

# PROGRESSION THROUGH CALCULATIONS FOR DIVISION

## MENTAL CALCULATIONS

(ongoing)

These are a **selection** of mental calculation strategies:

See NNS Framework Section 5, pages 52-57 and Section 6, pages 58-65

### 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 1      2 times table  
              5 times table  
              10 times table

Year 2      2 times table  
              3 times table  
              5 times table  
              10 times table

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

Year 4      Derive and recall all division facts up to  $12 \times 12$

Years 5 & 6 Derive and recall quickly all division facts up to  $12 \times 12$ .

### Using and applying division facts

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

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

$30 \times 7 = 210$ ,  $300 \times 7 = 2100$ ,  $3000 \times 7 = 21\,000$ ,  $0.3 \times 7 = 2.1$  etc

## Dividing by 10, 100, 1000, 10000, 100000 and 1000000

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 4 Divide any number to 10000 by 10 and 100

Year 5 Divide whole numbers and decimals by 10, 100, 1000, 10000, 100000 and 1000000

Year 6 Divide whole numbers and decimals up to 3DP by 10, 100, 1000, 10000, 100000 and 1000000

## Use of factors

$$\begin{array}{l} 378 \div 21 \quad 378 \div 3 = 126 \qquad 378 \div 21 = 18 \\ \qquad \qquad 126 \div 7 = 18 \end{array}$$

## Use related facts

Given that  $1.4 \times 1.1 = 1.54$

What is  $1.54 \div 1.4$ , or  $1.54 \div 1.1$ ?

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

THE FOLLOWING ARE MINIMUM 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!'**

## YR and Y1

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

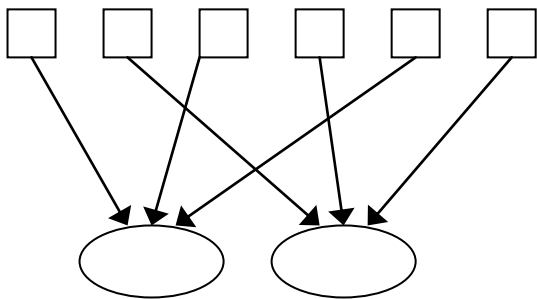


## Y2

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

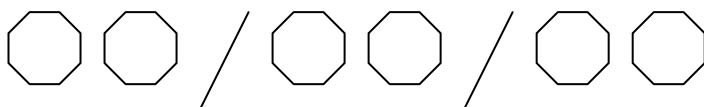
### ✓ **Sharing equally**

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



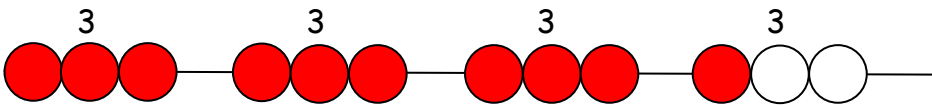
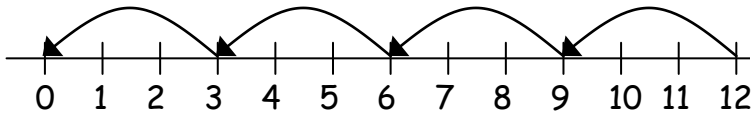
### ✓ **Grouping or repeated subtraction**

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



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

$$12 \div 3 = 4$$



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

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

$$\square \div 2 = 4 \qquad 20 \div \triangle = 4 \qquad \square \div \triangle = 4$$

### Y3

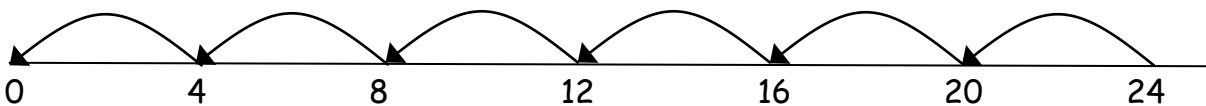
Ensure that the emphasis in Y3 is on grouping rather than sharing.

Children will continue to use:

- ✓ **Repeated subtraction using a number line**

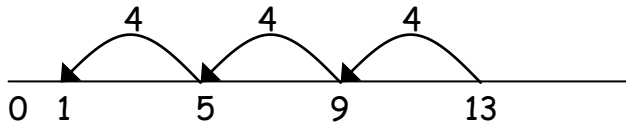
Children will use an empty number line to support their calculation.

$$24 \div 4 = 6$$



Children should also move onto calculations involving remainders.

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



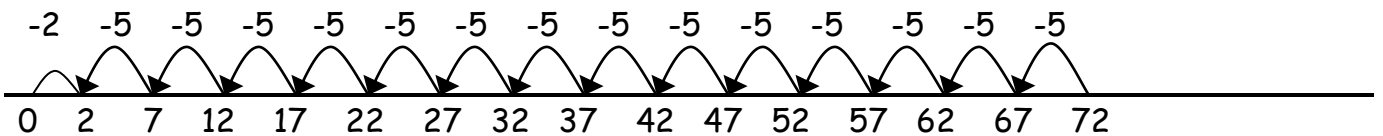
✓ Using symbols to stand for unknown numbers to complete equations using inverse operations

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

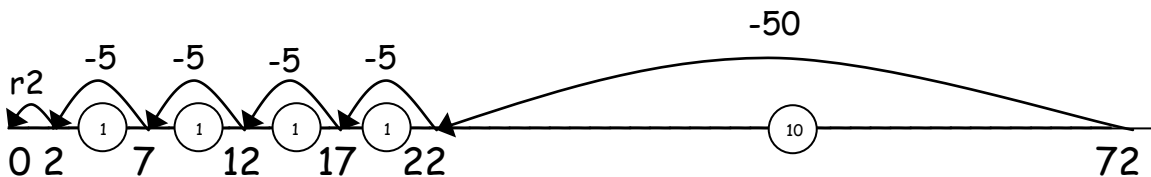
✓ **Chunking**

Children will develop their use of repeated subtraction to be able to subtract 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.

$72 \div 5$



**Moving onto:**



**Y4**

✓ **Chunking**

Initially children subtract several chunks, but with practice they should look for the biggest multiples of the divisor that they can find to subtract.

✓ **Vertical Chunking**

Short division  $TU \div U$

$$72 \div 3$$

$$\begin{array}{r} 3 \overline{) 72} \\ - 30 \\ \hline 42 \\ - 30 \\ \hline 12 \\ - 6 \\ \hline 6 \\ - 6 \\ \hline 0 \end{array}$$

Answer : 24

Leading to subtraction of other multiples.

$$96 \div 6$$

$$\begin{array}{r} 16 \\ 6 \overline{) 96} \\ - 60 \\ \hline 36 \\ - 36 \\ \hline 0 \end{array}$$

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  $62 \div 8$  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)


## Y5

Children will continue to use written methods to solve short division  $TU \div U$ .

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

✓ **Short division** **Vertical chunking**  $HTU \div U$

$$196 \div 6$$

$$\begin{array}{r} 32 \text{ r } 4 \\ 6 \overline{) 196} \\ \underline{- 180} \\ 16 \\ \underline{- 12} \\ 4 \end{array}$$


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:  $98 \div 4 = 24 \text{ r } 2 = 24\frac{1}{2} = 24.5 = 25$ .

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  $240 \div 52$  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  $ThHTU$  by  $U$ .

✓ Children who are confident may also use the short division method:

$$\begin{array}{r} 97 \\ 3 \overline{) 291} \end{array}$$

## Y6

Children will continue to use written methods to solve short division  $HTU \div U$  and  $ThHTU \div U$ .

✓ Long division **by chunking** HTU ÷ TU

972 ÷ 36

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

20x  
 7x  
 ↓  
 27

Answer : 27

Children will work on numbers up to four digits divided by two digits.

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.

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

87.5 ÷ 7

$$\begin{array}{r}
 12.5 \\
 7 \overline{) 87.5} \\
 \underline{- 70.0} \\
 17.5 \\
 \underline{- 14.0} \\
 3.5 \\
 \underline{- 3.5} \\
 0
 \end{array}$$

10x  
 2x  
 0.5x  
 ↓  
 12.5

Answer : 12.5

✓ Children can express remainders as fractions or decimals

456 ÷ 5 = 91.2

$$\begin{array}{r}
 91.2 \\
 5 \overline{) 456.10}
 \end{array}$$

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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 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.