

Division Workshop


November 27th 2013





Aims

The aim with calculation strategies is to teach a series of mental and informal methods to develop a pupils' grasp of number and flexibility in approaches, before moving on to more traditional ways of setting the calculations out.



The aim is that children use mental methods when appropriate, but for calculations that they cannot do in their heads they use an efficient written method accurately and with confidence.

To divide successfully in their heads, children need to be able to:

- understand and use the vocabulary of division, e.g. in $18 \div 3 = 6$, the 18 is the dividend, the 3 is the divisor and the 6 is the quotient;
- partition (split up) two-digit and three-digit numbers into multiples of one hundred, ten and ones;
- recall multiplication and division facts to 10×10 (the new 2014 curriculum requires up to 12×12 in Year 4), recognise multiples of single-digit numbers, and divide multiples of 10 or 100 by a single-digit number using their knowledge of division facts and place value;
- know how to find a remainder working mentally, e.g. find the remainder when 48 is divided by 5;
- understand and use multiplication and division as inverse operations.


Stages 1 & 2

Using objects/pictures/marks

Sharing


Grouping with the use of a number line
(how many groups of 2 in 6?)

Stage 1 -
Pictures / marks
12 children get into teams of 4 to play a game. How many teams are there?




A large red arrow points from Stage 1 to Stage 2.

Stage 2 -
Sharing - 6 sweets are shared between 2 people.
How many do they have each? ($6 \div 2$)



Two groups of three dots are shown, with an upward-pointing arrow above each group.

Grouping - There are 6 sweets. How many people can have 2 each? (How many 2's make 6?)



A number line is shown with markings at 0, 2, 4, and 6. Three curved arrows indicate jumps of 2 units from 0 to 2, 2 to 4, and 4 to 6.

Stages 3 & 4

Still using the number line for division with remainders

Using tables knowledge to count up in bigger chunks of the divisor

Stage 3 -
Division with remainders
 $16 \div 3 = 5 \text{ r}1$
Sharing - 16 shared between 3, how many left over?
Grouping - How many 3's make 16, how many left over?
e.g.

Stage 4 -
 $30 \div 6$ can be modelled as:
Grouping - counting on in 6's until you reach the number you are dividing. Eg.

$41 \div 4 = 10 \text{ r}1$

The diagram illustrates two stages of division using number lines. Stage 3 shows the division of 16 by 3, with a number line from 0 to 18 marked every 3 units. Five jumps of 3 are shown, ending at 15, with a remainder of 1 at 16. Stage 4 shows the division of 30 by 6, with a number line from 0 to 30 marked every 6 units. Five jumps of 6 are shown, ending at 30. Below this, the division of 41 by 4 is shown, with a number line from 0 to 41. A large jump of 40 is shown, labeled '10 groups', and a smaller jump of 1 is shown, ending at 41.

Stage 5

Chunking!





1

2

3

4

It is called
'chunking' because
you 'take easy
chunks' out of the
starting number
(the dividend).

172 divided by 4.

- Write 172 at the top of your page.
-

172

- 100 (4 x 25)

- Think of an easy multiple of 4 which is close to, but lower than 172 like 100 and write it underneath 172. (This is your first 'chunk'.)
-

- Next to 100 write... how many chunks of 4 100 is = 25. Then draw a line underneath.

(Click mouse to continue.)

- Next subtract 100 from 172. You should get 72. Write 72 underneath.
-

- Think again of an easy multiple of 4 which is close to, but lower than 72, like 40, and write it underneath 72.
(This is your second 'chunk'.)
-

- As before write... how many chunks of 4 40 is = 10. Then continue as before.

$$\begin{array}{r} 172 \\ - 100 \quad (4 \times 25) \\ \hline 72 \\ - 40 \quad (4 \times 10) \\ \hline 32 \end{array}$$

- Nearly there!..

(Click mouse to continue.)

- Now use your times tables to divide 32 by 4.
-

- You should get 8.
So write 4×8
(This is your third 'chunk'.)
-

- Since 4×8 is exactly 32, there won't be a remainder.
(So there won't be any more chunks.)
-

- Last step...

$$\begin{array}{r} 172 \\ - 100 \quad (4 \times 25) \\ \hline 72 \\ - 40 \quad (4 \times 10) \\ \hline 32 \\ - 32 \quad (4 \times 8) \\ \hline 0 \end{array}$$

(Click mouse to continue.)

- Down the side you should have a 25, 10 and 8.
-


- Add them together and you get your answer!
-

- The answer is 43!

■ **So $172 / 4 = 43$**

$$\begin{array}{r} 172 \\ - 100 \quad 4 \times 25 \quad \text{Chunk 1} \\ \hline 72 \\ - 40 \quad 4 \times 10 \quad \text{Chunk 2} \\ \hline 32 \\ - 32 \quad 4 \times 8 \quad \text{Chunk 3} \\ \hline 0 \end{array} \quad \begin{array}{r} + \\ \hline 43 \end{array}$$

(Click mouse to continue.)



Stage 6

Long division

Step 1 in Long Division

1. Divide

$$\begin{array}{r} 4 \\ 2 \overline{) 947} \end{array}$$

- Divide 2 into first number in the dividend.
 - Think how many 2's will fit into 9.
 - Write that number directly above the number you divided into.

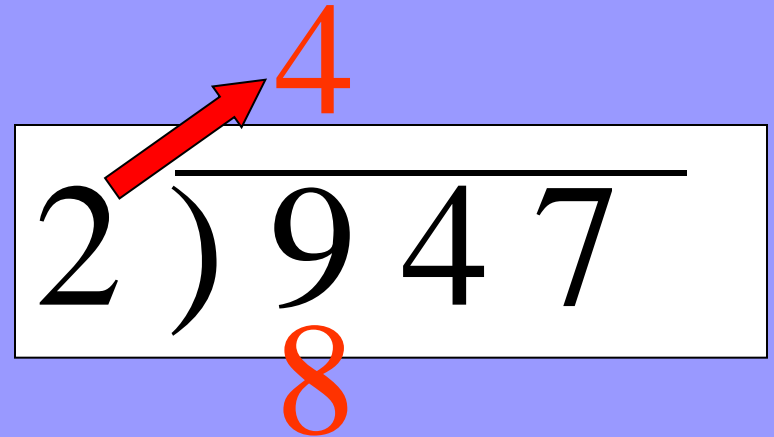
How many 2's will go into 9?



Step 2 in Long Division

2. Multiply

- Multiply the divisor times the first number in the quotient.
 - Write your answer directly under the 9 or the number you just divided into.


$$\begin{array}{r} 2 \overline{) 947} \\ 8 \end{array}$$


$$2 \times 4 = 8$$

Step 3 in Long Division

3. Subtract

$$\begin{array}{r} 4 \\ \hline 2 \overline{) 947} \\ \underline{- 8} \\ 1 \end{array}$$

- Draw a line under the 8.
 - Write a subtraction sign next to the 8.
 - Subtract 8 from 9.
 - Write your answer directly below the 8.

Step 4 in Long Division

4. Bring down

- Go to the next number in the dividend to the right of the 9.
 - Write an arrow under the 4.
 - Bring the 4 down next to the 1.

$$\begin{array}{r} 4 \\ \hline 2 \overline{) 947} \\ \underline{-8} \\ 14 \end{array}$$

Step 5 in Long Division

5. Repeat or Remainder

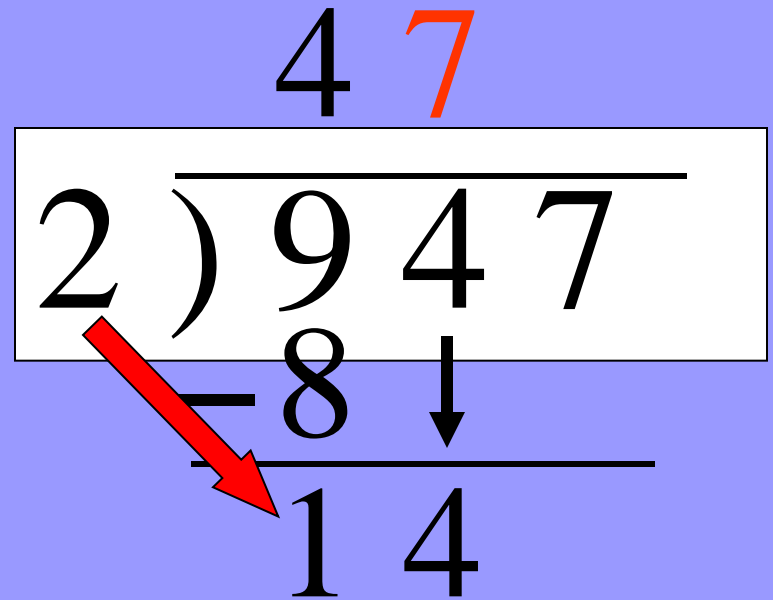
- This is where you decide whether you repeat the 5 steps of division.
 - If your divisor can divide into your new number, 14, or if you have numbers in the dividend that have not been brought down, you repeat the 5 steps of division.

$$\begin{array}{r} 4 \\ \hline 2 \overline{) 947} \\ \underline{-8} \\ 14 \end{array}$$

Step 1 in Long Division

1. Divide

- Divide 2 into your new number, 14.
 - Place your answer directly above the 4 in your quotient.

$$\begin{array}{r} 47 \\ \hline 2 \overline{) 947} \\ \underline{-8} \\ 14 \end{array}$$


Step 3 in Long Division

3. Subtract

- Draw a line under the bottom 14.
 - Draw a subtraction sign.
 - Subtract & place answer under the line.

$$\begin{array}{r} 47 \\ 2 \overline{) 947} \\ \underline{-8} \downarrow \\ 14 \\ \underline{-14} \\ 0 \end{array}$$

Step 4 in Long Division

4. Bring down

- Put an arrow under the next number, 7, in the dividend.
 - Bring the 7 down next to the 0.

$$\begin{array}{r} 47 \\ 2 \overline{) 947} \\ \underline{-8} \\ 14 \\ \underline{-14} \\ 07 \end{array}$$

Step 5 in Long Division

5. Repeat or Remainder

- If the 2 will divide into your new number, 7, then repeat the steps of division.

$$\begin{array}{r} 47 \\ 2 \overline{) 947} \\ \underline{-8} \\ 14 \\ \underline{-14} \\ 07 \end{array}$$

Step 1 in Long Division

1. Divide

- Divide your divisor, 2, into your new number, 7.
 - Place your answer in the quotient next to the 7.

$$\begin{array}{r} 473 \\ 2 \overline{) 947} \\ \underline{-8} \\ 14 \\ \underline{-14} \\ 07 \end{array}$$

Step 2 in Long Division

2. Multiply

- Multiply your divisor, 2, by your new number in the quotient, 3.
 - Place your answer under the number you brought down, 7.

$$\begin{array}{r} 473 \\ 2 \overline{) 947} \\ \underline{-8} \\ 14 \\ \underline{-14} \\ 07 \\ \underline{6} \end{array}$$

Step 3 in Long Division

3. Subtract

$$\begin{array}{r} 473 \\ \hline 2 \overline{) 947} \\ \underline{-8} \\ 14 \\ \underline{-14} \\ 07 \\ \underline{-6} \\ 1 \end{array}$$

- Draw a line under the number 6.
 - Place your subtraction sign.
 - Subtract & put your answer directly under the 6.

Step 4 in Long Division

4. Bring down

- Look at your dividend to see if there are any more numbers to bring down.
 - If not, move to step 5.

$$\begin{array}{r} 473 \\ \hline 2 \overline{) 947} \\ \underline{-8} \\ 14 \\ \underline{-14} \\ 07 \\ \underline{-6} \\ 1 \end{array}$$

Step 5 in Long Division

5. Repeat or Remainder

- Since there are no more numbers to bring down & 2 will not divide into 1, you do not repeat the steps of division.
 - The number left over, 1, becomes the remainder.

$$\begin{array}{r} 473 \text{ R1} \\ \hline 2 \overline{) 947} \\ \underline{-8} \\ 14 \\ \underline{-14} \\ 07 \\ \underline{-6} \\ 1 \end{array}$$