeated addition) and write them using the multiplication (\times) and equals ($=$) signs.

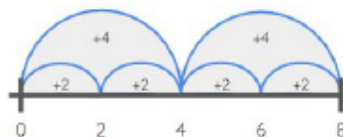
Missing numbers need to be placed in all possible places.

$7 \times 2 = \blacktriangleright$ $\blacktriangleright = 2 \times 7$
 $7 \times \blacktriangleright = 14$ $14 = \blacktriangleright \times 7$
 $\blacktriangleright \times 2 = 14$ $14 = 2 \times \blacktriangleright$
 $\square \times \blacktriangleright = 14$ $14 = \blacktriangleright \times \square$

Arrays and repeated addition
An array



Repeated addition



Doubling multiples of 5 up to 50
 $15 \times 2 = 30$

Partition two digit numbers into tens and ones to multiply (Greater Depth)
 $13 \times 3 =$
 $10 \times 3 = 30$
 $3 \times 3 = 9$
 $30 + 9 = 39$

Use doubling to multiply by 2.

$15 \times 2 = 30$
 $10 + 5$
 $20 + 10 = 30$

DIVISION

End of Year Objective:

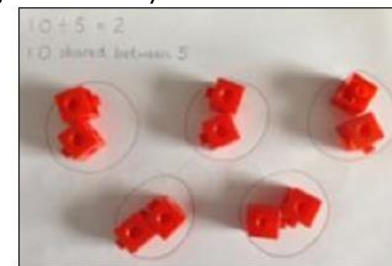
Calculate mathematical statements for division within the multiplication tables and write them using the division (\div) and equals ($=$) signs.

Use multiplication facts to solve missing number problems.

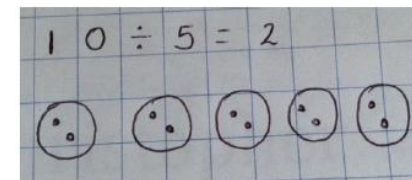
$6 \div 2 = \blacktriangleright$ $\blacktriangleright = 6 \div 2$
 $6 \div \blacktriangleright = 3$ $3 = 6 \div \blacktriangleright$

Grouping

10 children get into teams of 2 to play a game. How many teams are there?



When children are confident in the process of sharing, simplify drawings to jottings, checking that all groups are the same.



Children also need to be taught that if they are not all equal the extra ones must be left as a remainder. E.g. $21 \div 5 = 4 \text{ r } 1$

YEAR 3

ADDITION

End of Year Objective:

Add numbers with up to three digits, using formal written method of column addition.

Children will continue to build upon the partitioning method from Y2 and extend this to add together numbers which include 3-digit numbers.

When secure, children will then progress to expanded addition adding the least significant digits first

24	67	74
+ 9	+ 24	+ 52
13	11	6
20	80	120
33	91	126

SUBTRACTION

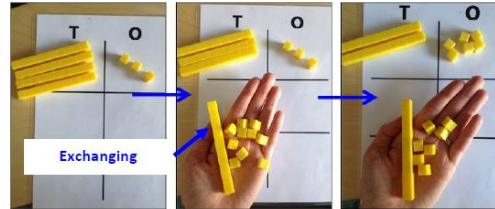
End of Year Objective:

Subtract numbers with up to three digits, using formal written method of column subtraction.

Children will continue to build upon the partitioning method from Y2 and extend this to subtracting numbers which include 3-digit numbers.

18	46	158
- 7	- 23	- 32
11	23	126

When secure, children will then progress to problems which involve exchanging e.g. $43 - 17 = 26$



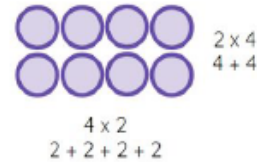
MULTIPLICATION

End of Year Objective:

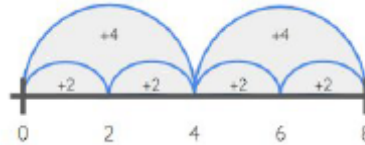
Write and calculate mathematical statements for multiplication using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, progressing to formal written methods.

Arrays and repeated addition

An array



Repeated addition



Doubling multiples of 5 up to 50
 $15 \times 2 = 30$

Multiply 2 digit numbers by 2, 3, 4 or 5, by partitioning into tens and units. E.g.

$23 \times 3 = 69$
 $20 \times 3 = 60$
 $3 \times 3 = 9$

Grid method to multiply TU x U
 $23 \times 5 = 115$

x	20	3
5	100	15
	$100 + 15 = 115$	

DIVISION

End of Year Objective:

Write and calculate mathematical statements for division using the multiplication tables that they know, including for two-digit numbers divided by one-digit numbers, progressing to formal written methods.

Count in groups.

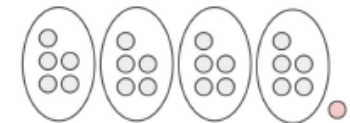
How many 5s in 15?

$1 \times 5 = 5$		$15 \div 5 = 3$
$2 \times 5 = 10$		$15 \div 3 = 5$
$3 \times 5 = 15$		

Ensure children are secure with grouping.

Children also need to be taught that if groups are not all equal the extra ones must be left as a remainder. E.g.

$21 \div 5 = 4 \text{ r } 1$



Use short division to divide TU by U with remainders.

$52 \div 4 = 13$

	13	
4	5	2
	1	2
		r 1
6	7	3

YEAR 4

ADDITION

End of Year Objective:

Add numbers with up to 4 digits and decimals with one decimal place using the formal written method of columnar addition where appropriate.

Children should progress to using formal column addition of up to 4-digit numbers with bridging when they have demonstrated a secure understanding of place value.

$$\begin{array}{r} 789 \\ + 642 \\ \hline 1431 \\ \hline \end{array}$$

Children to use a number line when working with time & temperature to avoid confusion. E.g. A TV show starts at 9:35 and lasts 1 hour 35 minutes. What time does it end?



SUBTRACTION

End of Year Objective:

Subtract numbers with up to 4 digits and decimals with one decimal place using the formal written method of column subtraction where appropriate.

Children should progress to using formal column subtraction of up to 4-digit numbers with decomposition when they have demonstrated a secure understanding of place value.

$$\begin{array}{r} 874 \\ - 523 \\ \hline 351 \end{array}$$

$$\begin{array}{r} 892 \\ - 457 \\ \hline 435 \end{array}$$

Children to use a number line when working with time & temperature to avoid confusion.

MULTIPLICATION

End of Year Objective:

Multiply two-digit and three-digit numbers by a one-digit number using formal written layout.

Extend grid method to include HTU x U and TU x TU

E.g. 72×38

x	70	2		
30	2100	60	=	2160
8	560	16	=	576
				<u>2736</u>

Approximate by rounding first: E.g.
 223×8 to $200 \times 8 = 1600$
 72×38 to $70 \times 40 = 2800$

Multiply decimals to 1 decimal place using grid method.

DIVISION

End of Year Objective:

Divide numbers up to 3 digits by a one-digit number using the formal written method of short division and interpret remainders appropriately for the context.

Short Division

$69 \div 3 = 23$

$$\begin{array}{r} 23 \\ 3 \overline{)69} \end{array}$$

Short Division with end remainders

$94 \div 3 = 31 \text{ r}1$

$$\begin{array}{r} 31 \text{ r}1 \\ 3 \overline{)94} \end{array}$$

Short Division with internal remainders

$73 \div 3 = 24 \text{ r}1$

$$\begin{array}{r} 24 \text{ r}1 \\ 3 \overline{)73} \end{array}$$

YEAR 5

ADDITION

End of Year Objective:

Add whole numbers with more than 4 digits and decimals with two decimal places, including formal written methods (columnar addition).

Use mental methods where possible to add.

Continue to use column addition to add several numbers with different numbers of digits.

E.g. Find the total of 442, 1786, 25

1	7	8	6
	4	4	2
+		2	5
<hr/>			
2	2	5	3
1	1	1	

Add decimals with different numbers of digits with either 1 or 2 decimal places. Decimals must line up.

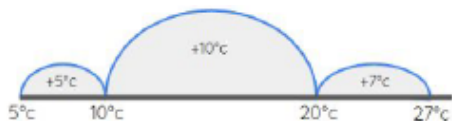
E.g. $14.75 + 12.8 = 27.55$

1	4	.	7	5	
+	1	.	2	.	8
<hr/>					
2	7	.	5	5	
		.			

Continue to use number line when working with time & temperature.

E.g. The average temperature in March is 5°C and in July it is 27°C . What is the difference between the two?

$27 - 5 = 22$



$5^{\circ}\text{C} + 10^{\circ}\text{C} + 7^{\circ}\text{C} = 22^{\circ}\text{C}$

Extend to negative numbers.

SUBTRACTION

End of Year Objective:

Subtract whole numbers with more than 4 digits and decimals with two decimal places, including formal written methods (columnar subtraction).

Formal column subtraction with decomposition of numbers with different numbers of digits with either 1 or 2 decimal places.

E.g. $14.24 - 8.7 = 5.54$

	0	13			
	1	4	.	2	4
-		8	.	7	
<hr/>					
	5	.	5	4	

Use formal methods where numbers include multiple zeros.

E.g. $2000 - 1542 =$
 $£20.00 - £12.65 =$

Continue to use number line when working with time & temperature.

MULTIPLICATION

End of Year Objective:

Multiply numbers up to 4 digits by a one- or two-digit number using a formal written method, including long multiplication for two-digit numbers.

Multiply two multiples of 10 fluently. E.g.

$30 \times 60 = 1800$

$20 \times 60 = 1200$

Multiply whole numbers and decimals by 10, 100 and 1000 fluently. E.g.

$23 \times 100 =$

$45 \times 10 =$

$3.6 \times 100 =$

$3.87 \times 1000 =$

Formal short multiplication

	3	2
x		3
<hr/>		
	9	6

	2	3	
x		7	
<hr/>			
	1	6	1
		2	

Formal long multiplication

	2	4	
x	1	6	
<hr/>			
+	1	4	4
<hr/>			
	2	4	0
<hr/>			
	3	8	4

	1	2	4	
x		2	6	
<hr/>				
+		7	4	4
<hr/>				
	2	4	8	0
<hr/>				
	3	2	2	4

DIVISION

End of Year Objective:

Divide numbers up to 4 digits by a one-digit number using the formal written method of short division and interpret remainders appropriately for the context.

Short Division with internal remainders

$73 \div 3 = 24 \text{ r}1$

	2	4	.	1
3		7	3	

Divide decimal numbers

E.g. 5 cleaners earn $£350.50$ in one day. How much does each cleaner earn? $350.50 \div 5$

Always place the decimal point directly above the decimal point in the numerator.

	0	7	.	0	1	0
5		3	5	0	5	0

We have 7.59kg of cookies. A small bag of cookies weighs 0.36kg. How many bags of cookies can we fill? $7.59 \div 0.36 =$

Always make the divisor into a whole number by using a multiple of 10 e.g. 10, 100, 1000. Whole numbers are easier to divide by.

$0.36 \times 100 = 36$

Adjust the numerator by multiplying using the same multiple of 10.

$7.59 \times 100 = 759$

Now calculate

$759 \div 36 = 21 \text{ r}3$

	0	2	1	.	3
3	6		7	5	9

$1 \times 36 = 36$
 $2 \times 36 = 72$
 $3 \times 36 = 108$

Use rounding remainders appropriately. We can only fill 21 bags.

YEAR 6

ADDITION

End of Year Objective:
Add whole numbers and decimals using formal written methods (columnar addition).

Continue using mental strategies to develop fluency and speed.

Add numbers up to 10,000,000 and decimals with different numbers of digits with up to three decimal places.

E.g. $564,765 + 265,876 =$
 $12.765 + 126.4 =$

Begin to add numbers including negatives, always in context.

E.g. $-5^{\circ}\text{C} + 9^{\circ}\text{C} =$
 $-9^{\circ}\text{C} + 15^{\circ}\text{C} =$

Reason with formal written method using missing numbers.

$$\begin{array}{r} 71\blacksquare7 \\ + \quad 63 \\ \hline 7\blacksquare22 \end{array}$$

Including decimals.

$$\begin{array}{r} 14.\blacksquare5 \\ + 1\blacksquare.8\blacksquare \\ \hline 7.55 \end{array}$$

Continue to use number line when working with time & temperature.

SUBTRACTION

End of Year Objective:
Subtract whole numbers and decimals using formal written methods (columnar subtraction).

Continue using mental strategies to develop fluency and speed.

Subtract numbers up to 10,000,000 and decimals with different numbers of digits with up to three decimal places.

E.g. $564,765 - 265,876 =$
 $212.765 - 126.4 =$

Begin to subtract numbers including negatives, always in context.

E.g. $5^{\circ}\text{C} - 9^{\circ}\text{C} =$
 $9^{\circ}\text{C} - 15^{\circ}\text{C} =$

Reason with formal written method using missing numbers.

$$\begin{array}{r} 487\blacksquare \\ - 2\blacksquare\blacksquare4 \\ \hline \blacksquare533 \end{array}$$

Including decimals.

$$\begin{array}{r} 14.\blacksquare4 \\ - \blacksquare.7\blacksquare \\ \hline 5.54 \end{array}$$

Continue to use number line when working with time & temperature.

MULTIPLICATION

End of Year Objective:
Multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication.

Multiply one-digit numbers with up to two decimal places by whole numbers.

Formal long multiplication

Including decimals

DIVISION

End of Year Objective:
Divide numbers up to 4 digits by a two-digit number using the formal written method of short division where appropriate, interpreting remainders according to the context. Use written division methods in cases where the answer has up to two decimal places

Extend to dividing 4-digits by 2-digits.
E.g. $7665 \div 15 = 511$

$$\begin{array}{r} 0511 \\ 15 \overline{)7665} \end{array}$$

1 x 15 = 15
2 x 15 = 30
3 x 15 = 45
4 x 15 = 60
5 x 15 = 75

Formal short division with remainders shown as fractions and decimals.

$$\begin{array}{r} 094.75 \\ 8 \overline{)758.00} \end{array}$$

$$\begin{array}{r} 094.6 \\ 8 \overline{)758} \end{array}$$

$$\begin{array}{r} 094.\frac{6}{8} \\ 8 \overline{)758} \end{array}$$

Formal long division with remainders shown as fractions and decimals.

$8712 \div 16 = 544 \text{ r}8$ or $544 \frac{1}{2}$ or 544.5

$$\begin{array}{r} 0544 \text{ r}8 \\ 16 \overline{)8712} \\ - 80 \quad \downarrow \\ \hline 071 \\ - 64 \quad \downarrow \\ \hline 072 \\ - 64 \\ \hline 08 \end{array}$$

1 x 16 = 16
2 x 16 = 32
3 x 16 = 48
4 x 16 = 64
5 x 16 = 80