Progression Towards a Written Method for Division

In developing a written method for division, it is important that children understand the concept of division, in that it is:

- repeated subtraction
- sharing into equal amounts

They also need to understand and work with certain principles, i.e. that it is:

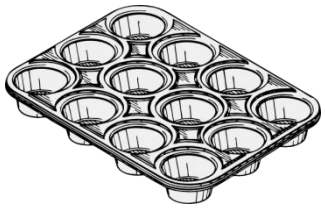
- the inverse of multiplication
- not commutative i.e. 15 ÷3 is not the same as 3 ÷ 15
- not associative i.e. 30 ÷ (5 ÷ 2) is not the same as (30 ÷ 5) ÷ 2

YR

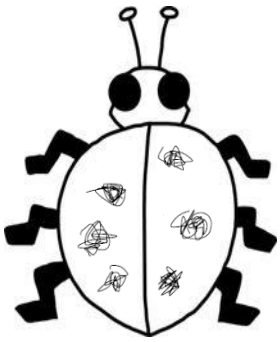
Early Learning Goal:
Children solve problems, including halving and sharing.

Children are encouraged to develop a mental picture of the number system in their heads to use for calculation. They should experience practical calculation opportunities using a wide variety of equipment, including small world play, role play, counters, cubes etc.

Children may also investigate sharing items or putting items into groups using items such as egg boxes, ice cube trays and baking tins which are arrays.



They may develop ways of recording calculations using pictures, etc.



A child's jotting showing halving six spots between two sides of a ladybird.

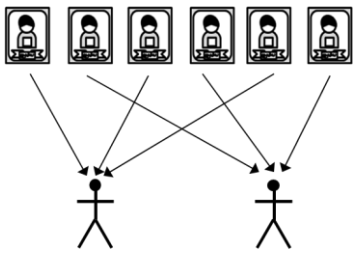
A child's jotting showing how they shared the apples at snack time between two groups.

Y1

End of Year Objective:
Solve one-step problems involving division by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher.

In year one, children will continue to solve division problems using practical equipment and jottings. They should use the equipment to share objects and separate them into groups, answering questions such as 'If we share these six apples between the three of you, how many will you each have? How do you know?' or 'If six football stickers are shared between two people, how many do they each get?'

They may solve both of these types of question by using a 'one for you, one for me' strategy until all of the objects have been given out.



Children should be introduced to the concept of simple remainders in their calculations at this practical stage, being able to identify that the groups are not equal and should refer to the remainder as '… left over'.

Y2

End of Year Objective:
Calculate mathematical statements for division within the multiplication tables and write them using the division (÷) and equals (=) signs.

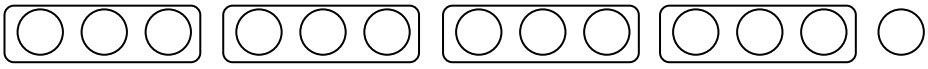
Children will utilise practical equipment to represent division calculations as grouping (repeated subtraction) and use jottings to support their calculation, e.g.

12 ÷ 3 =

Children need to understand that this calculation reads as 'How many groups of 3 are there in 12?'

They should also continue to develop their knowledge of division with remainders, e.g.

13 ÷ 4 =



13 ÷ 4 = 3 remainder 1

Children need to be able to make decisions about what to do with remainders after division and round up or down accordingly. In the calculation 13 ÷ 4, the answer is 3 remainder 1, but whether the answer should be rounded up to 4 or rounded down to 3 depends on the context, as in the examples below:

I have £13. Books are £4 each. How many can I buy?
Answer: 3 (the remaining £1 is not enough to buy another book)

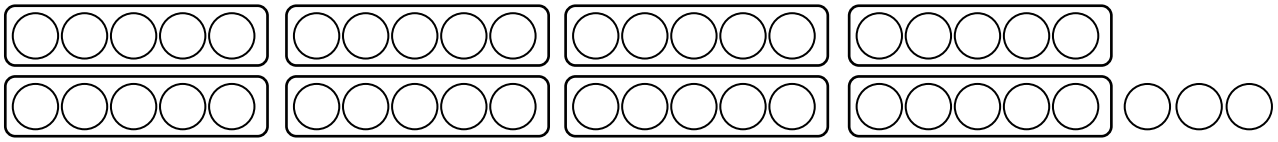
Apples are packed into boxes of 4. There are 13 apples. How many boxes are needed?
Answer: 4 (the remaining 1 apple still needs to be placed into a box)

Y3

End of Year Objective:
Write and calculate mathematical statements for division using the multiplication tables that they know, including for two-digit numbers divided by one-digit numbers, progressing to formal written methods.*

Initially, children will continue to use division by grouping (including those with remainders), where appropriate linked to the multiplication tables that they know (2, 3, 4, 5, 8 and 10), e.g.

43 ÷ 8 =



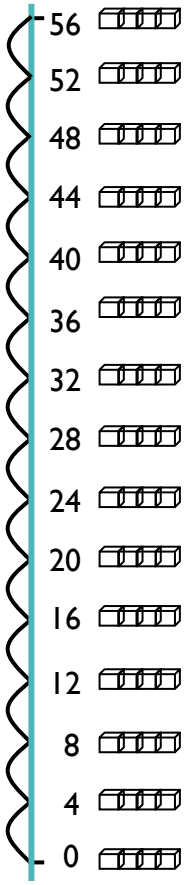
43 ÷ 8 = 5 remainder 3

Children should first use the repeated subtraction on a vertical number line alongside the continued use of practical equipment. There are two stages to this:

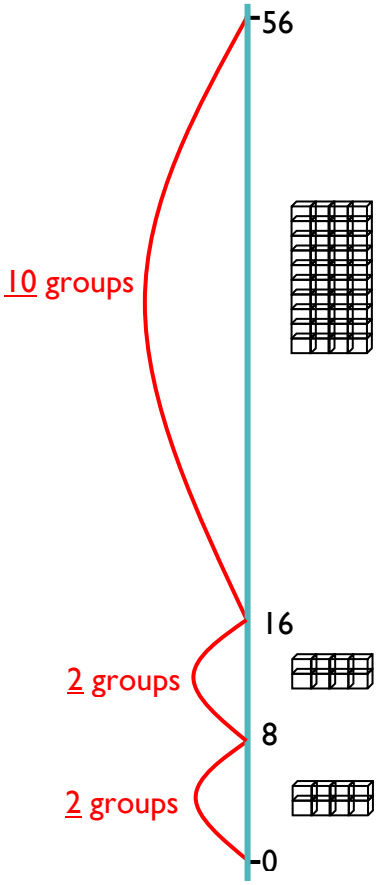
Stage 1 – repeatedly subtracting individual groups of the divisor
Stage 2 – subtracting multiples of the divisor (initially 10 groups and individual groups, then 10 groups and other multiples in line with tables knowledge)

After each group has been subtracted, children should consider how many are left to enable them to identify the amount remaining on the number line.

Stage 1
56 ÷ 4 = 14 (groups of 4)



Stage 2
56 ÷ 4 = 10(groups of 4) + 2(groups of 4) + 2(groups of 4)
= 14(groups of 4)



Children should be able to solve real life problems including those with money and measures. They need to be able to make decisions about what to do with remainders after division and round up or down accordingly.

Y4

End of Year Objective:
Divide numbers up to 3 digits by a one-digit number using the formal written method of short division and interpret remainders appropriately for the context.

Children will need to use knowledge of multiplication facts to be able to use short division effectively. Multiples of the divisor must be identified and remainders must be calculated.

98 ÷ 7 becomes

$$\begin{array}{r} 1\ 4 \\ 7\overline{)\ 9^{2}\ 8} \end{array}$$

Answer: 14

432 ÷ 5 becomes

$$\begin{array}{r} 8\ \ 6\ \ r2 \\ 5\overline{)\ 4\ 3^{3}\ 2} \end{array}$$

Answer: 86 remainder 2

Children should write their answer above the calculation to make it easy for them and the teacher to distinguish. Children must be careful to write their answer in the correct place, ensuring that H T and O line up in answers and dividend.

Y5

End of Year Objective:
Divide numbers up to 4 digits by a one-digit number using the formal written method of short division and interpret remainders appropriately for the context.

By the end of year 5, children should be able to use the short division method to divide a four digit number by a single digit number.

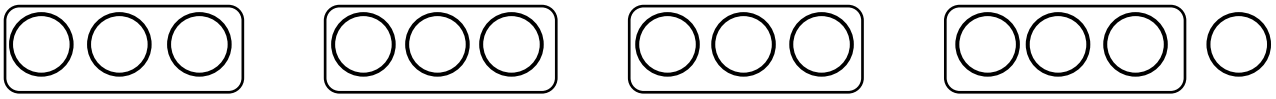
$$8\overline{)3^{3}26^{6}0}\quad 40\ 7\ r4$$

Remainder 4

$\frac{4}{8} = \frac{1}{2}$

Answer = 407 ½

For simple fraction equivalents, this could also be demonstrated using a simple calculation such as 13 ÷ 4 to show the remainder initially as a fraction.



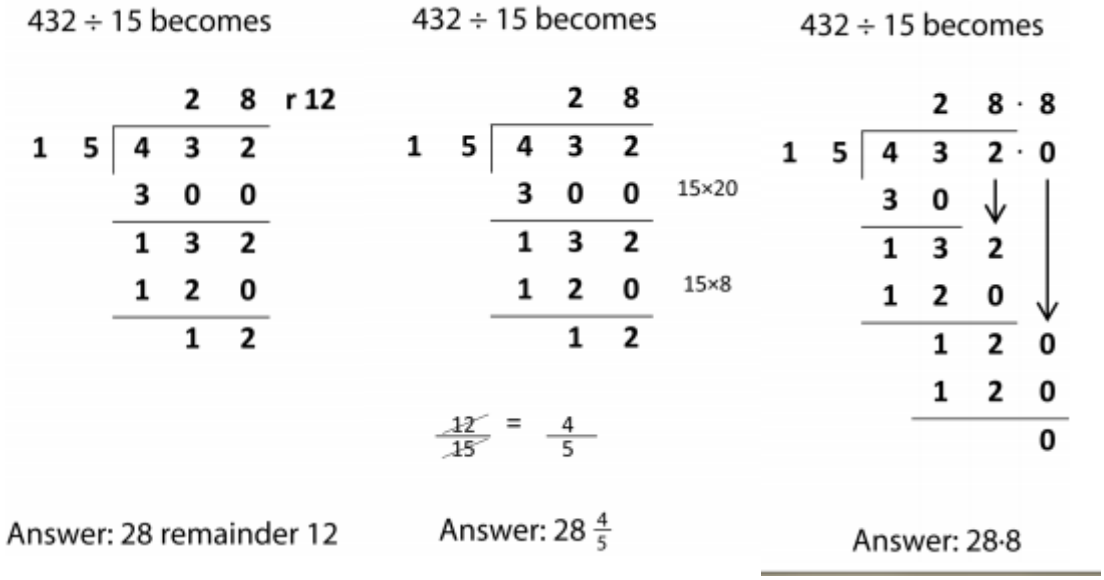
Using practical equipment, children can see that for 13 ÷ 4, the answer is 3 remainder 1, or put another way, there are three whole groups and a remainder of 1. This remainder is one part towards a full group of 4, so is $\frac{1}{4}$. To show the remainder as a fraction, it becomes the numerator where the denominator is the divisor (the number that you are dividing by in the calculation).

Children should be able to solve real life problems including those with money and measures. They need to be able to make decisions about what to do with remainders after division and round up or down accordingly.

Y6

End of Year Objective:
Divide numbers up to 4 digits by a two-digit number using the formal written method of long division where appropriate, interpreting remainders according to the context.

Use written division methods in cases where the answer has up to two decimal places.



Using the long division method, children should be able to interpret quotients (remainders) as whole numbers by rounding up or down where appropriate, as fractions and as decimal numbers up to two decimal places.
Children should be able to solve real life problems including those with money and measures. They need to be able to make decisions about what to do with remainders after division and round up or down accordingly.

To show the remainder as a decimal relies upon children's knowledge of decimal fraction equivalents. For decimals with no more than 2 decimal places, they should be able to identify:

Half: $\frac{1}{2} = 0.5$

Quarters: $\frac{1}{4} = 0.25$, $\frac{3}{4} = 0.75$

Fifths: $\frac{1}{5} = 0.2$, $\frac{2}{5} = 0.4$, $\frac{3}{5} = 0.6$, $\frac{4}{5} = 0.8$

Tenths: $\frac{1}{10} = 0.1$, $\frac{2}{10} = 0.2$, $\frac{3}{10} = 0.3$, $\frac{4}{10} = 0.4$, $\frac{5}{10} = 0.5$, $\frac{6}{10} = 0.6$, $\frac{7}{10} = 0.7$, $\frac{8}{10} = 0.8$, $\frac{9}{10} = 0.9$

Children can identify the quotient as a fraction and then find the decimal equivalent.

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  446
8|3574
 3200-
  374
  320-
   54
   48-
    6
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Remainder 6

$\frac{6}{8} = \frac{3}{4} = 0.75$

Answer = 446.75

In the example, 3574 ÷ 8, children should be able to identify that the remainder as a fraction of $\frac{6}{8}$ can be written as $\frac{3}{4}$ in its lowest terms. As $\frac{3}{4}$ is equivalent to 0.75, the answer can therefore be written as 446.75

How to use long division:

To calculate 748 divided by 51,

First, set the sum out as shown:

$$51\overline{)748}$$

We work out 74 divided by 51, and write the answer (1) above the 4.

1 × 51 = 51, so we write this underneath 74.
Subtract 51 from 74 to get the remainder (23).

$$\begin{array}{r} 1 \\ 51\overline{)748} \\ -51 \\ \hline 23 \end{array}$$

We now bring down the next digit (8) and write it on the end of the 23.

$$\begin{array}{r} 1 \\ 51\overline{)748} \\ -51 \\ \hline 238 \end{array}$$

We now work out 238 divided by 51, and write the answer (4) above the 8. You use estimation skills here: 51 is roughly 50 and 4 × 50 = 200. You can work out 51 × 4 = 204 separately.

We write 204 underneath the 238 and subtract to find the remainder. There are no more digits to bring down, so we have our answer:

$$\begin{array}{r} 14 \\ 51\overline{)748} \\ -51 \\ \hline 238 \\ -204 \\ \hline 34 \end{array}$$

So the answer is **14 remainder 34.**