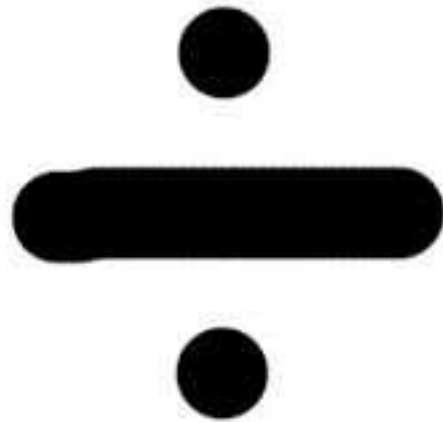


Calculation Policy – Years 5 and 6

Tuesday 6th November 2018

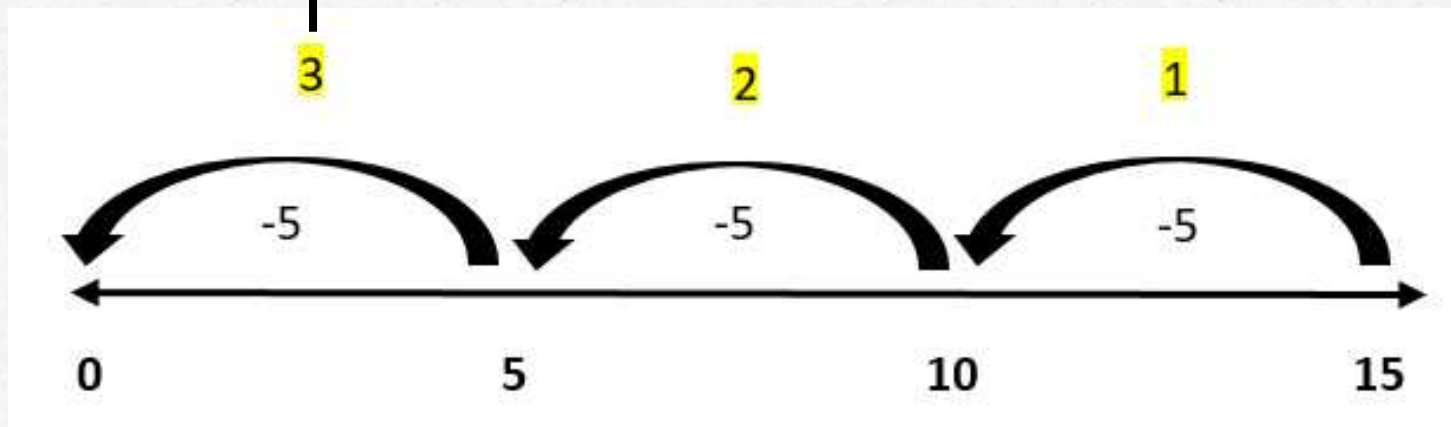


Division



Stage 2

Division as repeated subtraction using a number line
($15 \div 5 = 3$)



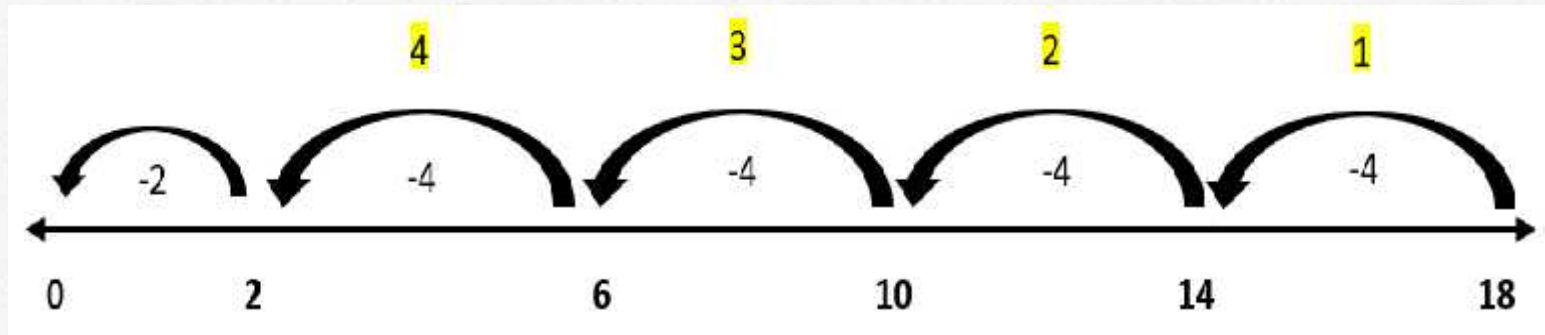
Start from the right at 15. Jump back in fives until zero is reached. Count the number of jumps.

Stage 3

For division calculations giving rise to remainders, children should begin to use a number line.

$$18 \div 4 = 4 \text{ r } 2$$

Four jumps of four with two left over.

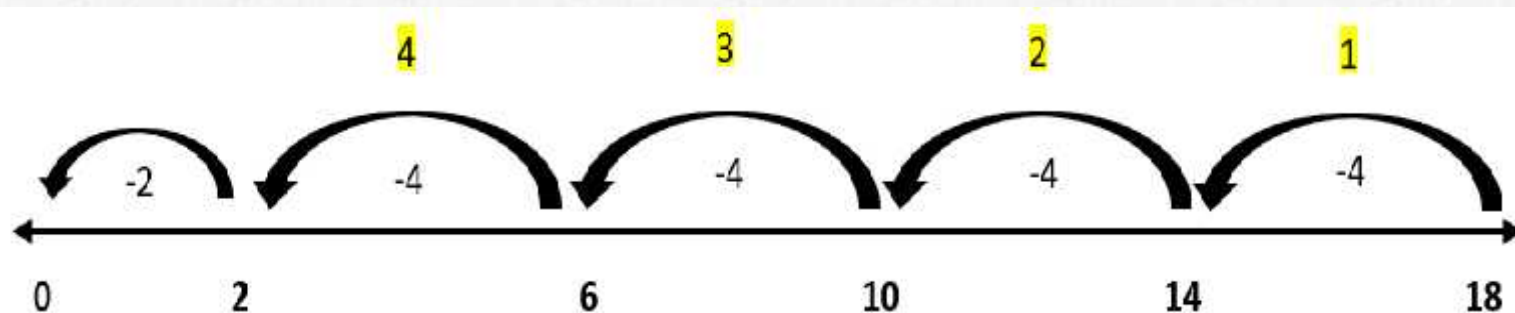


Over to you:

Try a number line to find the answer to one of these calculations:

$$24 \div 6$$

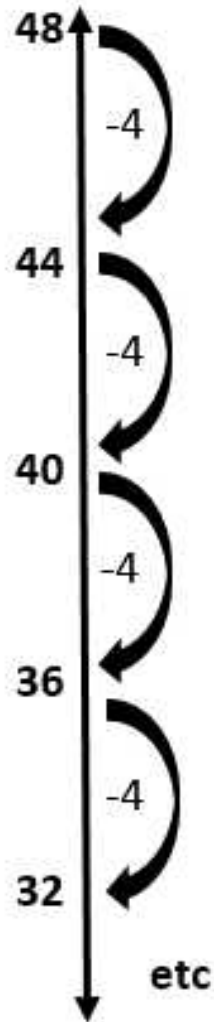
$$33 \div 5$$



Stage 3

Children will continue to consolidate the use of a number line. This normally appears as a horizontal number line, but can be used as a vertical one.

Stage 3



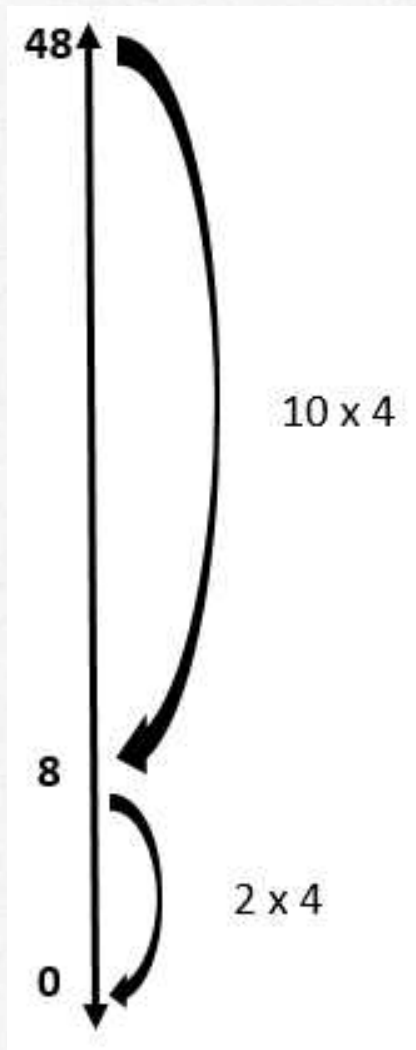
12 jumps of 4 so
 $48 \div 4 = 12$

Stage 3



12 jumps of 4
with 2 left over
 $50 \div 4 = 12 \text{ r } 2$

Stage 3



Some children will move towards 'chunking'.

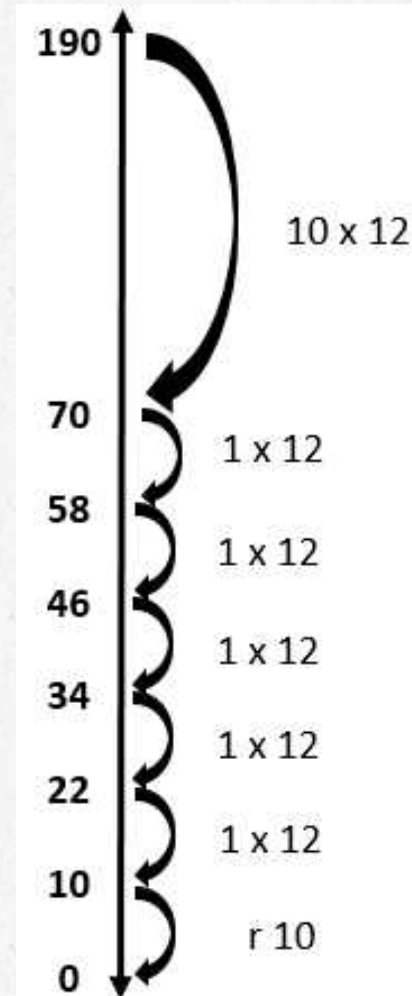
For $48 \div 4$, this would involve jumping back 10×4 in one jump, then two further jumps of 4 (12 jumps of four in total, giving an answer of 12).

Stage 3

Chunking using larger numbers

$$190 \div 12$$

15 jumps of 12 and
10 left over
 $190 \div 12 = 15 \text{ r } 10$



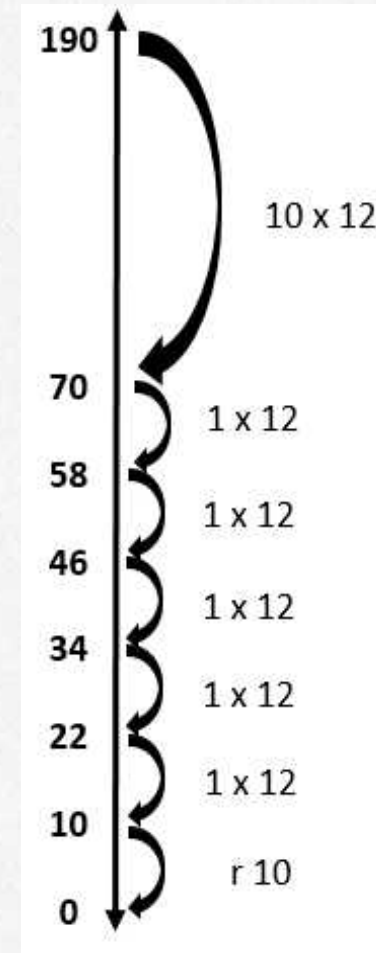
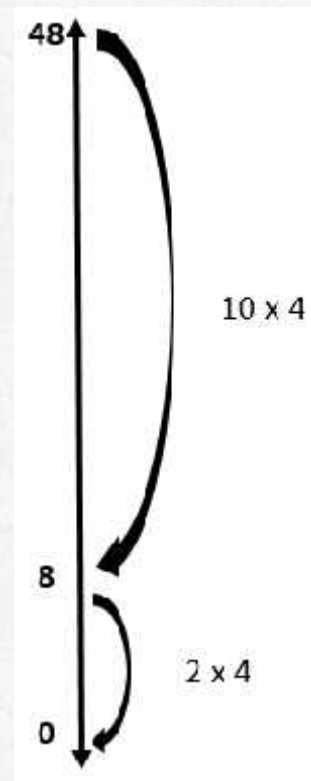
Over to you:

Try using a number line and chunking to find the answer to one of these calculations:

$$32 \div 4$$

$$44 \div 6$$

$$172 \div 9$$



Stage 4

Moving into more formal vertical method

$$161 \div 7 =$$

$$\begin{array}{r} 23 \text{ e)} \\ \hline 7 \overline{) 161} \\ \underline{-70} \text{ a)} \\ 91 \text{ b)} \\ \underline{-70} \text{ c)} \\ 21 \\ \underline{-21} \text{ d)} \\ 0 \end{array}$$

- a) Remove ten lots of seven from 161.
- b) Continue removing ten lots of seven until you can no longer do this ($91 - 70 = 21$).
- c) Once you reach a number whereby you can no longer take away ten lots of seven (21), divide this number by 7 ($21 \div 7 = 3$).
- d) Check that there are no remainders.
- e) Work out the number of groups of seven that you have subtracted.

$$10 \text{ groups} + 10 \text{ groups} + 3 \text{ groups} = 23$$

Stage 4

Moving into more formal vertical method

$$161 \div 7 = 23$$

$$\begin{array}{r} 23 \text{ e)} \\ \hline 7 \overline{) 161} \\ \underline{-70} \text{ a)} \\ 91 \text{ b)} \\ \underline{-70} \text{ (10 x 7)} \\ 21 \text{ c)} \\ \underline{-21} \text{ (3 x 7)} \\ 0 \text{ d)} \end{array}$$

- a) Remove ten lots of seven from 161.
- b) Continue removing ten lots of seven until you can no longer do this ($91 - 70 = 21$).
- c) Once you reach a number whereby you can no longer take away ten lots of seven (21), divide this number by 7 ($21 \div 7 = 3$).
- d) Check that there are no remainders.
- e) Work out the number of groups of seven that you have subtracted.

$$10 \text{ groups} + 10 \text{ groups} + 3 \text{ groups} = 23$$

Over to you:

Try using a more formal method involving chunking to find the answer to one of these calculations:

$$204 \div 6$$

$$192 \div 9$$

	23	e)
7)	<u>161</u>	a)
	-70	(10 x 7)
	91	b)
	-70	(10 x 7)
	21	c)
	-21	(3 x 7)
	0	d)

Stage 5

Formal Bus Stop Method (this should only be taught when teachers are certain that children are secure with place value relating to division).

In the past, some children have not used this method in primary education, and many schools chose not to teach this at Key Stage 2 at all.

$$\begin{array}{r} 137 \text{ r } 5 \\ 7 \overline{) 964} \end{array}$$

'Chunking' alongside
formal 'Bus Stop' method

$$5 \overline{) 72}$$

$$72 \div 5 =$$

$$5 \overline{) 72}$$

$$\begin{array}{r} 5 \overline{) 72} \\ - 50 \\ \hline 22 \end{array} \quad (10 \times 5)$$

$$72 \div 5 =$$

$$\begin{array}{r} 1 \\ 5 \overline{) 72} \end{array}$$

10 lots of 5
are 50 and I
have 2 tens
left

$$72 \div 5 =$$

$$\begin{array}{r} 14 \\ 5 \overline{) 72} \\ \underline{- 50} \quad (10 \times 5) \\ 22 \\ \underline{- 20} \quad (4 \times 5) \end{array}$$

$$\begin{array}{r} 14 \\ 5 \overline{) 72} \end{array}$$

4 lots of 5
are 20

$$72 \div 5 = 14 \text{ r } 2$$

$$\begin{array}{r} 14 \text{ r } 2 \\ 5 \overline{) 72} \\ \underline{- 50} \quad (10 \times 5) \\ 22 \\ \underline{- 20} \quad (4 \times 5) \\ 2 \end{array}$$

$$\begin{array}{r} 14 \text{ r } 2 \\ 5 \overline{) 72} \end{array}$$

I have 2
ones left

Stage 5

$$584 \div 4$$

$$\begin{array}{r} 1 \\ 4 \overline{) 584} \end{array}$$

a)



a) Work from the left hand side. How many fours in five ($5 \div 4 = 1 \text{ r } 1$).

Place the '1' on top of the '5' and the remainder '1' in front of the '8' on the bottom row.

Stage 5

$$584 \div 4$$

$$\begin{array}{r} 14 \\ 4 \overline{) 51824} \\ \text{a)} \quad \text{b)} \end{array}$$

b) As a 'one' has been placed (carried) in front of the '8', work out how many fours are in eighteen ($18 \div 4 = 4 \text{ r } 2$). Place the '4' on top of the '8' and the remainder '2' in front of the '4' on the bottom row.

Stage 5

$$584 \div 4$$

$$\begin{array}{r} 146 \\ 4 \overline{) 584} \end{array}$$

a) b) c)

c) As a 'two' has been placed (carried) in front of the 'four', work out how many fours are in twenty four ($24 \div 4 = 6$). Place the '6' on top of the '4'.

This leaves an answer of 146.

$$\text{So } 584 \div 4 = 146$$

Over to you:

Try using the bus stop method to find the answer to one of these calculations:

$$672 \div 4$$

$$882 \div 7$$

$$584 \div 4$$

$$\begin{array}{r} 146 \\ 4 \overline{) 584} \end{array}$$

a) b) c)

Common Errors

$$\begin{array}{r} 000 \\ 6 \overline{) 133} \end{array}$$

$$\begin{array}{r} 1212 \text{ r } 1 \\ 6 \overline{) 1^{13} 13} \end{array}$$

Can you see where each child has gone wrong?

$$\begin{array}{r} 000 \\ 6 \overline{) 133} \end{array}$$

A year 6 pupil working at greater depth had not understood the bus stop process.

She felt that this was the way that she should be doing division, but the method was not working for her.

She could not see her error until she reworked the problem, reverting back to chunking and successfully calculating the answer.

$$\begin{array}{r} 12 \ 12 \ r \ 1 \\ 6 \overline{) 1 \ 13 \ 13} \end{array}$$

This example is also from a child in Y6 working at greater depth.

The child was using linked multiplication facts but was recording the wrong part of it. She knew that 2 lots of 6 was 12, but wrote the 12 rather than the 2 lots. She could not see her error.

She got the correct answer when she worked through the calculation using chunking.

Stage 5

Formal 'Bus Stop' method to carry out long division

$$1152 \div 16$$

Set up in the same way as in the previous example.

$$16 \overline{) 1152}$$

Stage 5

Step 1 – as you are dividing by 16, you will need to count in multiples of this number. Use a vertical list.

Place 16 at the top of the list, then 160 at the bottom. Work out half of 160 (80), and place this at the half way stage. Then, count in multiples of 16, checking that the fifth multiple is 80, and the tenth multiple is 160.

$$16 \overline{) 1152}$$

16

32

48

64

80

96

112

128

144

160

Stage 5

Step 2 – Start on the left with $1 \div 16$. You cannot perform this calculation in this context. Therefore, carry the ‘one’ over to the next digit, to make 11.

$$16 \overline{) 1152}$$

16

32

48

64

80

96

112

128

144

160

Stage 5

Step 3 – Next is $11 \div 16$. Again, you cannot perform this calculation in this context. Therefore, carry the ‘one’ over to the next digit, to make 115.

$$16 \overline{) 1 \cancel{1} 1152}$$

16

32

48

64

80

96

112

128

144

160

Stage 5

Step 4 – Now try $115 \div 16$. Check on the list for the closest number. 16 divides into 112 seven times. Place the '7' on top of the '5'. There is still '3' left over from this calculation; this needs to be carried in front of the '2'.

$$16 \overline{) 11532}$$

The diagram shows a long division problem. The divisor is 16. The dividend is 11532. A horizontal line is drawn above the dividend. The digit 7 is written above the 5. A vertical line is drawn below the 115, and the 3 is carried over to the 2, making the number 32. The 115 is crossed out with a diagonal line.

16

32

48

64

80

96

112

128

144

160

Stage 5

Step 5 – Lastly we need to calculate $32 \div 16$.
Check on the list for the closest number. 16
divides into 32 twice exactly. Place the '2' on top
of the '2'. This gives an answer of 72.

$$\begin{array}{r} 72 \\ 16 \overline{) 11532} \end{array}$$

- 16
- 32
- 48
- 64
- 80
- 96
- 112
- 128
- 144
- 160

To conclude...

The aim is that children will master the formal methods during KS2.

If they do not grasp it but can use non-standard methods efficiently this does not always point to a major problem.

It is about having a toolbox of formal, informal and mental methods at the child's disposal to use where appropriate, depending on the context.

To conclude...

It is essential that parents appreciate the approaches being used in school and back these up at home. If children are doing one thing at home and another at school, the child can easily become confused.

When working on addition, subtraction, multiplication and division in class, teachers will let parents know via the weekly slip in the homework diary which methods are currently being covered in class.