



Wreay C of E Primary School Progression through Calculations for Division

MENTAL CALCULATIONS (ongoing)

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

(Ideas are taken from the new National Curriculum September 2014)

Doubling and halving

Knowing that halving is dividing by 2.

Deriving and recalling division facts

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

<u>Reception</u>	Beginning to develop chanting of: 2 times table 5 times table 10 times table
<u>Year 1</u>	Teach and know the value of: 2 times table 5 times table 10 times table
<u>Year 2</u>	Practise and develop: 2 times table 5 times table 10 times table Teach: 3 times table 4 times table
<u>Year 3</u>	Practise: 2 times table 5 times table 10 times table 3 times table 4 times table Teach: 6 times table 8 times table
<u>Year 4</u>	Practise all tables so far. Teach: 7 times table 9 times table 11 times table 12 times table
<u>Year 5 & 6</u>	Derive and recall quickly all multiplication 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 $3 \times 7 = 21$, 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 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 of factors

$$378 \div 21 \quad 378 \div 3 = 126 \quad 378 \div 21 = 18$$

$$126 \div 7 = 18$$

Use related facts

Given that $1.4 \times 1.1 = 1.54$

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

IF USING NUMBERLINES FOR DIVISION CALCULATIONS THE ARROWS SHOULD BE DRAWN BELOW THE NUMBERLINE.

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



THE FOLLOWING ARE STANDARDS THAT WE EXPECT THE MAJORITY OF CHILDREN TO ACHIEVE BY THE END OF THE ACADEMIC YEAR.

RECEPTION

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.





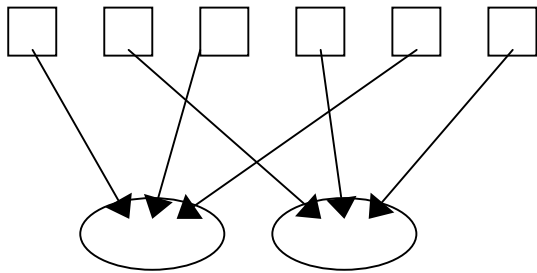
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YEAR 1

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

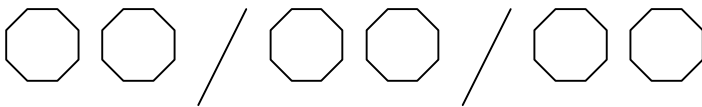
✓ **Sharing equally**

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



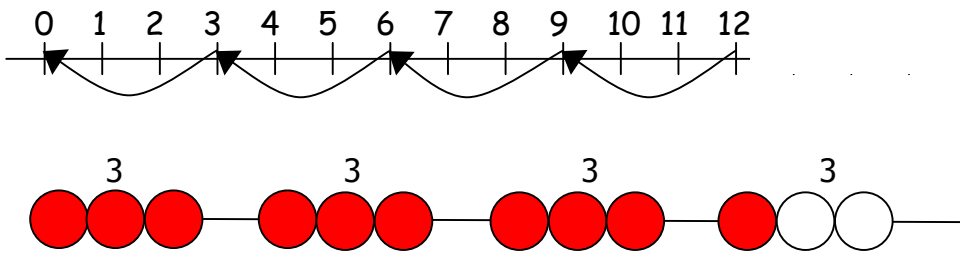
✓ **Grouping or repeated subtraction**

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?'



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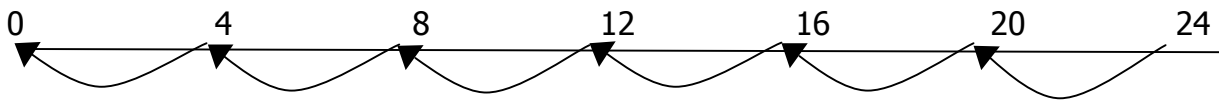
YEAR 2

Children will continue to use:

✓ **Repeated subtraction using a number line**

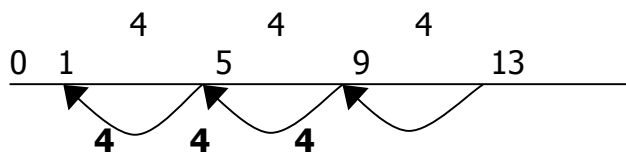
Children will use an empty number line to support their calculation.

$$24 \div 4 = 6$$



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**

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

Pupils should also know:

- ✓ That multiplication of two numbers can be done in any order (commutative) and division of one number by another cannot.
- ✓ How to solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in context.

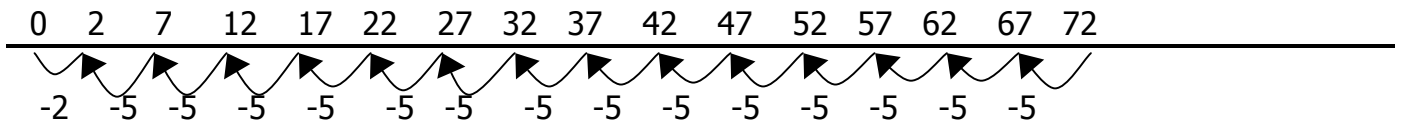


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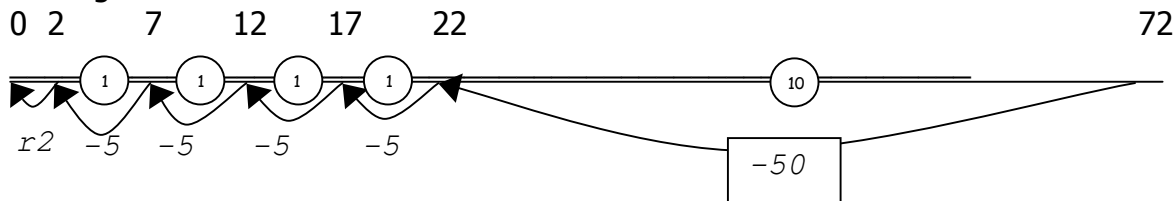
YEAR 3

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.

$$72 \div 5$$



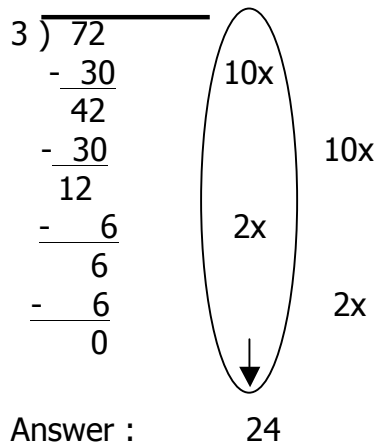
Moving onto:



Then onto the vertical method:

Short division TU \div U (CHUNKING)

$$72 \div 3$$





Leading to subtraction of other multiples.

$$96 \div 6$$

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

Answer : 16

Diagram illustrating the division process: A vertical oval encloses the numbers 10x and 6x. An arrow points from the 6x to the 16 in the answer.

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)



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YEAR 4

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 $HTU \div U$ (CHUNKING)

$$196 \div 6$$

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

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 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.



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YEAR 5

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

Long division $HTU \div TU$ (CHUNKING)

$$972 \div 36$$

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

20x
7x

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 $3 \frac{2}{10}$ which could then be written as $3 \frac{1}{5}$ in its lowest terms.

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

$$87.5 \div 7$$

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

10x
2x
0.5x

Answer : 12.5

NOTE: If you have any children that are secure with the 'chunking' method for short and long division they may move onto the traditional methods shown in Year 6.

Children should also be taught:

- ✓ To divide whole numbers and those involving decimals by 10, 100 and 1000.
- ✓ Divide numbers up to 4 digits by a one digit number using written methods of short division and interpret remainders appropriately for the context.



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YEAR 6

Traditional method

(Short division – division by a single digit)

$$\begin{array}{r} 132 \\ 3 \overline{) 396} \end{array}$$

To work this out divide 396 into 3 one digit at a time, starting from the left (which represents 300 in the number 396). Put the results of each division on the top of the line.

The 3 goes into the 3, 1 time exactly,

The 9 goes into the 3, 3 times exactly,

The 3 goes into the 6, 2 times exactly.

Children could check if this is correct by using the inverse – $3 \times 132 = 396$

Carrying Numbers

$$\begin{array}{r} 513 \\ 5 \overline{) 25615} \end{array}$$

Divide 5 into 2,565 one digit at a time. Starting from the left.

5 won't go into 2 so this is carried over to the hundreds column, where you now have 25 in the hundreds column.

5 goes into 25 5 times exactly.

5 goes into 6 once, so this remainder is carried over to the next column where you now have 15.

5 Goes into 15 3 times exactly.

Traditional method

(Long division – division by two digit number)

$$15 \overline{) 8640}$$

15 doesn't go into 8 so look at the next digit.

15 goes into 86 5 times so put a 5 above the 6. $15 \times 5 = 75$

$$\begin{array}{r} 5 \\ 15 \overline{) 8640} \end{array}$$

$$\begin{array}{r} 5 \\ 15 \overline{) 8640} \\ \underline{75} \\ 11 \end{array}$$

Take the 75 away from the 86 to get your remainder. $86 - 75 = 11$



$$\begin{array}{r} 5 \\ 15 \overline{) 8640} \\ \underline{75} \\ 114 \end{array}$$

Next carry the 4 down to make 114. 15 goes into 114 7 times so put a 7 above the 4.
 $15 \times 7 = 105$.

$$\begin{array}{r} 576 \\ 15 \overline{) 8640} \\ \underline{75} \\ 114 \\ \underline{105} \\ 90 \end{array}$$

Take 105 from 114 to get your remainder: $114 - 105 = 9$

Carry the 0 down next to the 9 to make 90. 15 goes into 90 6 times exactly so put a 6 above the 0.

Children should also be taught:

- ✓ To divide numbers up to 4 digits by a two digit whole number using the formal written method, and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context.
- ✓ Divide proper fractions by whole numbers (e.g. $\frac{1}{3} \div 2 = \frac{1}{6}$)
- ✓ Associate a fraction with division and calculate decimal fraction equivalents (e.g. 0.375) for a simple fraction (e.g. $\frac{3}{8}$)

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 consider if a mental calculation would be appropriate before using written methods.