



Maths – How do we learn?

Learning, Teaching and Supporting in Maths

Calculation Strategies

We teach 4 strands of Maths

- ▶ Number
- ▶ Shape, Space and Measures
- ▶ Data Handling
- ▶ Using and Applying Maths

Using and Applying Maths happens in all of the strands, as well as in other lessons, such as Science.



Number

- ▶ Today we are focusing on – and ÷
- ▶ We will work through the Calculation Policy
- ▶ We will also look at some of the resources we use to teach number in School.
- ▶ As well as how you can help at home!



Maths

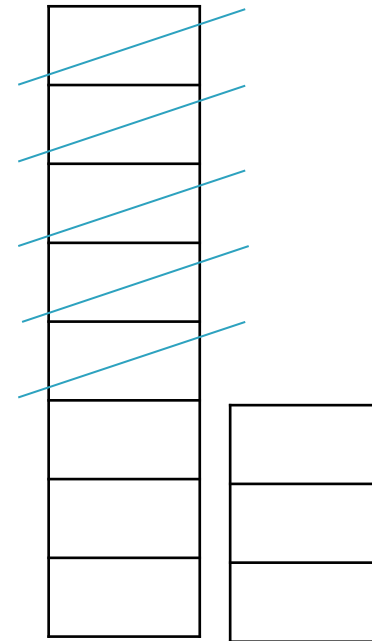
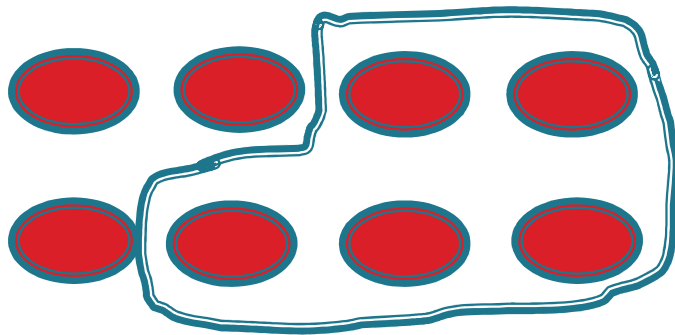
How do we learn Subtraction?



Subtracting– Stage 1

Children begin by using real objects to take away an amount or to find how many are left.

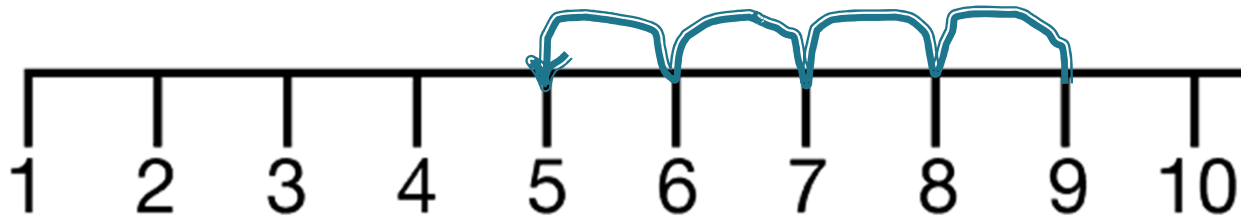
If I have 8 counters and take away 5, then how many are left?



Subtracting– Stage 2

Introduced as taking away first so children understand that the answer is less than what they started with

9–4 Start at 9 and then count back 4

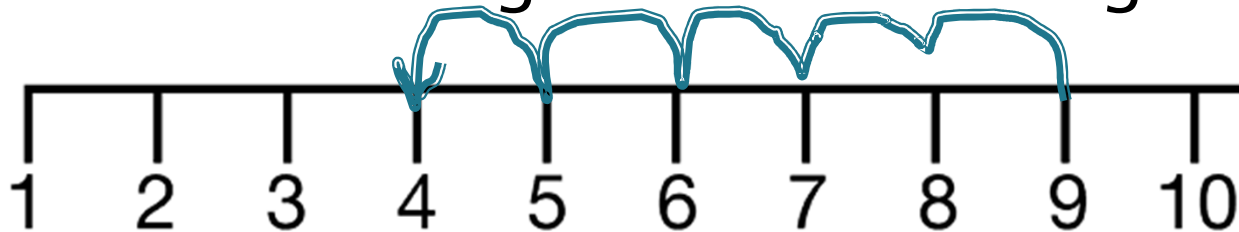


So $9-4=5$

Difference– Stage 2

Then move onto looking at the difference between the 2 numbers, by either counting back or counting on

9-4 Counting back from 9 to get to 4

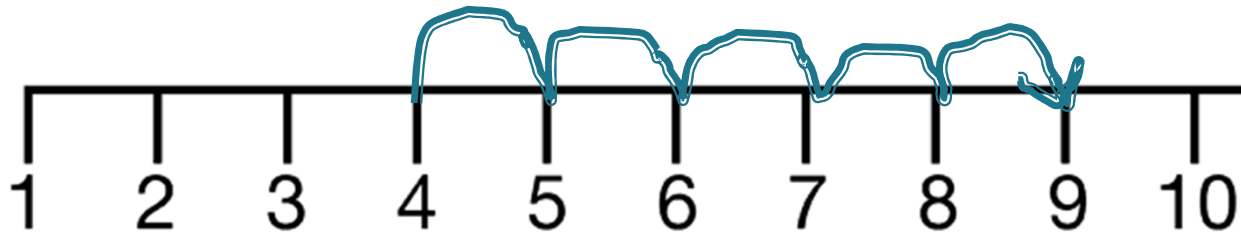


Then count the number of jumps so the answer is 5



Subtracting– Stage 2

9–4 Counting on from 4 to get to 9



Then count the number of jumps so the answer is 5



Hundred Square– Stage 3

Use a hundred square to take away multiples of 10 first

$$46 - 20$$

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

Hundred Square– Stage 3

Use a hundred square to take away using partitioning

$$54 - 13 = 54 - 3 - 10 = 41$$

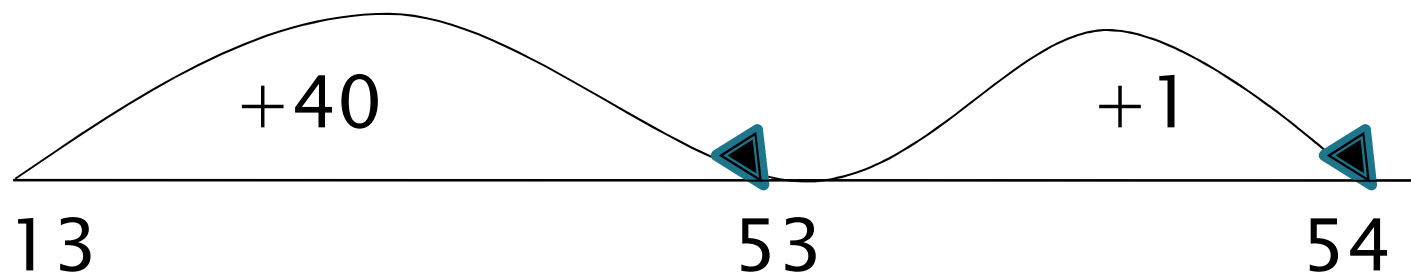
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60



Number line– Stage 3

Using a numbered or blank number line to solve subtraction questions and to find the difference

What is the difference between 54 and 13?

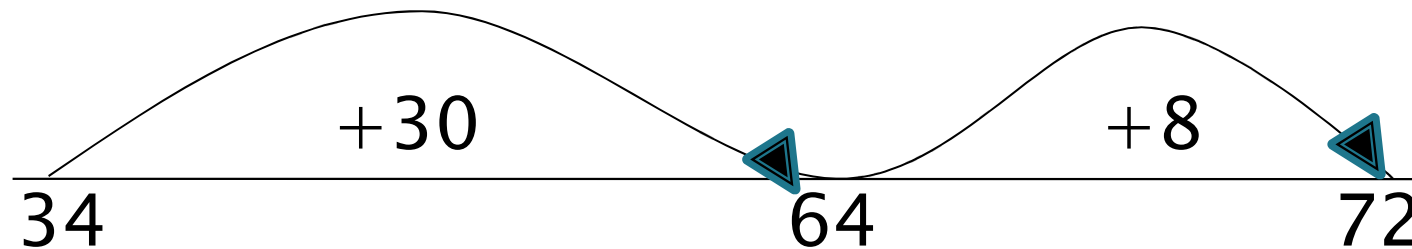


Then count the number of jumps



Number line– Stage 3

What is the difference between 34 and 72?



Expanded Subtraction– Stage 4

First we partition the number and then subtract starting with the units

$$564 - 132 =$$

$$\begin{array}{r} \text{H} \quad \text{T} \quad \text{U} \\ 500 + 60 + 4 \\ - \underline{100 + 30 + 2} \\ 400 + 30 + 2 = 432 \end{array}$$



Expanded Subtraction– Stage 4

Then moving onto exchanging– where they need to ‘take from the next column’

$$564 - 172 =$$

	H	T	U	
	500	+ 60	+ 4	
-	<u>100</u>	+ <u>70</u>	+ <u>2</u>	
-			+ 2	=

	H	T	U	
	400	+ 160	+ 4	
	500	+ 60	+ 4	
-	<u>100</u>	+ <u>70</u>	+ <u>2</u>	
	300	+ 90	+ 2	= 392



Column subtraction– Stage 5

Move onto compact vertical subtraction.

Ensuring they line up the numbers in columns

$$\begin{array}{r} 64 \\ -32 \\ \hline 32 \end{array}$$

$$\begin{array}{r} 564 \\ -132 \\ \hline 432 \end{array}$$

Then use the inverse to check– if you add the answer to the number you subtracted, do you get the starting number? So $32 + 32 = 64$



Column subtraction– Stage 6

Using vertical subtraction with exchanging–
where they take from the next column


$$564 - 172 =$$

$$\begin{array}{r} 41 \\ \cancel{5}64 \\ - 172 \\ \hline 392 \end{array}$$

Ensure the children understand that it is 60-70 and that you can't do this as you need the biggest number at the top, so you have to take a hundred. They can't just switch the 70 and 60 around to get 10!



Finally ...


- ▶ Importance of working through the stages and not expecting it to be linked to year group– need to understand how/why it works and not just learn the method!
 - ▶ Children need to choose appropriate method for the problem, eg What is the difference between 2006 & 1993? – column subtraction will work but counting on is more efficient
 - ▶ We encourage them to choose the most effective and efficient method so a number line with decimals could be more accurate
 - ▶ Any questions?
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Resources for Subtraction

Maths Caddies:

- ▶ Mini number grid– 100 square
- ▶ Digit cards
- ▶ Number fans
- ▶ Mini counting sticks

Classroom resources:

- ▶ Cubes
 - ▶ Objects for counting
 - ▶ Bead strings
 - ▶ Dienes materials
 - ▶ Money
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Maths

How do we learn Division?

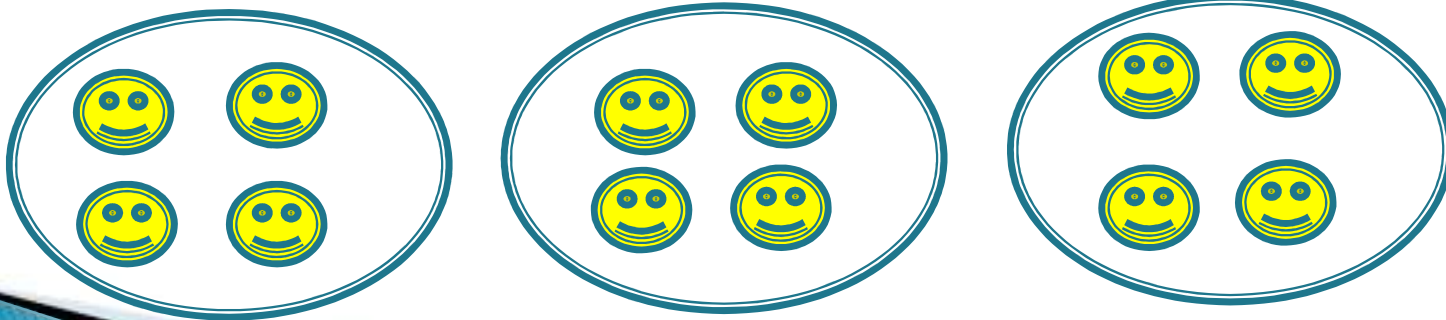


Sharing– Stage 1

Division starts with practical objects which are shared out equally

If I share my 12 sweets between 3 people, how many do they each get?

They would start by putting one sweet in each circle and then repeat, until they are all gone. The answer is the number within each circle.



Grouping– Stage 1

The children use practical objects to understand grouping

If I have 12 sweets and I give each person 3, how many people will get the sweets?

A circle is put around each group of 3 and the number of groups are counted

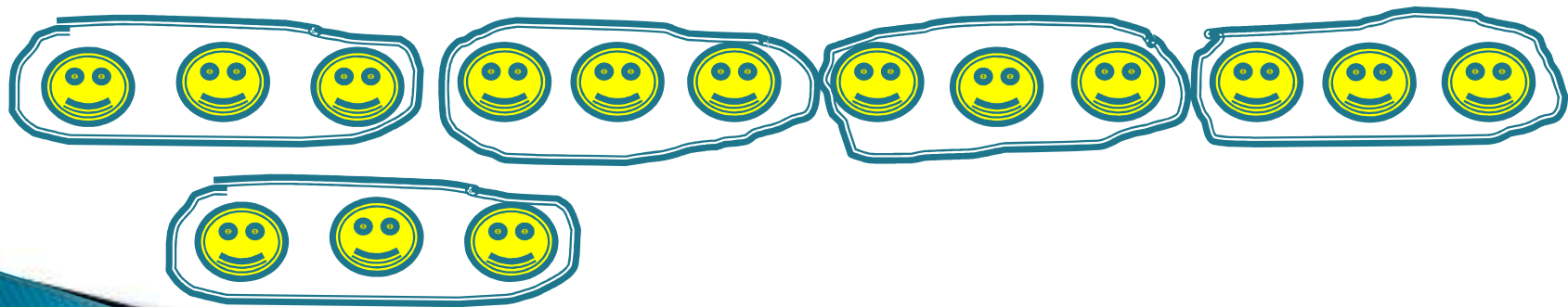


Dividing– Stage 2

The \div symbol is introduced
Multiplication facts are used to help with
grouping

If I have 15 sweets and I give each person 3,
how many people will get the sweets?

$$15 \div 3 = 5 \text{ as } 5 \times 3 = 15$$

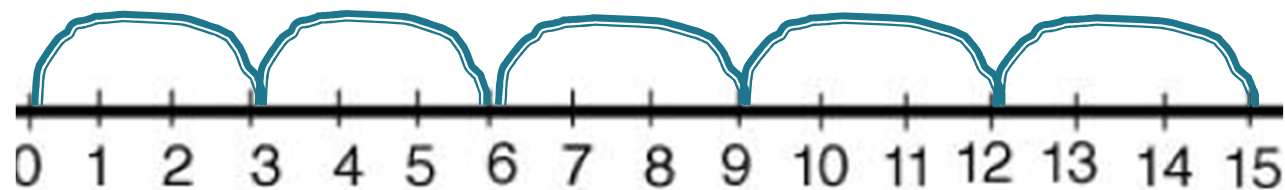


Number line– Stage 3

Children are taught to use a number line for grouping

If I have 15p and beads cost 3p each, then how many beads can I buy?

$$15 \div 3 = 5$$

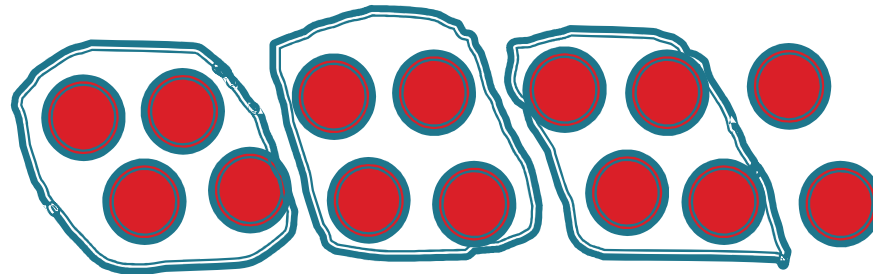


Division– Stage 3

Division is shown as repeated subtraction and as being the inverse to multiplication which is repeated addition

Left over numbers are introduced as a remainder

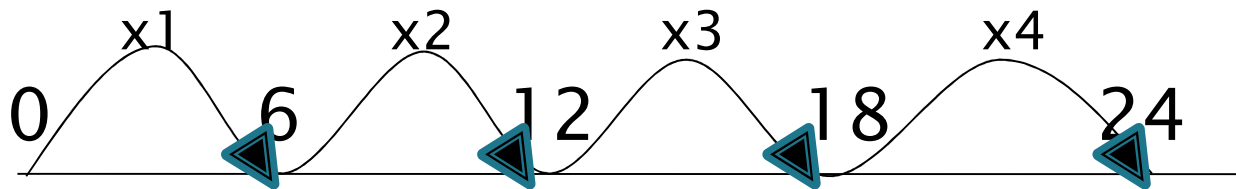
$$14 \div 4 = 3 \text{ with } 2 \text{ left over}$$



Using times tables– Stage 3

Number lines are also used to count up in groups of the divisor

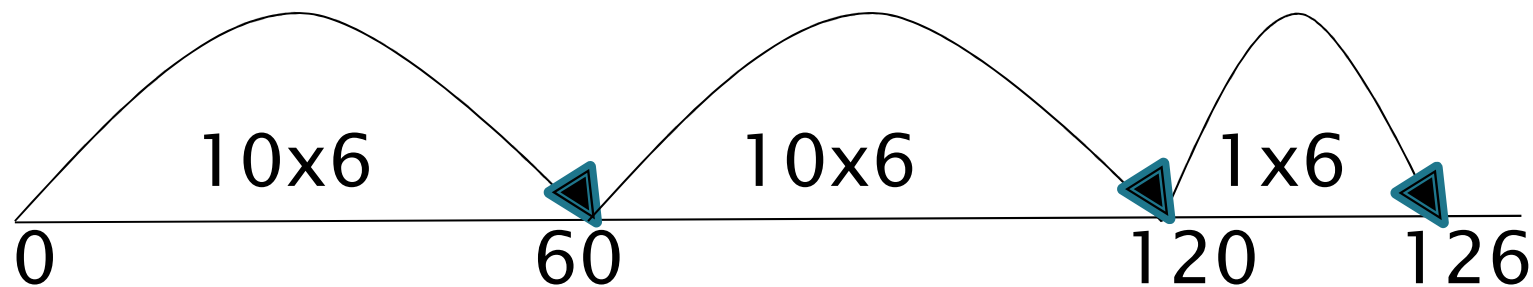
A baker bakes 24 buns. She puts 6 in every box. How many boxes can she fill?



Number lines– Stage 4

Use knowledge of times tables to make larger jumps with larger numbers

What is 126 divided by 6?

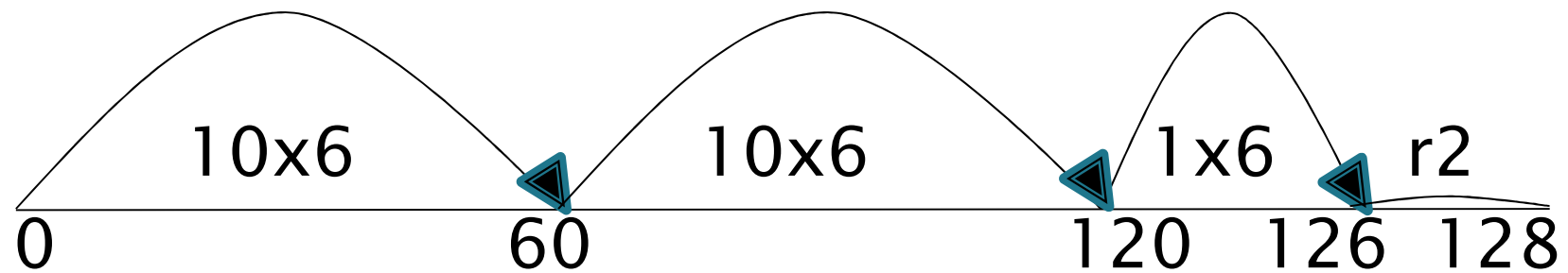


Count up the groups of 6 so $10+10+1=21$

Remainders– Stage 4

Number lines can also be used with remainders, which are now written as r

What is $128 \div 6$?



Count up the groups of 6 so $128 \div 6 = 21r2$

Short division– Stage 5

Short division is introduced as bus stop method with no remainders

$$936 \div 3 = 312$$

$$\begin{array}{r} 312 \\ 3 \overline{) 936} \end{array}$$

Unlike the other calculations, with division you start with the largest place value, ie with the hundreds.

First of all you do $900 \div 3$ which is 300 so write 3 above the 9. Then move onto $30 \div 3 = 10$ so write 1 above the 3 and finally $6 \div 3 = 2$ so write 2 above the 6



Short division– Stage 5

Then move onto short division (bus stop method) with remainders in the units digit

$$937 \div 3 = 312 \text{ r}1$$

$$849 \div 4 = 211 \text{ r}3$$

$$\begin{array}{r} 312 \text{ r}1 \\ 3 \overline{) 937} \end{array}$$

$$\begin{array}{r} 211 \text{ r}3 \\ 4 \overline{) 849} \end{array}$$



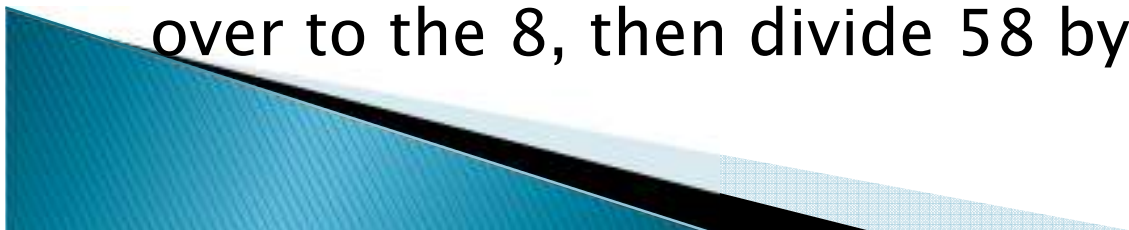
Short division– Stage 6

Using short division but with numbers which are not divisible by the divisor and where 0 is used as a place holder

$$698 \div 8 =$$

$$\begin{array}{r} 087r2 \\ 8 \overline{)698} \end{array}$$

As 8 doesn't divide exactly into 6 then write 0 above the 6 and divide 690 by 8 which is 80 as $8 \times 8 = 64$ then $80 \times 8 = 640$ so carry 50 over to the 8, then divide 58 by 8 which is 7 remainder 2



Remainders– Stage 6

Once you have the answer to a division question, then you can express the remainder as a fraction or a decimal

$$698 \div 8 = 87 \text{ r}2$$

$$\begin{array}{r} 087 \text{ r}2 \\ 8 \overline{)698} \end{array}$$

The r2 can be written as a fraction where the remainder is divided by the divisor $2/8 = 1/4$ so $87 \frac{1}{4}$

The fraction could then be converted into a decimal as $1 \div 4 = 0.25$ then the answer could be expressed as 87.25



Remainders– Stage 6

Alternatively, the remainder could be expressed as a decimal by continuing the short division

$$698 \div 8 = 87.25$$

$$\begin{array}{r} 087.25 \\ 8 \overline{) 698.2040} \end{array}$$

The r2 can be carried to the tenths



Long division– Stage 7

Long division is introduced initially with single digit divisors

$$698 \div 8 = 87 \text{ r}2$$

$$\begin{array}{r} 087 \text{ r}2 \\ 8 \overline{)698} \\ - 64 \\ \hline 58 \\ - 56 \\ \hline 2 \end{array}$$



Long division– Stage 7

Long division with 2 digit divisors and turning the remainder into a decimal by continuing the division

$$186 \div 12 = 15.5$$

$$\begin{array}{r} 015.5 \\ 12 \overline{) 186.0} \\ \underline{-12} \\ 66 \\ \underline{-60} \\ 60 \\ \underline{-60} \\ 0 \end{array}$$



Also ...

- ▶ Importance of working through the stages and not expecting it to be linked to year group– need to understand how/why it works and not just learn the method!
- ▶ Only move onto short/long \div when ready as number line is effective although not as efficient
- ▶ Use of number line to count on in groups can also be effective for larger numbers, 2 digit divisors and decimals




Resources for Division

Maths Caddies:

- ▶ Mini counting sticks
- ▶ Number cards
- ▶ Multiplication square
- ▶ Place value sliders

Classroom resources:

- ▶ Cubes
 - ▶ Dienes materials
 - ▶ Number lines
 - ▶ Money
- 

And Finally...

It is vitally important that children have a secure understanding of number knowledge: counting, number bonds, tables & place value.

There are many opportunities for number knowledge in real life – please use them!

If you have any questions then don't hesitate to ask!

