Strategies your Child might Use for...
DIVISION

Sharing and Grouping

Early division begins with sharing in practical activities. It is important, however, that children go on to recognise that division has another meaning besides sharing. For example, 15 ÷ 3 can mean **15 shared between 3** (3 lots of 5) but it can also mean **15 grouped into 3s** (5 lots of 3)

For written calculations, it is the idea of division as grouping which is used.
To find out how many groups of three are in fifteen, we can use a number line and count forwards or backwards in threes:-

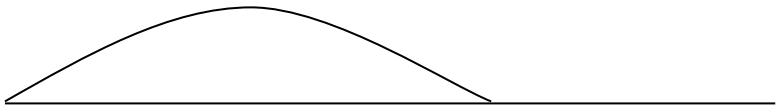
(0) **3 6 9 12 15**
15 ÷ 3 = 5

As children become more competent and the numbers they work with get larger, this basic method is refined in certain ways.

Further Use of a Number Line to Support Division

The number line is so useful and adaptable. Drawing a number line and using tables knowledge, children start to count up from zero in chunks (of 4 in the example below). Again, it is most useful to use 'chunks' that are multiples of 10 wherever possible:-

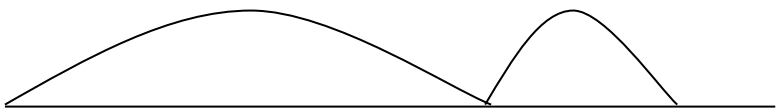
10 lots of 4



0 40 52

Work out how many are left and, using table knowledge, work out how many lots of 4 this is equal to:

10 lots of 4 3 lots of 4



0 40 52

Count up the 'lots of 4': 10 + 3 Therefore 52 ÷ 4 = 13

The answer can also be obtained by counting backwards rather than forwards and, again, a number line may need to be used at the same time:-

52 ÷ 4

3 lots of 4 10 lots of 4

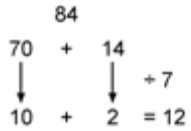
0 12 52

When recorded vertically, this becomes the 'chunking' method of division!

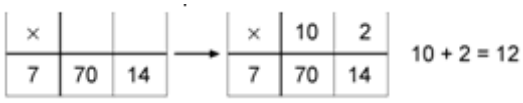
Partitioning Mentally to Support Division

Mental methods for dividing TU ÷ U can be based on partitioning and on the distributive law of division over addition. This allows a multiple of the divisor and the remaining number to be divided separately. The results are then added to find the solution.
Many children can partition and multiply with confidence. But this is not the case for division. One reason for this may be that mental methods of division, stressing the correspondence to mental methods of multiplication, have not in the past been given enough attention.
Many children will also be able to find a remainder mentally, for example the remainder when 34 is divided by 6.

One way to work out TU ÷ U mentally is to partition TU into a multiple of the divisor plus the remaining ones, then divide each part separately.
Informal recording for 84 ÷ 7 might be:



In this example, using knowledge of multiples, the 84 is partitioned into 70 (the highest multiple of 7 that is also a multiple of 10 and less than 84) plus 14, and then each part is divided separately.
Another way to record is in a grid, with links to the grid method of multiplication.



As the mental method is recorded, ask: 'How many sevens in seventy?' and: 'How many sevens in fourteen?'
Also record mental division using partitioning:

$$
\begin{aligned}
64 \div 4 &= (40 + 24) \div 4 \\
&= (40 \div 4) + (24 \div 4) \\
&= 10 + 6 = 16 \\
87 \div 3 &= (60 + 27) \div 3 \\
&= (60 \div 3) + (27 \div 3) \\
&= 20 + 9 = 29
\end{aligned}
$$

Remainders after division can be recorded similarly.

$$
\begin{aligned}
96 \div 7 &= (70 + 26) \div 7 \\
&= (70 \div 7) + (26 \div 7) \\
&= 10 + 3 \text{ R } 5 = 13 \text{ R } 5
\end{aligned}
$$

'Chunking' on a number line

TIPS FOR SUCCESS:

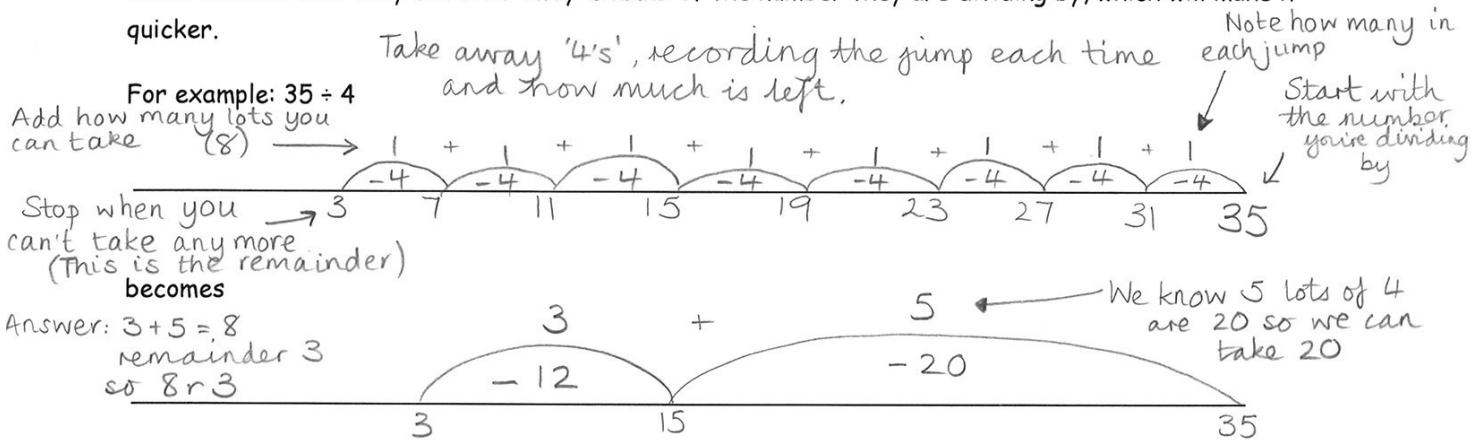
- ✓ *Children need to be able to mentally subtract from 2-digit numbers accurately.*
- ✓ *Children need to know their times tables to find suitable multiples to subtract.*

This method of division is the next step from number line division (sometimes called 'bunny hops').

Children will have learned that **division is the same as repeated subtraction** – taking away lots of the number you are dividing by. Once they have learned that they can take single jumps on the line, we start to look at ways to make the method quicker and simpler.

Children learn that they can take-away 'chunks' of the number they are dividing by, which will make it quicker.

For example: 35 ÷ 4

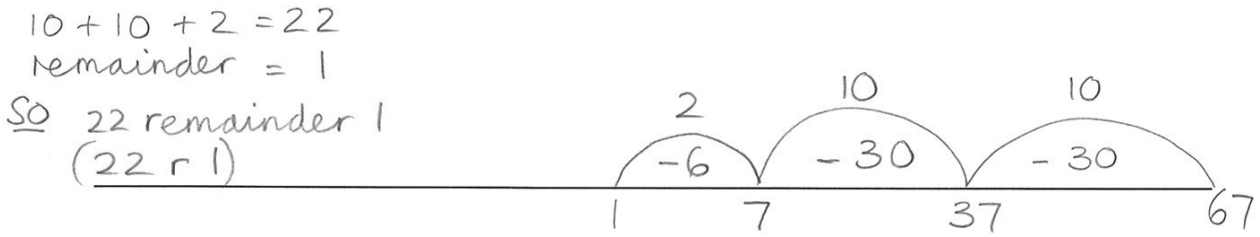


Children use their times tables to find multiples of the number they are dividing by, then subtract the larger amount from the number they are dividing. Each time, they record how many there are in the chunk. They subtract each chunk and record what is left.

Children keep subtracting chunks of the number they are dividing by until there is not enough left to take any more. What is left over is the remainder.

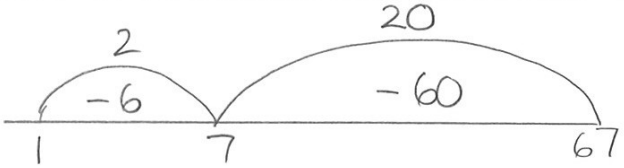
Finally, they add up how many 'lots' of the number they are dividing by they have taken and write the answer, remembering to note if there is a remainder.

For example: 67 ÷ 3



Children continue to learn that they can use place value (especially multiples of 10) to subtract larger 'chunks' of the number they are dividing by.

e.g. If we know 3 x 2 = 6, we also know that 3 x 20 = 60 (20 is the same as 2 x 10 so 3 x 2 x 10 = 60)

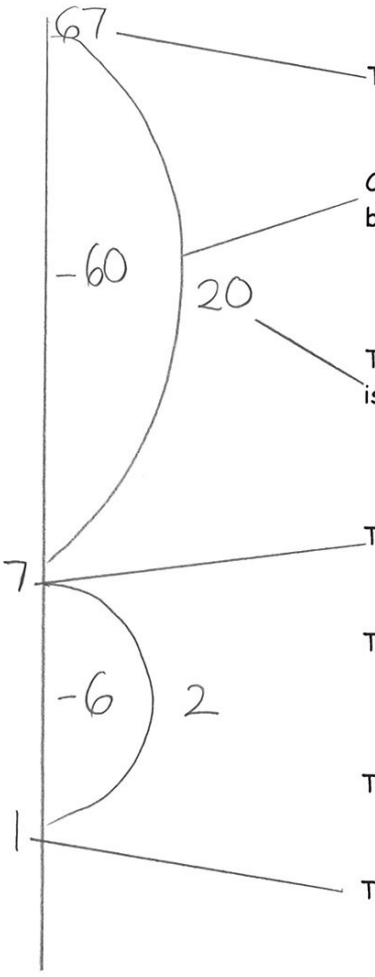


'Chunking' in a vertical method

TIPS FOR SUCCESS:

- ✓ *Children need to be able to mentally subtract accurately.*
- ✓ *Children need to know their times tables to find suitable multiples to subtract.*
- ✓ *Children need to know how to use written subtraction.*

Chunking on a number line is the same vertically or horizontally. Children learn to turn the number line so it is vertical. As they subtract larger 'chunks', children learn that they can use this to divide larger numbers. e.g. 67 ÷ 3



The number to divide goes at the top.

Children subtract 'chunks' of the number they are dividing by.

They record how many of the number they are dividing by is in each chunk.

They work out what is left are subtracting each chunk.

They keep subtracting until they can't take any more.

They add how many lots they have taken. 20 + 2 = 22

They remember to write the remainder.

22 remainder 1

(22 r 1)

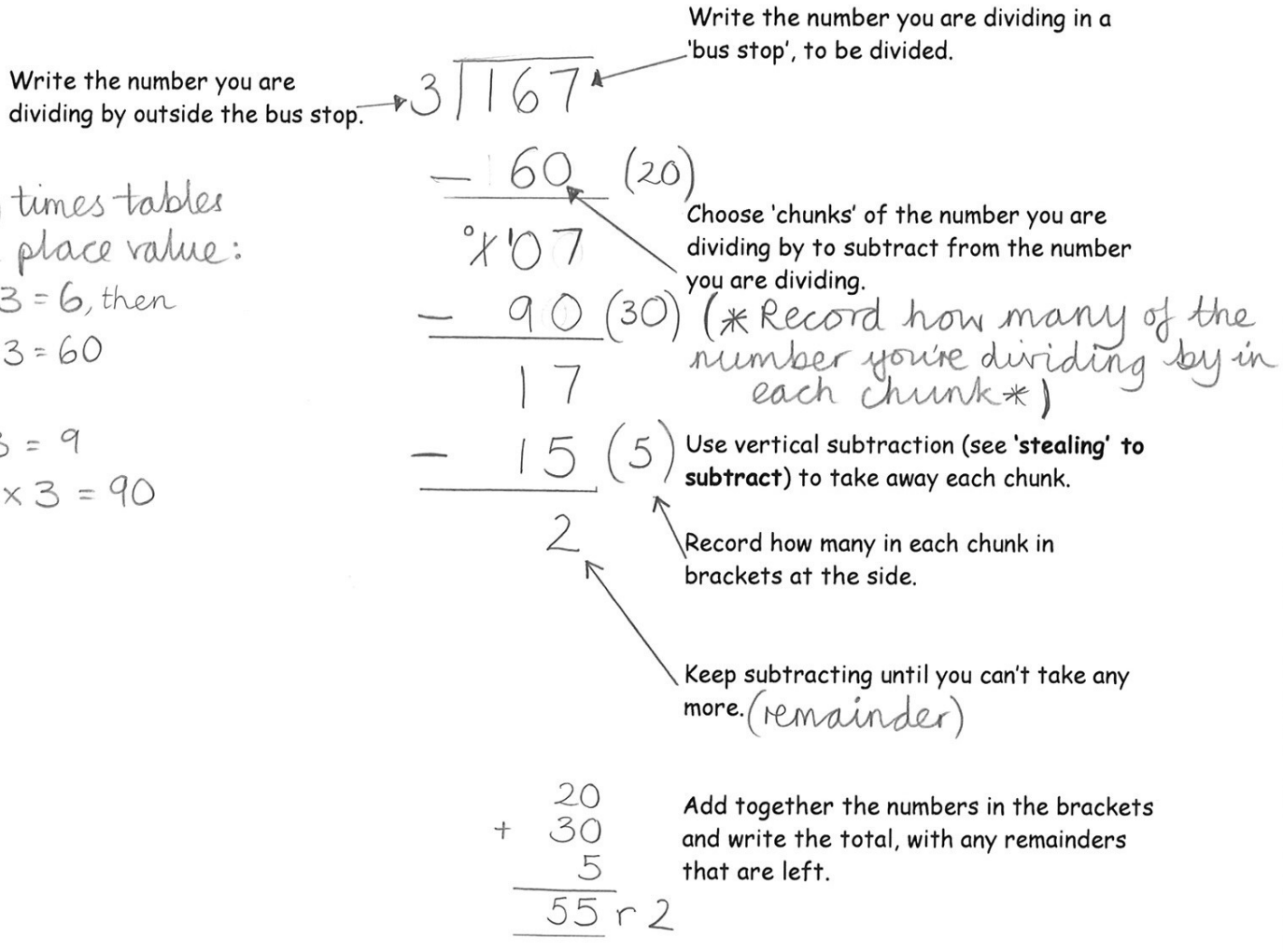
The vertical line method leads into the vertical, written method of division, by subtracting 'chunks'.

'Chunking' in a vertical method (continued)

When children have practised the vertical, 'bunny hop' chunking, they are introduced to chunking as a written method of division. (This is sometimes known as 'long division').

The steps are similar to the vertical line method but the recording is more formal.

167 ÷ 3



Using times tables and place value:

If 2 × 3 = 6, then

20 × 3 = 60

3 × 3 = 9

so 30 × 3 = 90

*It helps to choose numbers that are easy to subtract, such as multiples of ten because they end in zero.

**They need to be multiples of the number you are dividing by.

Children will begin to use what they know about times tables and place value to find larger numbers (see previous example).

This method helps children to understand the short, division method, which is the next step for written division.

Compact Method of Division

'Short' division of Tens and Ones ÷ Ones can be introduced as a more compact recording of the mental method of partitioning. Short division of two-digit numbers is only introduced to children who are confident with multiplication and division facts and with subtracting multiples of 10 mentally, and whose understanding of partitioning and place value is sound. For 81 ÷ 3, the value 81 is split into 60 and 'a bit'. 60 is the highest multiple of 3 that is also a multiple of 10 and less than 81, to give 60 + 21. Each number is then divided by 3.

$$\begin{aligned} 81 \div 3 &= (60 + 21) \div 3 \\ &= (60 \div 3) + (21 \div 3) \\ &= 20 + 7 \\ &= 27 \end{aligned}$$

The short division method may initially be recorded like this:

$$3\overline{)60 + 21}\ \ 20 + 7$$

This is then shortened to:

$$3\overline{)8^{2}1}\ \ 27$$

The carry digit '2' represents the '2 tens' that have been exchanged for '20 units'. In the first example above, it is written in front of the 1 to show that 21 is to be divided by 3. In the second it is written as a superscript.
The 27 written above the line represents the answer: 20 + 7, or 2 tens and 7 ones.