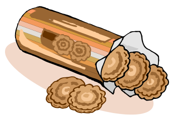
Teaching Division from Foundation to Year 6

Children are taught to understand division as 'repeated subtraction', using sharing and grouping.

Practical experience of sharing



10 fat sausages sizzling in the pan – encourages counting back in 2s.

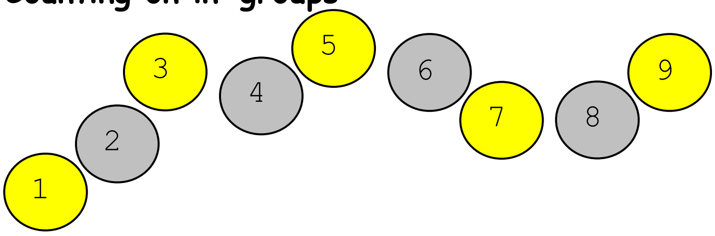
Putting things into pairs

Although division is not formally introduced until year 2 the ground work is laid as early as the foundation stage.
This includes songs that encourage equal jumps.

The children can share out toys, fruit and other materials in context where possible.

It is important children have the opportunity to 'see, hear, say and do' the mathematics.

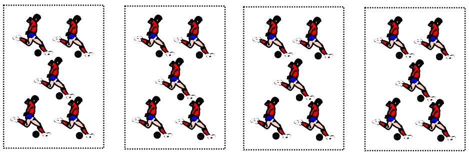
Counting on in 'groups'



Can we jump in 2s along a number track? Will we land on 7? Why not?

Division is known as **<u>'repeated subtraction'</u>** but is also the opposite (**inverse**) of multiplication.
(Multiplication is repeated addition eg. 3 x 3 = 3 + 3 + 3 = 9)

The children will be encouraged to count forward and back in 2s, 3s, 5s and 10s



20 children get into teams of 5 to play a game.
How many teams are there?

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Giving visual images for division is important.

Sorting objects and people into groups.

Mentally the children are making links between doubles and halves. Emphasise the importance of using doubling & halving as a quick way to finding some answers.

Children are encouraged and given opportunities to explore the 100 square identifying patterns, such as numbers that go up in 2s, 3s, 5s, 10s etc.

Introducing sharing and grouping

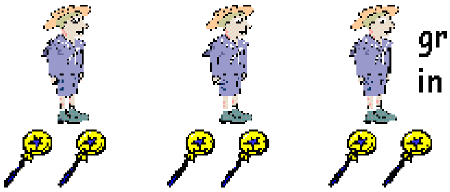
6÷2=□

6 lollies are shared between 2 children. How many lollies does each child get?

sharing between 2

Grouping

There are 6 lollies. How many children can have two each?



grouping in 2's

6 ÷ 2 can be solved in two practical situations

Sharing

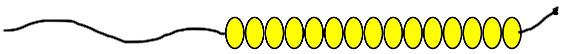
Share 6 between 2

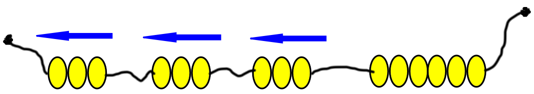
Grouping

Repeated subtraction – how many groups of two are there in 6?

More grouping

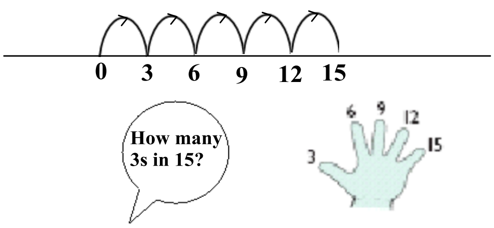
How many 3s in 15?
This is the image we may show children in class:





At home get them to do this type of activity practically it is not necessary to draw it out.

Here the beads are sorted into groups of 3.



Using a number line, children count on in 3s until 15 is reached. They then count how many jumps of 3 they have made.
(In this example there are 5 jumps of 3 in 15)

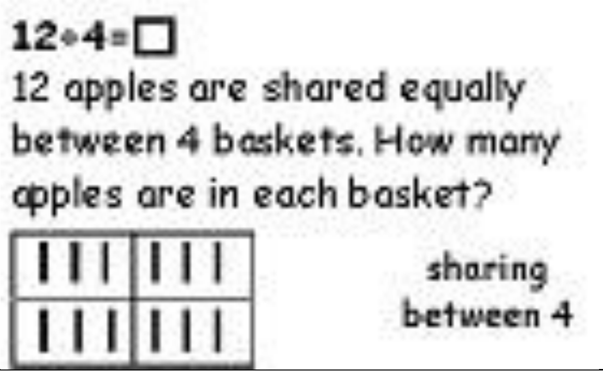
Initially sharing is a powerful image for the children to use.
However, when numbers increase this can no longer be carried out practically.

It is important that when grouping is used the children make links with counting in groups on a number line.

They are also encouraged to count up using multiplication facts. (repeated addition)

As confidence grows the children use facts to find 'missing numbers'.

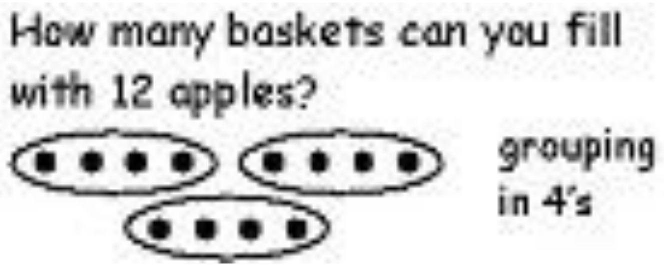
More sharing



Children can record using dots or tally marks. They can be shared or split into groups.

This is sharing.

Each basket holds 4 apples.



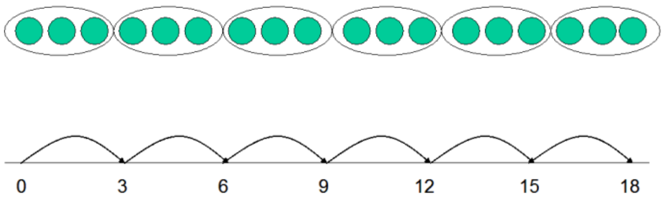
This is grouping.

$\frac{1}{2}$ of 6 is 3   6 ÷ 2 = 3

Children will also look at relationships of fractions finding halves and quarters of numbers.

Using number lines

18 ÷ 3 =

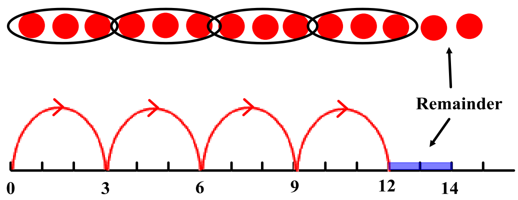
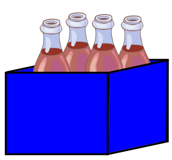


Children may use addition or subtraction when grouping. This example shows how counting on in 3s helps solve 18 ÷ 3 = 6. This is supported with some hands on grouping of objects.

It is important that children can make a link between grouping and jumping on a number line.

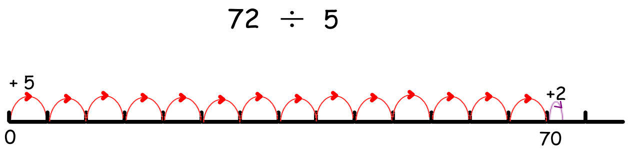
Children need to understand the link between division and multiplication (they are exact opposites – the inverse of each other)

They will be taught division facts alongside multiplication.

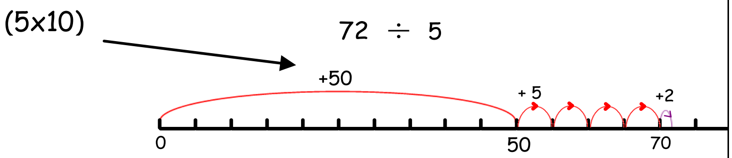
'If I know' If I know 5 x 8 = 40 Then 8 x 5 = 40 And 40 ÷ 5 = 8 Also 40 ÷ 8 = 5	'If I know' is a way of showing the link between multiplication and division.
Using multiplication to solve division problems 20 ÷ ☐ = 2 ☐ ÷ 10 = 3	Here it is wise to think about the 3 facts for free. To solve 20 ÷ ☐ = 2 the calculation could be rearranged to read 2 x ☐ = 20. It could also be rearranged to read 20 ÷ 2 = ☐.
Using number lines to show remainders after division. 14 ÷3 = 4 remainder 2 	Using the language of 'remainder' Grouping objects and drawing number lines gives a good visual understanding of remainders.
A box can hold 4 Cola bottles. Q. How many boxes can I fill if I have 18 bottles? ***(Round down)*** Q. How many boxes will I need for 18 bottles? ***(Round up)*** 	Children will need to be familiar with interpreting the remainders, when faced with 'real life' problems. Round down = the answer would be less than the number of boxes 18 bottles would go into as the answer asks for the number of FULL boxes. Round up = You will one box which might not be full but will still be needed to hold the bottles.

Using the number line confidently

The children by now are using number lines, counting on in small 'jumps'. In this example 14 jumps of 5 have been completed, leaving a remainder of 2.

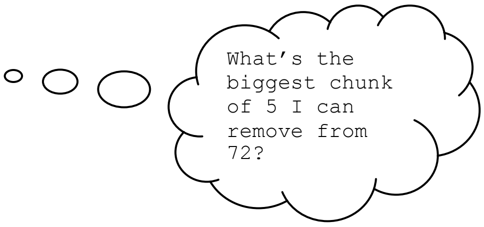


The next step to speed things up is to make larger 'jumps'…



Here one large jump of 50has been made because the child understands that jumping 50 is the same as jumping in 5, 10 times.

Children will also be shown how to count back on a number line to solve the same problem.



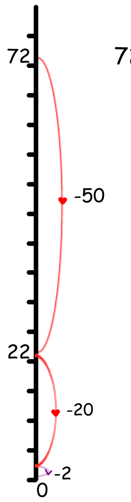
This method is OK for small numbers but very time consuming when numbers exceed 20.

This is where they think about the biggest 'chunk' of multiples they can take away from the total. They keep doing this until they get to 0. This is generally called the 'chunking method'.

Using adding or subtracting depending on child's confidence.

Moving towards a more formal method

Using the same method as previous, the number line is turn vertically as this is designed to show children how 'chunks' of a number can be repeatedly subtracted (taken away) from the starting number until 0 is reached (or as close to 0 is reached).



72 ÷ 5

```
    7  2
 –  5  0     (10 x 5)
   ______
    2  2     (22 left)
   ______
 –  2  0     (4 x 5)
   ______
       2     (2 remaining)
```

So there are 14 lots of 5 and 2 left over.

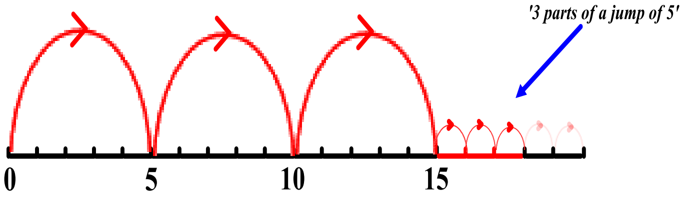
72 ÷ 5 = 14 remainder 2

When secure with number lines and 'chunking' they will begin to use a more efficient way of recording alongside the number line.

Turning the number line vertically helps to visualise what is happening.

ANY CHILD EXPERIENCING PROBLEMS SHOULD GO BACK TO USING A NUMBER LINE.

Interpreting remainders as a fraction



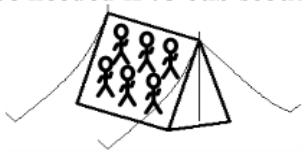
Interpreting remainders

If you divide 18 ÷ 5 =

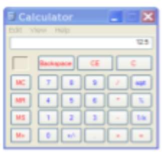
You have 3 lots of 5 and
3 parts of a jump of 5

So 18 ÷ 5 = $3\frac{3}{5}$

Cub scouts can sleep 6 to a tent. How many tents will be needed if 75 cub scouts are going camping?



Using a calculator to derive the answer gives us the display 12.5



Is the answer 12, 12.5 or 13 ?

Using division in context raises questions such as rounding (can we have half a person?)

Calculators are introduced as a way of solving division problems, however children need to interpret the displays carefully.

Division of larger numbers including decimals

$977 \div 36$

36 x 2 = 72
36 x 5 = 180
36 x 10 = 360
36 x 20 = 720
36 x 30 = 1080

$$
\begin{array}{rl}
36 \overline{)977} & \\
-720 & 36 \times 20 \\
\hline
257 & \\
-180 & 36 \times 5 \\
\hline
77 & \\
-72 & 36 \times 2 \\
\hline
5 &
\end{array}
$$

Answer: 27 r 5 or 27 $\frac{5}{36}$

This method looks different however it is simply repeated subtraction without the need for a number line.

$87.5 \div 7$

7 x 2 = 14
7 x 5 = 35
7 x 10 = 70
7 x 20 = 140

$$
\begin{array}{rl}
7 \overline{)87.5} & \\
-70.0 & 7 \times 10 \\
\hline
17.5 & \\
-14.0 & 7 \times 2 \\
\hline
3.5 & \\
-3.5 & 7 \times 0.5 \\
\hline
0 &
\end{array}
$$

Answer: 12.5

Ensure the decimal place is kept in their written working all the way down.

When using larger numbers encourage the children to write down useful multiplication facts first that they could use.

When faced with a decimal number the children should be able to use related facts to help them handle the decimals, eg.

If 7 x 5 = 35 then 7 x 0.5 = 3.5

Alternatively the number can be multiplied by 10 or 100 to make it a whole number (no decimals). It can then be divided as before, Finally the answer must be divided by 10 or 100 (depending on what you multiplied by)