

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

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

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

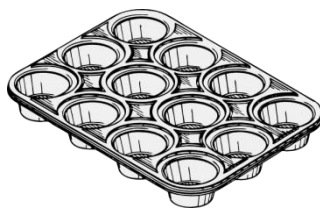
YR

Early Learning Goal:

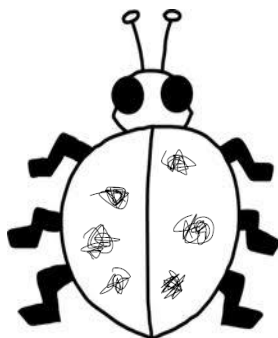
Children solve problems, including halving and sharing.

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.



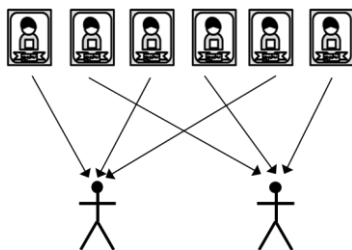
Y1

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 (\div) 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.

$$12 \div 3 =$$

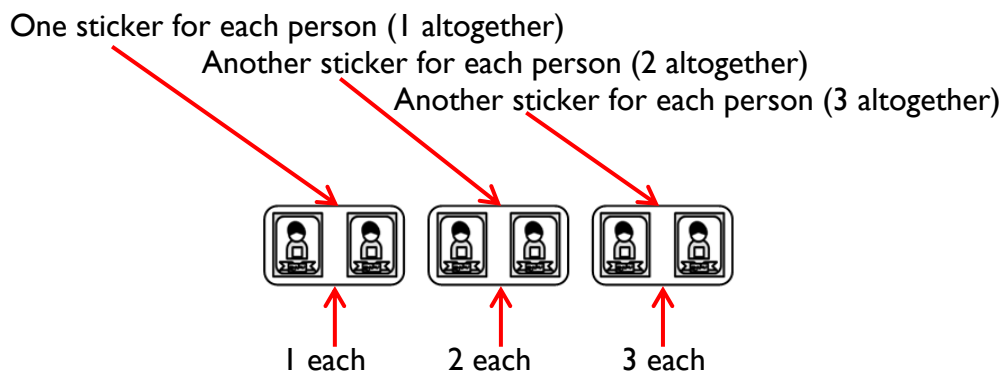


Children need to understand that this calculation reads as 'How many groups of 3 are there in 12?'

The link between sharing and grouping can be modelled in the following way:

To solve the problem 'If six football stickers are shared between two people, how many do they each get?'

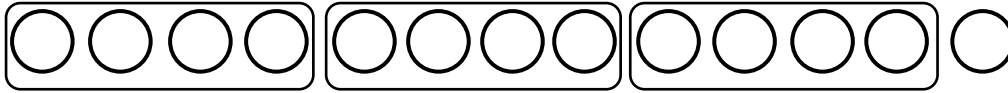
Place the football stickers in a bag or box and ask the children how many stickers would need to be taken out of the box to give each person one sticker each (i.e. 2) and exemplify this by putting the cards in groups of 2 until all cards have been removed from the bag.



Or:

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

$$13 \div 4 =$$



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

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 $13 \div 4$, 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 need 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.*

**Although the objective suggests that children should be using formal written methods, the National Curriculum document states "The programmes of study for mathematics are set out year-by-year for key stages 1 and 2. Schools are, however, only required to teach the relevant programme of study by the end of the key stage. Within each key stage, schools therefore have the flexibility to introduce content earlier or later than set out in the programme of study." p4*

It is more beneficial for children's understanding to go through the expanded methods of calculation as steps of development towards a formal written method.

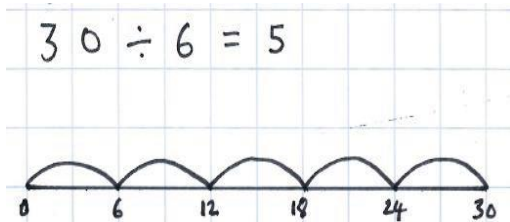
Initially, children will continue to use division by grouping (including those with remainders), where appropriate linked to the multiplication tables that they know (2, 3, 4, 5, 8 and 10), e.g.

$$43 \div 8 =$$



$$43 \div 8 = 5 \text{ remainder } 3$$

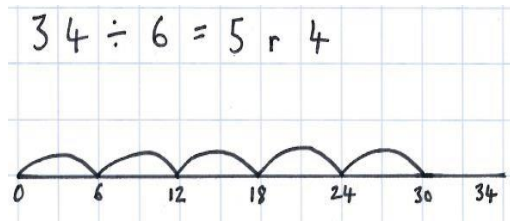
GROUPING



A number line counting up from zero. This representation should be supported by grouping of concrete materials and other pictorial representations.

Note: National Curriculum times table requirements should be considered when choosing examples for the early written division methods. National Curriculum requirements are by the end of Y2: x2, x5 and x10. By the end of Y3: x3, x4 and x8. By the end of Y4: up to 12 x 12.

GROUPING WITH REMAINDERS



Again, using a number line counting up from zero. This should also be supported by grouping of concrete materials and other pictorial representations.

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.

CHUNKING

Children will continue to develop their use of grouping (repeated subtraction) to be able to subtract multiples of the divisor, moving on to the use of the 'chunking' method.

$$\begin{array}{r} 12 \\ 4 \overline{) 48} \\ - 40 \\ \hline 8 \\ - 8 \\ \hline 0 \end{array}$$

Children should write their answer above the calculation to make it easy for them and the teacher to distinguish.

Answer: 12

When developing their understanding of 'chunking', children should utilise a 'key facts' box, as shown below. This enables an efficient recall of tables facts and will help them in identifying the largest group they can subtract in one chunk. Any remainders should be shown as integers, e.g.

$73 \div 3$

$$\begin{array}{r} 24r1 \\ 3 \overline{) 73} \\ - 30 \\ \hline 43 \\ - 30 \\ \hline 13 \\ - 6 \\ \hline 7 \\ - 6 \\ \hline 1 \end{array}$$

Key facts box

1x	3
2x	6
5x	15
10x	30

By the end of year 4, children should be able to use the chunking method to divide a three-digit number by a single digit number. To make this method more efficient, the key facts in the menu box should be extended to include 4x and 20x, e.g.

$196 \div 6$

$$\begin{array}{r} 32r4 \\ 3 \overline{) 196} \\ - 120 \\ \hline 76 \\ - 60 \\ \hline 16 \\ - 12 \\ \hline 4 \end{array}$$

Key facts box

1x	6
2x	12
4x	24
5x	30
10x	60
20x	120

SHORT DIVISION

$$\begin{array}{r} 24 \\ 4 \overline{) 96} \end{array}$$

After introduction, short division is extended into dividing up to three digits by one digit. Children should be able to interpret remainders appropriately for the context.

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.

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.

CHUNKING CONTINUED

Children may continue to use the key facts box for as long as they find it useful. Using their knowledge of linked tables facts, children should be encouraged to use higher multiples of the divisor. **During Year 5, children should be encouraged to be efficient when using the chunking method and not have any subtraction steps that repeat a previous step. For example, when performing $347 \div 8$ an initial subtraction of 160 (20×8) and a further subtraction of 160 (20×8) should be changed to a single subtraction of 320 (40×8).** Also, any remainders should be shown as integers, e.g.

$$523 \div 8$$

$$\begin{array}{r}
 65r3 \\
 8 \overline{) 523} \\
 \underline{- 320} \quad 40x \\
 203 \\
 \underline{- 160} \quad 20x \\
 43 \\
 \underline{- 40} \quad 5x \\
 3
 \end{array}$$

By the end of year 5, children should be able to use the chunking method to divide a four digit number by a single digit number. If children still need to use the key facts box, it can be extended to include 100x.

$$2458 \div 7$$

$$\begin{array}{r}
 351r1 \\
 7 \overline{) 2458} \\
 \underline{- 2100} \quad 300x \\
 358 \\
 \underline{- 350} \quad 50x \\
 8 \\
 \underline{- 7} \quad 1x \\
 1
 \end{array}$$

SHORT DIVISION CONTINUED

$$\begin{array}{r}
 86r2 \\
 5 \overline{) 432} \\
 \underline{40} \\
 32 \\
 \underline{30} \\
 2
 \end{array}$$

Move onto divisions with a remainder.

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 short division where appropriate, interpreting remainders according to the context.

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

SHORT DIVISION CONTINUED

$5 \overline{) 9331}^{186 \frac{1}{5}}$ Once children understand remainders, begin to express as a fraction or decimal.

The formal long division method is introduced. Where appropriate, children should be interpreting remainders as whole numbers, fractions, decimals or rounding as required.

$\begin{array}{r} 227r11 \\ 28 \overline{) 6367} \\ \underline{56} \\ 76 \\ \underline{56} \\ 20 \\ \underline{20} \\ 07 \\ \underline{07} \\ 00 \\ \underline{00} \\ 11 \end{array}$	Multiples of 28 28 56 84 112 140 168 196
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The 'Bus Stop Method' can be used, for pupils who are ready, alongside the formal long division method.

$$\begin{array}{r} 227r11 \\ 28 \overline{) 6367} \end{array}$$

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.