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 ÷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.
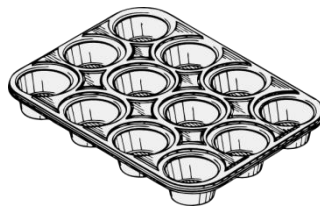
They may develop ways of recording calculations using pictures, etc.
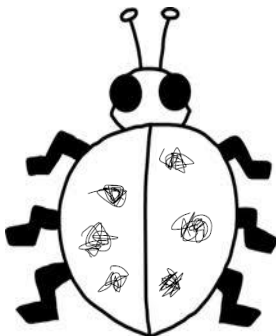
A child's jotting showing halving six spots between two sides of a ladybird.

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

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 understand division in 2 ways:

To group equally, answering questions such as 'If there are 8 cans, how many boxes of 2 can you make?"

1 There are 8 cans.
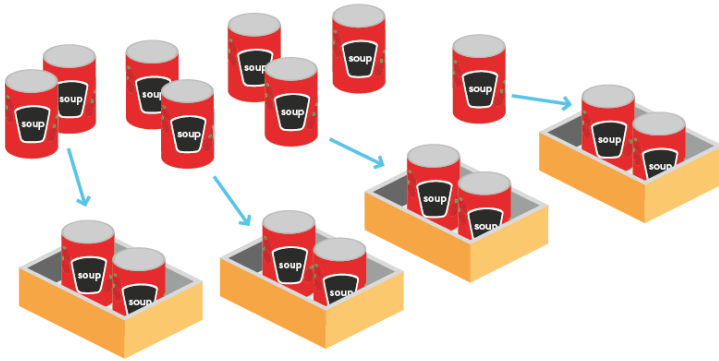
There are 4 boxes of 2 cans.

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

There are 6 cookies.
Each child takes the same number of cookies.
How many cookies does each child get?

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

Children will continue their work from Year 1 to utilise practical equipment to represent division calculations as both grouping (repeated subtraction) and sharing.

When groups, they can use jottings to support their calculation, e.g.
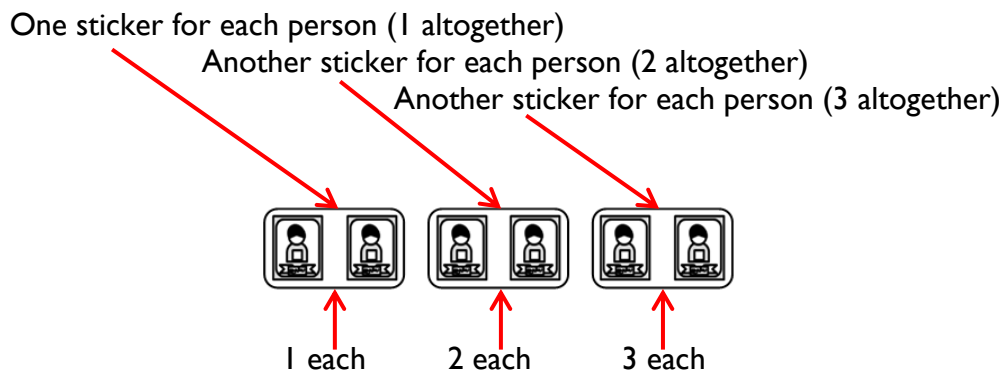
12 ÷ 3 =

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

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.

One sticker for each person (1 altogether)
Another sticker for each person (2 altogether)
Another sticker for each person (3 altogether)

Or:

1 each   2 each   3 each

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

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

Children will then begin to develop to dividing the tens and the units separately, using practical equipment to support, e.g.
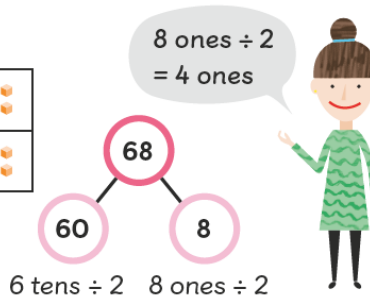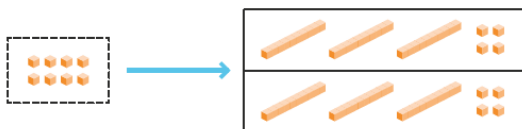
To find the number of sweets each person gets, divide 68 by 2.

68 ÷ 2 =

Step 1   Divide 6 tens by 2.

6 tens ÷ 2 = 3 tens

68
60   8
6 tens ÷ 2

Step 2   Divide 8 ones by 2.

8 ones ÷ 2 = 4 ones
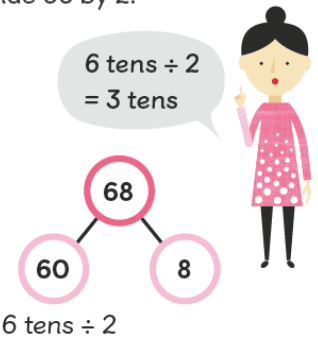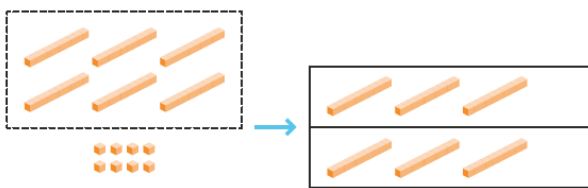
68
60   8
6 tens ÷ 2   8 ones ÷ 2
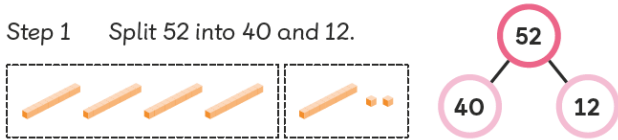
Step 3   Add the results.

68 ÷ 2 = 30 + 4 = 34
Each person gets 34 sweets.

Followed by dividing using renaming, e.g.
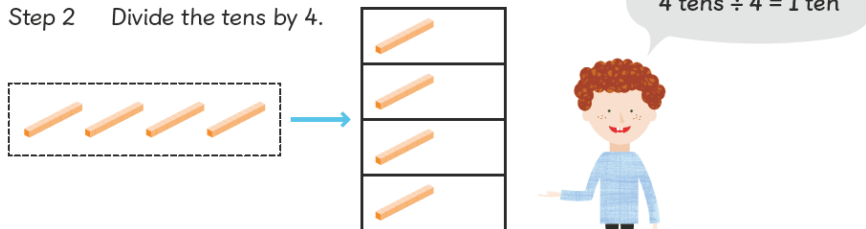
To find the number of ice creams in each box, divide 52 by 4.
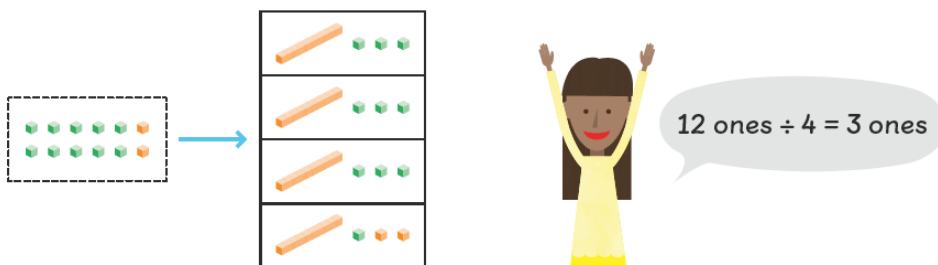
$52 \div 4 =$

Step 1   Split 52 into 40 and 12.

52

40   12

Step 2   Divide the tens by 4.

4 tens ÷ 4 = 1 ten

Step 3   Regroup 1 ten into 10 ones.

Step 4   Divide the ones by 4.

12 ones ÷ 4 = 3 ones

Step 5   Add the results.

$52 \div 4 = 10 + 3 = 13$

There are 13 ice creams in each box.

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.


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 continue to develop their use of grouping (repeated subtraction), sharing and renaming to solve division problems.

Children will continue to solve problems using grouping and sharing with remainders, interpreting remainders, e.g.

1 There were 11 balloons.
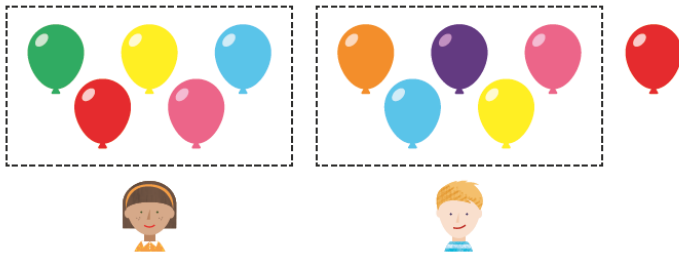
$11 \div 2 = 5$ remainder 1

The quotient is 5 and the remainder is 1.
Each friend got 5 balloons.
There was 1 balloon left over.

They will begin to formalise their thinking using bar modelling.

Children will solve division problems by building on Year 3 work on division by renaming, moving onto the formal method:

Each should take 34 postcards. $68 \div 2 = 34$

This method can be developed further to divide 3 digit numbers, e.g.

Method 2

4 hundreds ÷ 4

```
           1
4 ) 4  0  8
  - 4
  ─────────
           8
  -        8
  ─────────
           0
```

```
4 ) 4  0  8
  - 4
  ─────────
           8
  -        8
  ─────────
           0
```

8 ones ÷ 4

```
           1  0  2
4 ) 4  0  8
  - 4
  ─────────
           8
  -        8
  ─────────
           0
```

408 ÷ 4 = 102

She got 102 boxes.

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.

Year 5 will continue to develop methods learnt in Year 4, including problems with remainders.

```
          3   1   0
    3 )   9   3   0
      -   9   0   0
              3   0
      -       3   0
                  0
```

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.

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.

Year 6 will continue to practice and develop their methods from Year 5 to divide by a 2 digit number, including using bar modeling to solve division problems.

(2) $360 \div 12 = \boxed{}$

360 = 36 tens

$$12 \overline{)\begin{array}{ccc} 3 & 6 & 0 \end{array}}$$
$$- \quad 3 \quad 6$$
$$\overline{ 0}$$

360 = 36 tens

↓

12 tens

Share equally by 12.

$$\begin{array}{r} 3 \quad 0 \\ 12 \overline{)\begin{array}{ccc} 3 & 6 & 0 \end{array}} \\ - \quad 3 \quad 6 \\ \hline 0 \end{array}$$

3 tens

36 tens ÷ 12 = 3 tens

360 ÷ 12 = 30

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.