

WOOLENWICK JUNIOR SCHOOL

PROGRESSION THROUGH CALCULATIONS FOR DIVISION

The aim is that children use mental methods when appropriate, but for calculations that they cannot do in their heads they use an efficient written method accurately and with confidence. Children are entitled to be taught and to acquire secure mental methods of calculation and one **accurate** and **efficient** written method of calculation for division, which they know they can rely on when mental methods are not appropriate.

MENTAL CALCULATIONS (ongoing)

To divide successfully, children need to be able to:

Doubling and halving

Knowing that halving is dividing by 2

Using multiplication facts

By the end of Year 4 children should be able to derive and recall all multiplication facts up to 10×10

Using and applying multiplication facts

Children should be able to utilise their tables knowledge to derive other facts.

e.g. If I know $3 \times 7 = 21$, what else do I know?

210 divided by $7 = 30$, 2100 divided by $300 = 7$, 21 divided by $0.7 = 30$ 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.

Partition numbers into multiples of one hundred, ten and one in different ways

74 into $70 + 4$ or $60 + 14$

Note: It is important that children's mental methods of calculation are practised and secured alongside their learning and use of an efficient written method for division.

MANY MENTAL CALCULATION STRATEGIES WILL CONTINUE TO BE USED. THEY ARE NOT REPLACED BY WRITTEN METHODS.

PHASE 1: Practical Resources and Pictures (NNF - YR/1, P Level/Level 1)

Children will understand equal groups and share items out in play and problem solving. They will count in 2s and 10s and later in 5s. They develop ways of recording calculations using **pictures, cubes, counters** etc.



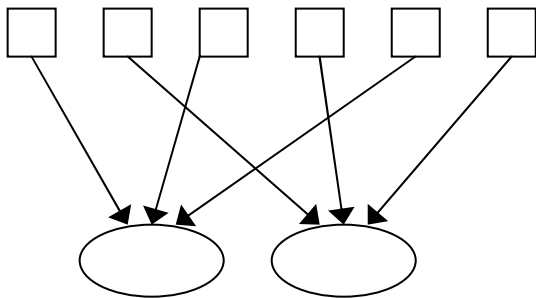
Vocabulary
equal, sharing, share

PHASE 2: Sharing and Grouping or Repeated Subtraction (NNF - Y2/3/4, Level 2/3)

Children will develop their understanding of division and use jottings to support calculation

✓ **Sharing equally**

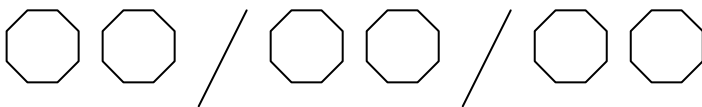
6 sweets shared between 2 people, how many do they each get?



Vocabulary
groups of, lots of, halve, share equally, each,

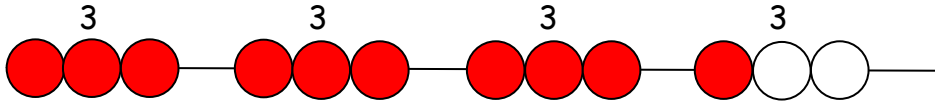
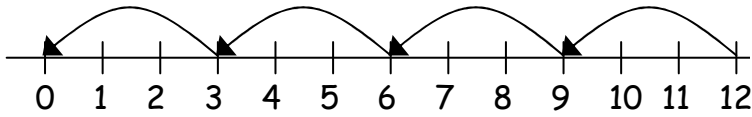
✓ **Grouping or repeated subtraction**

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



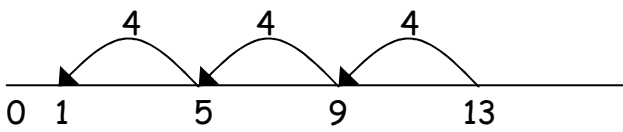
They will progress to repeated subtraction using a **number line** or **bead string**.

$$12 \div 3 = 4$$

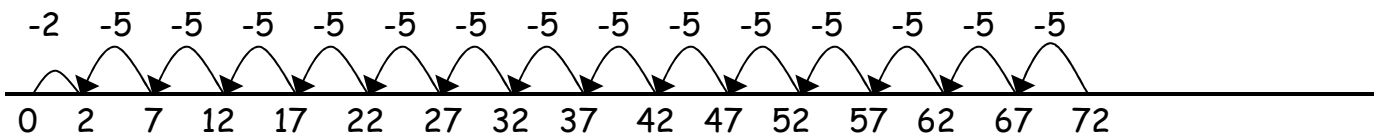


Children should also move onto calculations involving remainders.

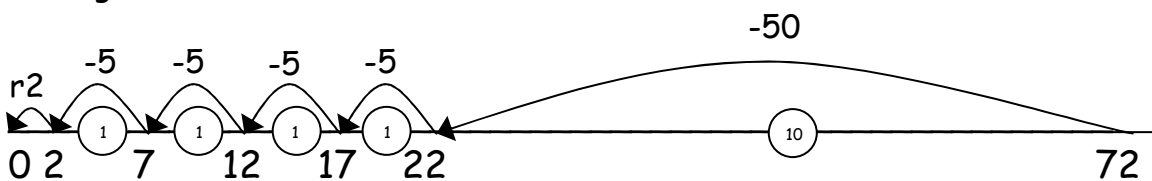
$$13 \div 4 = 3 \text{ r } 1$$



$$72 \div 5$$



Moving onto:



PHASE 3: Mental division using Partitioning (NNF - Y3/4, Level 3)

These methods are based on knowledge of partitioning and the distributive law of division over addition. Children should be introduced to the principle of this law (not its name). This allows a multiple of the divisor and the remaining number to be divided separately. The results are then added to find the total quotient.

$$\begin{array}{r}
 84 \text{ divided by } 7 = 70 + 14 \\
 \quad \quad \quad \downarrow \quad \quad \downarrow \\
 \quad \quad \quad 10 + 2 = 12
 \end{array}$$

divided by 7

Vocabulary
divisible by, partition,

PHASE 4: Expanded Short Division (NNF - Y5/6, Level 4/5)

- ✓ **Expanded Short Division TU ÷ U using the vertical method - chunking**
This method should be linked to repeated subtraction or grouping. Children will approximate first.

$$72 \div 3$$

$$\begin{array}{r} 3 \overline{) 72} \\ - 30 \\ \hline 42 \\ - 30 \\ \hline 12 \\ - 6 \\ \hline 6 \\ - 6 \\ \hline R 0 \end{array} \quad \begin{array}{l} 3 \times 10 \\ 3 \times 10 \\ 3 \times 2 \\ 3 \times 2 \end{array}$$

Vocabulary

dividend (quantity to be divided - 72), divisor (number to divide by - 3), (quotient (answer - 24), inverse, remainder, integer

Answer: 24 (no remainder)

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 $62 \div 8$ 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)

- ✓ **Short Division TU ÷ U using the vertical method**

Some children will be ready to move onto short division without chunking, however it is essential that they understand the mathematics behind this method.

$$\begin{array}{r} 24 \\ 3 \overline{) 72} \\ \hline 1 \end{array}$$

They should understand that it is not "3 into 7" but "3 into 70"

PHASE 5: Long Division (NNF - Y6, Level 5)

✓ Long division HTU \div TU

$$972 \div 36$$

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

Any remainders should be shown as fractions, i.e. if the children were dividing 32 by 10, the answer should be shown as $3 \frac{2}{10}$ which could then be written as $3 \frac{1}{5}$ in it's lowest terms.

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.