Calculation Policy: Division

PROGRESSION THROUGH CALCULATIONS FOR DIVISION

MENTAL CALCULATIONS

These are a selection of mental calculation strategies:

Doubling and halving
Knowing that halving is dividing by 2

Deriving and recalling division facts

Tables should be taught everyday from Y2 onwards, either as part of the mental oral starter or other times as appropriate within the day.

Year 2	10 times table
	5 times table
	2 times table
Year 3	4 times table
	8 times table
	3 times table
	6 times table
	9 times table
Year 4	11 times table
	12 times table
	Derive and recall all multiplication facts up to 12 x 12
Year 5 & 6	Derive and recall quickly division facts for all tables up to 10 x 10
	Work out products such as: 70 X 5, 70 X 50 and 700 X 50 using the related fact 7 X 5 and their knowledge of place value.

Using and applying division facts
Children should be able to utilise their times table knowledge to derive other facts.
e.g. If I know 21 ÷ 3 = 7, what else do I know?
210 ÷ 70 = 3, 210 ÷ 7 = 30, 210 ÷ 30 = 7, 21 ÷ 30 = 0.7 etc

Dividing by 10 or 100
Knowing that the effect of dividing by 10 is a shift in the digits one place to the right.
Knowing that the effect of dividing by 100 is a shift in the digits two places to the right.
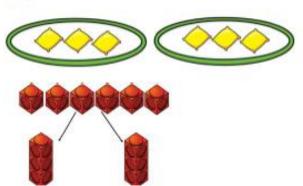
Use related facts
Given that 1.4 x 1.1 = 1.54
What is 1.54 ÷ 1.4, or 1.54 ÷ 1.1?

MANY MENTAL CALCULATION STRATEGIES WILL CONTINUE TO BE USED. THEY ARE NOT REPLACED BY WRITTEN METHODS.
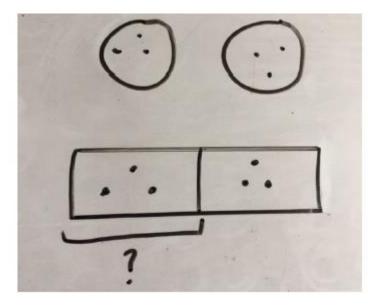
Division – Year 1
Dividing by sharing between 2

Concrete:

Sharing using a range of objects.
6 ÷ 2

Children need to be able to share. objects by using 'one for me, one for you' before they can divide. They need to be able to articulate 'we have got the same', 'we shared them equally'. Putting objects into bowls/containers will make it easier for the children to find out how many are left.
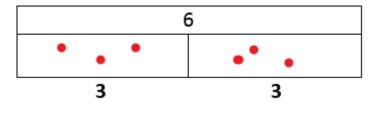
Pictorial:

Both images show 6 ÷ 2 =

The top image is more 'random' and the bottom image is structured into a bar.
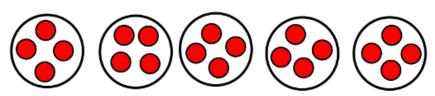Children might need to be steered into using the more structured image.

Concrete:

By using and developing the bar idea, children can develop the stem sentences to express what they have found. In this case, 6 shared between 2 is 3.
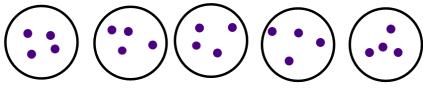
6 shared between 2 is _____.

Division – Year 1/ 2
Dividing by sharing

Concrete:

20 ÷ 5 =

Pictorial:

Leading onto:

20

Abstract:

20				
4	4	4	4	4

When children are learning to represent their work like this, they will need to be suing concrete objects and pictures alongside the abstract.

Division – Year 1/ 2
Dividing by grouping

Concrete:

$8 \div 2 =$

Children need to begin using their knowledge of times tables to count in groups of the divisor, in this case 2.

Develop the use of stem sentences for children to be able to reason their understanding.
There are <u>4</u> equal groups.
There are <u>2</u> in each group.
There are <u>8</u> altogether.
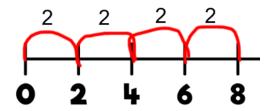
Pictorial:

Develop the use of stem sentences for children to be able to reason their understanding.
There are <u>4</u> equal groups.
There are <u>2</u> in each group.
There are <u>8</u> altogether.

Abstract:

Encourage children to count up in steps of 2.

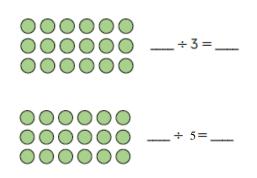**Division Year 2/3**
Dividing using arrays

Concrete:

$8 \div 2 =$

$8 \div 4 =$

Refer children back to their understanding of commutativity and building fact families.

Pictorial:

____ $\div 3 =$ ____

Circle the counters into the groups given to find how many equal groups there would be.

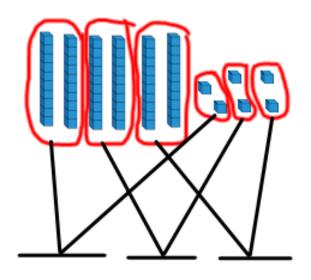____ $\div 5 =$ ____

Abstract:

Find the inverse of multiplication and division sentences by creating four linking number sentences.

$5 \times 3 = 15$
$3 \times 5 = 15$
$15 \div 5 = 3$
$15 \div 3 = 5$

Division – Year 3
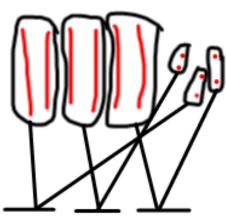**Dividing TO by a single digit without exchanging**
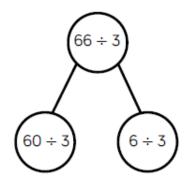
Concrete:

66 ÷ 3 =

Children need to physically move the pieces into the groups. To begin with, children need to use base 10 but when they have a good understanding of place value, they can move onto place value counters. Children will start with tens and then move onto the ones.

Pictorial:

Children need to draw the base 10 representations and then group them together. They might choose to give an answer using base 10 and then write the number that goes with it.
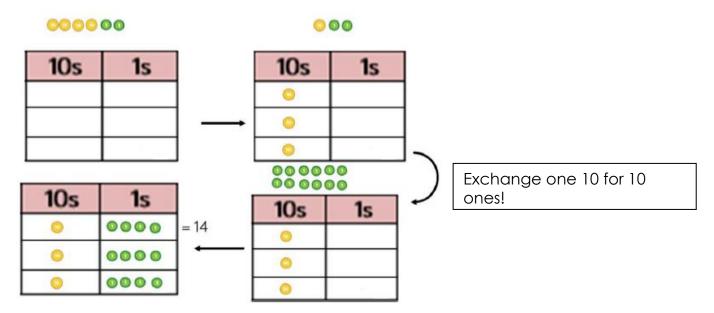
Abstract:

Children have been practising partitioning the tens and ones. When they move onto the abstract method, ensure that they do it alongside a practical/pictorial way too.
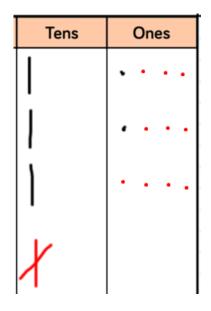
Division – Year 3
Dividing with exchanging

Concrete:

Sharing using place value counters.
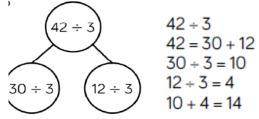$42 \div 3 = 14$

Exchange one 10 for 10 ones!

Pictorial: Children to represent the calcuation pictorially

Children could choose to draw using base 10 representations.

Children need to make it clear when they have exchanged – this could be completed in a different colour to begin with.
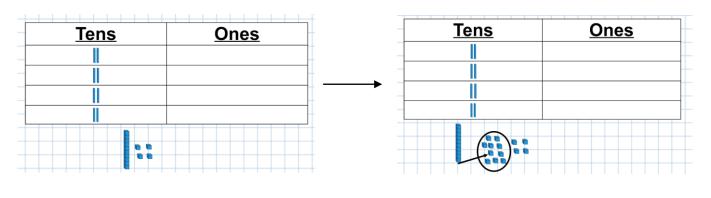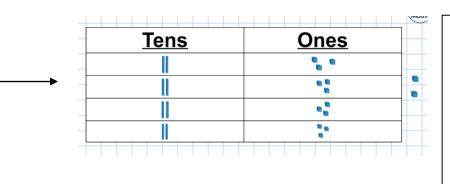
Abstract:

$42 \div 3$
$42 = 30 + 12$
$30 \div 3 = 10$
$12 \div 3 = 4$
$10 + 4 = 14$

Abstract – children write down what they have done with the counters they have used/drawn.

Division – Year 3/ 4
Dividing with remainders

Concrete:

$94 \div 4 =$

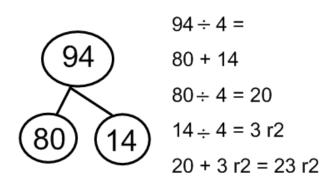| Tens	Ones

Ensure that children are clear about exchanging and why they have to exchange. Also reinforce the idea that when dividing, you start with the largest valued digit when dividing, rather than the smallest.

Pictorial:

Follow the concrete steps but using pictorial representations of base 10.

Abstract:

$94 \div 4 =$

$80 + 14$

$80 \div 4 = 20$
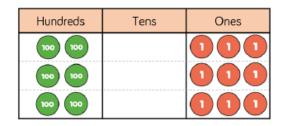
$14 \div 4 = 3 \, r2$

$20 + 3 \, r2 = 23 \, r2$

These steps need to be done in conjunction with concrete and pictorial images. Children will need to have a sound understanding of multiplication facts to be able to partition numbers effectively.

Division – Year 4
Dividing 3 digit numbers without exchanging
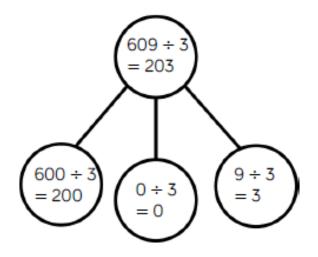
Concrete:

609 ÷ 3 =

Hundreds	Tens	Ones
100 100		1 1 1
100 100		1 1 1
100 100		1 1 1

Children can choose between using place value counters and base 10.

Pictorial:

Hundreds	Tens	Ones
▢ ▢		· · ·
▢ ▢		· 6 ·
▢ ▢		· · ·

Using the place value grids ensure that children are still thinking about the size of the digits they are using.
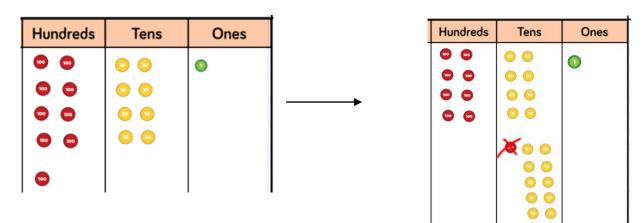
Abstract:

609 ÷ 3 = 203

600 ÷ 3 = 200

0 ÷ 3 = 0

9 ÷ 3 = 3

Children will have to use the whole part models alongside concrete and pictorial images.

Division – Year 4
Dividing 3 digits with exchanging and remainders

Concrete:
981 ÷ 4 =

Hundreds	Tens	Ones
100 100	10 10	1
100 100	10 10	
100 100	10 10	
100 100	10 10	
100		

Hundreds	Tens	Ones
100 100	10 10	1
100 100	10 10	
100 100	10 10	
100 100	10 10	

Pictorial:

Hundreds	Tens	Ones

Children need to draw on the base 10/place value counters and then exchange them.

Abstract:

```
        ┌─────────┐
        │ 981 ÷ 4 │
        │ =245 r 1│
        └─────────┘
       ╱     │     ╲
┌────────┐ ┌────────┐ ┌────────┐
│ 800 ÷ 4│ │160 ÷ 4 │ │ 21 ÷ 4 │
│ = 200  │ │ = 40   │ │ = 5 r 1│
└────────┘ └────────┘ └────────┘
```
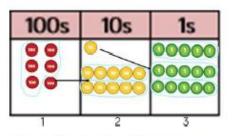
These representations have to be completed alongside images or models that are made.

Division – Year 4/5/6
Short division

Concrete:

Short division using place value counters to group.
615 ÷ 5

1. Make 615 with place value counters.
2. How many groups of 5 hundreds can you make with 6 hundred counters?
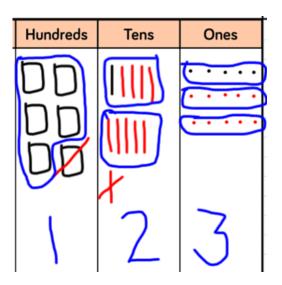3. Exchange 1 hundred for 10 tens.
4. How many groups of 5 tens can you make with 11 ten counters?
5. Exchange 1 ten for 10 ones.
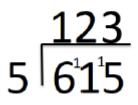6. How many groups of 5 ones can you make with 15 ones?

> Children need to learn the process but also be able to articulate what they are doing to the digits within the numbers and why.

Pictorial:
Represent the digits using pictures.

Abstract:

Children to the calculation using the short division scaffold.

> As children become more proficient at dividing larger numbers, encourage children to partition in order to use mental calculations. (600 + 15 ÷ 5 = 123)

Division – Year 6
Long division

There are not concrete or pictorial representations for long division.

Abstract:

$$
\begin{array}{r}
015 \text{R7} \\
32 \overline{) 487} \\
-320 \quad (32 \times 10 = 320) \\
\overline{167} \quad + \\
-160 \quad (32 \times 5 = 160) \\
\overline{7}
\end{array}
$$

Different ways of asking/representing 615 ÷ 5 =

Part/Whole model:

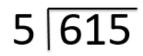Using the part whole model below, how can you divide 615 by 5 without using short division?

Word problems:

I have £615 and share it equally between 5 bank accounts. How much will be in each account?

615 pupils need to be put into 5 groups. How many will be in each group?

Procedural variation:

$$5\overline{)615}$$

$615 \div 5 =$

$\square = 615 \div 5$

Conceptual variation:
What is the calculation?
What is the answer?