PROGRESSION THROUGH CALCULATIONS FOR DIVISION

MENTAL CALCULATIONS
These are a selection of mental calculation strategies. On an additional document you will find year group expectations for mental starters. Each week teachers must cover rapid recall, mental strategies and mental calculations.

Doubling and halving
Knowing that halving is dividing by 2

Deriving and recalling division facts

Tables should be taught everyday from Y1 onwards, either as part of the mental oral starter or other times as appropriate within the day.

Year 1   2 times table
                5 times table
                10 times table

Year 2   2 times table
                5 times table
                10 times table

Year 3   2 times table
                3 times table
                4 times table
                5 times table
                8 times table
                10 times table

Year 4   Derive and recall all division facts up to 12 x 12

Years 5 & 6 Derive and recall quickly all division facts up to 12 x 12.

Using and applying division facts
Children should be able to utilise their tables knowledge to derive other facts.
e.g. If I know 3 x 7 = 21, what else do I know?
30 x 7 = 210, 300 x 7 = 2100, 3000 x 7 = 21 000, 0.3 x 7 = 2.1 etc

Dividing by 10,100, 1000,
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.

Year 3	Divide whole numbers by 10
Year 4	Divide any number to 10 000 by 10 and 100
Year 5	Divide whole numbers and decimals by 10, 100, 1000,
Year 6	Divide whole numbers and decimals up to 3DP by 10, 100, 1000 giving answers to 3DP

Use of factors

378 ÷ 21   378 ÷ 3 = 126   378 ÷ 21 = 18
                126 ÷ 7 = 18

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.

THE FOLLOWING ARE <u>MINIMUM</u> STANDARDS THAT WE EXPECT THE CHILDREN TO ACHIEVE – SOME WILL ACHIEVE BEYOND THIS EXPECTATION AND MUST NOT BE LIMITED

'THERE IS NO LID ON LEARNING!'

<u>YR and Y1</u>

Children will understand equal groups and share items out in play and problem solving. They will count in 2s and 10s and 5s.
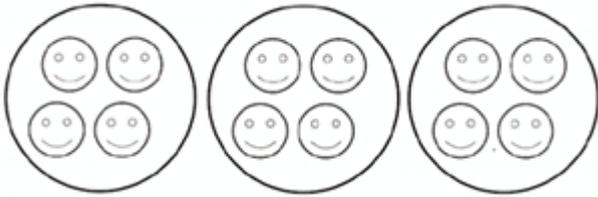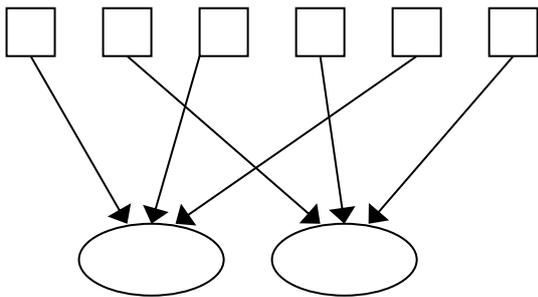

<u>Y2</u>

Children will develop their understanding of division and use jottings to support calculation
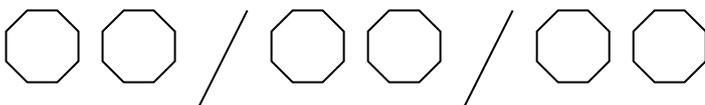
✓ **Sharing equally**

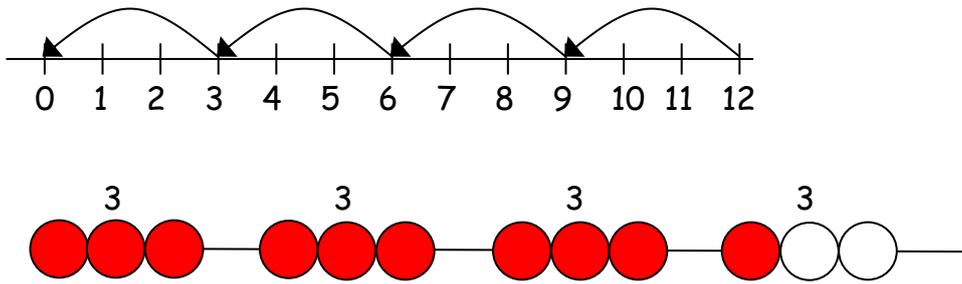6 sweets shared between 2 people, how many do they each get?

✓ **Grouping or repeated subtraction**

There are 6 sweets, how many people can have 2 sweets each?

✓ **Repeated subtraction using a number line or bead bar**

12 ÷ 3 = 4

The bead bar will help children with interpreting division calculations such as 10 ÷ 5 as 'how many 5s make 10?'

✓ **Using symbols to stand for unknown numbers to complete equations using inverse operations**
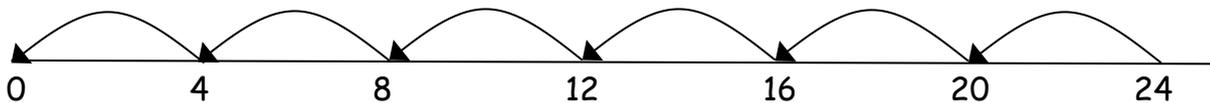
□ ÷ 2 = 4   20 ÷ △ = 4   □ ÷ △ = 4

Y3

Ensure that the emphasis in Y3 is on grouping rather than sharing.

Children will continue to use:

✓ **Repeated subtraction or addition using a number line**
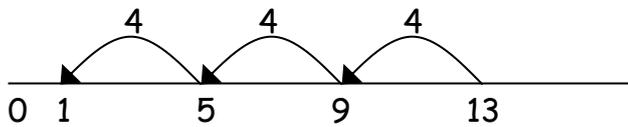
Children will use an empty number line to support their calculation. When jumping along a number line the children will use the monkey to jump.

24 ÷ 4 = 6

Children should also move onto calculations involving remainders.

$13 \div 4 = 3 \text{ r } 1$

✓ **Using symbols to stand for unknown numbers to complete equations using inverse operations**

$26 \div 2 = \square$ $24 \div \triangle = 12$ $\square \div 10 = 8$

✓ **Chunking**

Children will develop their use of repeated addition to be able to add multiples of the divisor. Initially, these should be multiples of 10s, 5s, 2s and 1s – numbers with which the children are more familiar. Children will work on dividing a two digit number by a one digit number. They will create a key facts box with 10 x, 5 x, 2x the divisor. Children should be encouraged to add the biggest multiple first.
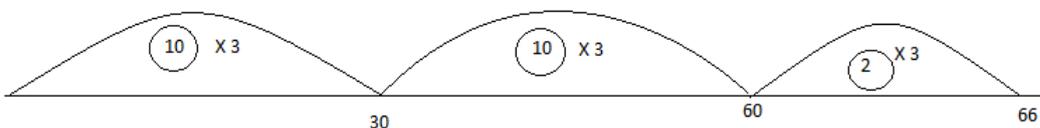
$66 \div 3 =$

KF
2 X 3 = 6
5 X 3 = 15
10 X 3 = 30

✓ **Children should be introduced to the formal short division method**

<u>Y4</u>

- ✓ **Chunking**

Initially children add several chunks, but with practice they should look for the biggest multiples of the divisor that they can find to add.
When dividing a three digit number they should be able to add multiples of 20, 30 etc.
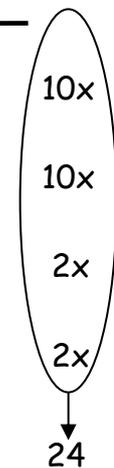- ✓ **Vertical Chunking**

When the children write the division calculation, they need to be able to write it as a multiplication calculation with a hole in it.

$72 \div 3 =$ $\qquad$ $\square \times 3 = 72$

```
3 ) 72
   - 30      10x
     42
   - 30      10x
     12
   -  6      2x
      6
   -  6      2x
      0
Answer :   24
```

Leading to subtraction of other multiples.

$96 \div 6$

```
    1 6
6 )  96
   - 60      10x
     36
   - 36      6x
      0
Answer :   16
```

Any remainders should be shown as integers, i.e. 14 remainder 2 or 14 r 2.

Children need to be able to decide what to do after division and round up or down accordingly. They should make sensible decisions about rounding up or down after division. For example 62 ÷ 8 is 7 remainder 6, but whether the answer should be rounded up to 8 or rounded down to 7 depends on the context.

e.g. I have 62p. Sweets are 8p each. How many can I buy?
Answer: 7 (the remaining 6p is not enough to buy another sweet)

Apples are packed into boxes of 8. There are 62 apples. How many boxes are needed?
Answer: 8 (the remaining 6 apples still need to be placed into a box)

✓ Children will use the formal short division method:

$$3 \overline{) 2\,9^21 } = 97$$

Y5

✓ Children will divide numbers up to 4 digits by a one digit number using the formal written method of short division and interpret remainders.

✓ Children will practise and extend their use of the formal written short division method.

Children can start to subtract larger multiples of the divisor, e.g. 30x

✓ **Long division method HTO ÷ O**

196 ÷ 6

```
         32 r 4
6 )  196
   - 180      30x
      16
   -  12      2x
       4
```

Answer :   32   remainder 4   or   32 r 4

Any remainders should be shown as integers, i.e. 14 remainder 2 or 14 r 2.

Children need to record answers for non-integer division in different ways, including: with remainders, fractions, decimals or with rounding, for example: $98 ÷ 4 = 24$ r $2 = 24\frac{1}{2} = 24.5 = 25$.

Children need to be able to decide what to do after division and round up or down accordingly. They should make sensible decisions about rounding up or down after division. For example 240 ÷ 52 is 4 remainder 32, but whether the answer should be rounded up to 5 or rounded down to 4 depends on the context.

Children need to be able to divide ThHTO by O.

✓ Formal short division method when dividing numbers by up to 4 digits:

98 ÷ 7 becomes	432 ÷ 5 becomes	496 ÷ 11 becomes
$\begin{array}{c c c}& 1 & 4 \\ \hline 7 & 9 & ^2 8\end{array}$	$\begin{array}{c c c c}& 8 & 6 & r\,2 \\ \hline 5 & 4 & ^3 3 & 2\end{array}$	$\begin{array}{c c c c}& 4 & 5 & r\,1 \\ \hline 1\,1 & 4 & ^5 9 & 6\end{array}$
Answer: 14	Answer: 86 remainder 2	Answer: $45\frac{1}{11}$

Y6

✓ Children will divide numbers up to 4 digits by a two digit number using the formal written method of long division.

✓ Children will divide numbers up to 4 digits by a two digit number using formal short division.

Children will continue to use written methods to solve short division HTO ÷ O and ThHTO ÷ O.

✓ **Long division HTO÷ TO**

972 ÷ 36

$$
\begin{array}{r}
27 \\
36 \overline{)\ 972} \\
-\ 720 \quad 20\times \\
\hline
252 \\
-\ 252 \quad 7\times \\
\hline
0
\end{array}
$$

Answer : 27

Any remainders should be shown as fractions, i.e. if the children were dividing 32 by 10, the answer should be shown as $3 \, {}^2/_{10}$ which could then be written as $3 \, {}^1/_5$ in it's lowest terms.

Extend to decimals with up to two decimal places. Children should know that decimal points line up under each other.

$87.5 \div 7$

```
            12.5
    7 )  87.5
      -  70.0      10x
         17.5
      -  14.0      2x
          3.5
      -   3.5      0.5x
            0
```

Answer :   12.5

✓ Children can express remainders as fractions or decimals

$456 \div 5 = 91.2$

```
       091.2
    5  456.¹0
```

+ - + - + - + - + - + - +

By the end of year 6, children will have a range of calculation methods, mental and written. Selection will depend upon the numbers involved.

Children should not be made to go onto the next stage if:

  1) **they are not ready.**
  2) **they are not confident.**

Children should be encouraged to approximate their answers before calculating.

Children should be encouraged to check their answers after calculation using an appropriate strategy.

Children should be encouraged to consider if a mental calculation would be appropriate before using written methods.