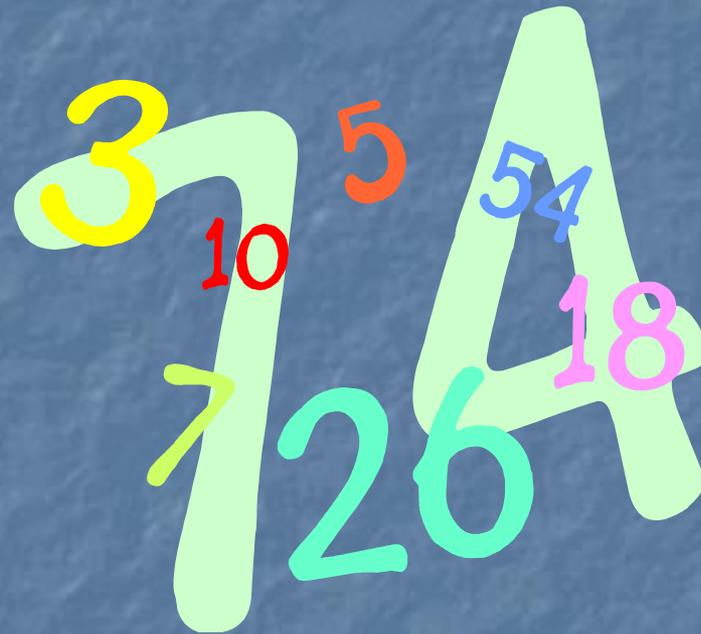


KS1 Maths Workshop for parents



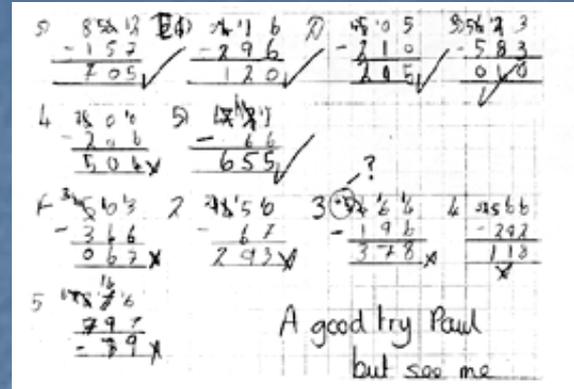
- Thursday 23rd November 2017

Aims of the Workshop

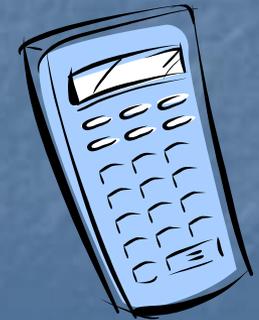
- To give parents a clear overview of how Maths is taught at St Luke's
- To provide parents with a better understanding of the National Curriculum expectations
- To provide parents with materials that they can use at home to support children's maths development.

Maths in the past!

- In the 1960s, a lot of time was given to practising methods.



- Research shows that despite this some children found certain methods difficult, forgot them rather quickly or made persistent errors.
- Sometimes, the result was a dislike of the subject, which could persist into adult life.
- With the 1970s bringing the introduction of calculators, people began to debate what calculating skills are actually needed in life.



The PA Maths approach

- At St Luke's we follow a programme of study used widely in many schools called PA Maths
- It has been produced and written based on detailed research which shows that children need to use concrete apparatus and pictorial representations to support their understanding of formal written methods
- As well as this, we aim for all Maths learning to incorporate fluency, reasoning and problem solving

The National Curriculum

- The national curriculum for mathematics aims to ensure that all pupils:
- become **fluent** in the fundamentals of mathematics, including through varied and frequent practice with increasingly complex problems over time, so that pupils develop conceptual understanding and the ability to recall and apply knowledge rapidly and accurately.
- **reason mathematically** by following a line of enquiry, conjecturing relationships and generalisations, and developing an argument, justification or proof using mathematical language
- can **solve problems** by applying their mathematics to a variety of routine and non-routine problems with increasing sophistication, including breaking down problems into a series of simpler steps and persevering in seeking solutions.

The importance of Mental Maths - Examples of written calculations which should be done mentally in Year 3 and Year 5!

A.

$$\begin{array}{r} 3 \\ -2 \\ \hline 1 \end{array} \checkmark \quad \begin{array}{r} 4 \\ -0 \\ \hline 4 \end{array} \checkmark \quad \begin{array}{r} 5 \\ -3 \\ \hline 2 \end{array} \checkmark \quad \begin{array}{r} 7 \\ -4 \\ \hline 3 \end{array} \checkmark \quad \begin{array}{r} 9 \\ -5 \\ \hline 4 \end{array} \checkmark$$

B.

$$\begin{array}{r} 85 \\ -32 \\ \hline 53 \end{array} \checkmark \quad \begin{array}{r} 76 \\ -50 \\ \hline 26 \end{array} \checkmark \quad \begin{array}{r} 80 \\ -50 \\ \hline 30 \end{array} \checkmark \quad \begin{array}{r} 37 \\ -33 \\ \hline 4 \end{array} \checkmark \quad \begin{array}{r} 89 \\ -87 \\ \hline 2 \end{array} \checkmark$$

17

$$\begin{array}{r} 53 \\ \times 10 \\ \hline 530 \end{array} \checkmark$$

18

$$\begin{array}{r} 58 \\ \times 10 \\ \hline 580 \end{array} \checkmark$$

19

$$\begin{array}{r} 62 \\ \times 10 \\ \hline 620 \end{array} \checkmark$$

20

$$\begin{array}{r} 92 \\ \times 10 \\ \hline 920 \end{array} \checkmark$$

21

$$\begin{array}{r} 124 \\ \times 10 \\ \hline 1240 \end{array} \checkmark$$

22

$$\begin{array}{r} 156 \\ \times 10 \\ \hline 1560 \end{array} \checkmark$$

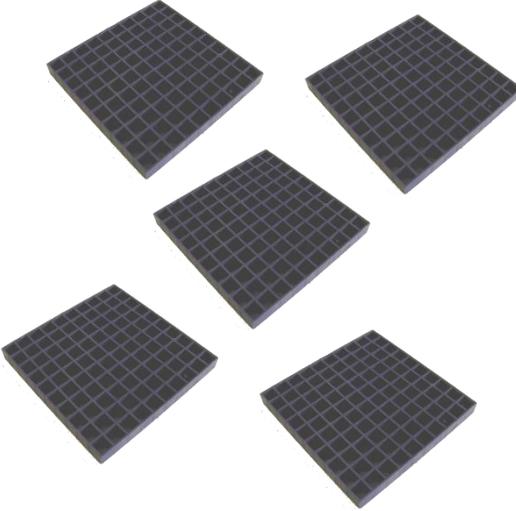
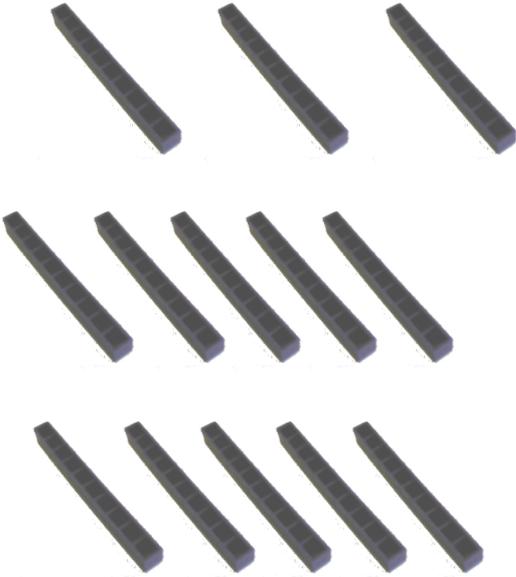
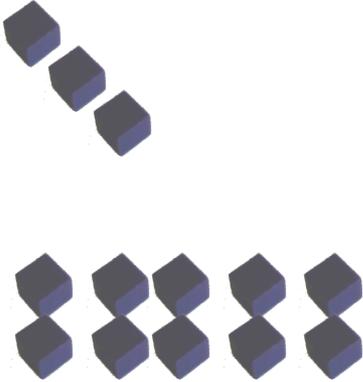
23

$$\begin{array}{r} 132 \\ \times 10 \\ \hline 1320 \end{array} \checkmark$$

Concrete, Pictorial and Abstract



Concrete, Pictorial and Abstract

H	T	U
		

So how do children learn in maths?

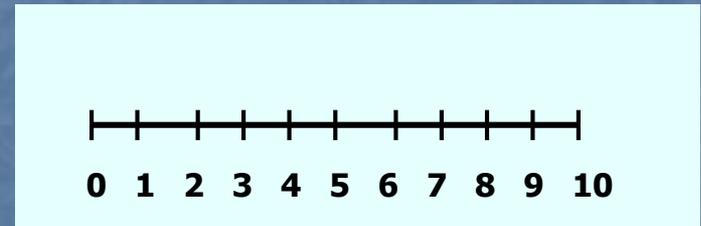
- **Counting** of objects and mental counting.



- Early stages of calculation with learning of addition and subtraction **number facts**, with recording.

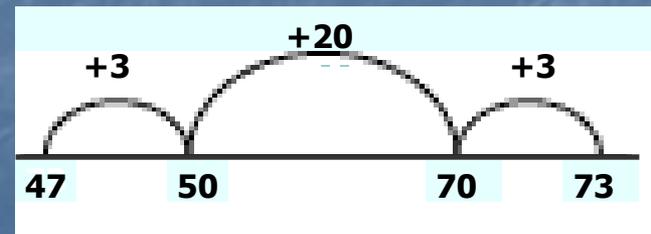
$$5 + 8 = \blacksquare \quad \text{or} \quad 13 = \blacksquare + 5$$

- Work with **structured number lines**



- Work with **larger numbers, unstructured number lines** and informal **jottings**.

e.g. $47 + 26$



- **Informal written methods**, first with whole numbers and decimals.



Remember to partition

$$\begin{array}{r}
 76 + 47 = \\
 76 + 40 + 7 = \\
 116 + 7 = \mathbf{123}
 \end{array}$$



I must remember to add the least significant digit first

$ \begin{array}{r} 368 \\ + 493 \\ \hline 11 \\ 150 \\ 700 \\ \hline 861 \end{array} $	$ \begin{array}{l} (8+3) \\ (60+90) \\ (300+400) \end{array} $
---	--

- **Formal written methods.**

$ \begin{array}{r} 47 \\ + 76 \\ \hline 123 \\ \hline 11 \end{array} $	$ \begin{array}{r} 368 \\ + 493 \\ \hline 861 \\ \hline 11 \end{array} $
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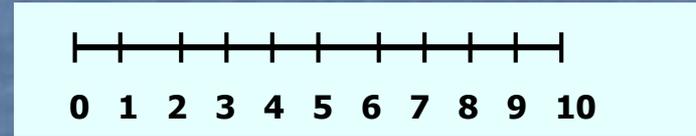
- Use of **calculators** for more difficult calculations.
- With any calculation, teach children to **consider first whether a mental method is appropriate and remembering to estimate first.**

Addition



1. **Practical** addition of real objects.
2. **Mental addition** of number facts.

3. Use of a **structured number line** to add.



4. **Partitioning** to add.

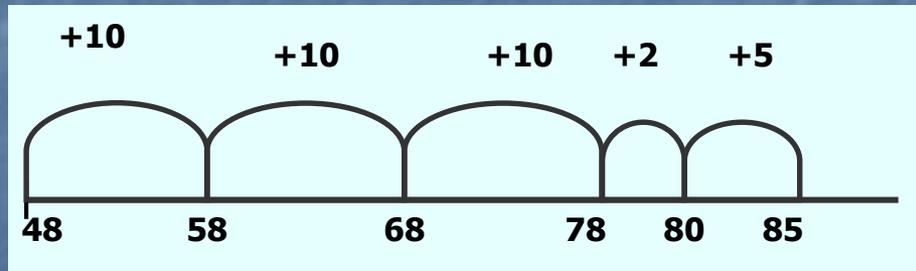
$$\begin{array}{|c|c|c|} \hline 1 & 2 & 3 \\ \hline \end{array} = \quad + \quad +$$

5. Use of an **unstructured number line**.

$$37 + 48 =$$



Remember to put the largest number first



Note: the units jump can be broken down to make it easier to count on through a multiple of 10

Addition cont

6. Beginning to record vertically.
Adding the least significant digit first.

$$126 + 57 =$$

Estimate: $126 + 57$ is nearly $130 + 60$ so estimate answer should be near 190.

$$\begin{array}{r} 126 \\ + 57 \\ \hline 13 \quad (6+7) \\ 70 \quad (20+50) \\ 100 \quad (100+0) \\ \hline 183 \end{array}$$

Addition cont

7. Standard vertical method involving carrying.

When children are confident working with larger numbers using the previous strategies, they will be introduced to 'carrying' digits.

Usually this is during Year 5 and 6. $2856+1095$

Estimate: $2900+1100 = 4000$ Answer should be less as I have rounded up.

$$\begin{array}{r} 47 \\ + 76 \\ \hline 123 \\ \hline 11 \end{array} \quad \begin{array}{r} 368 \\ + 493 \\ \hline 861 \\ \hline 11 \end{array}$$

$$\begin{array}{r} 2856 \\ + 1095 \\ \hline 3951 \\ \hline 11 \end{array}$$

Addition cont

8. Adding decimals

This is first introduced through money and measures. As with all vertical methods, children should know how to line up place value columns and the decimal point under each other.

$$\pounds 5.75 + \pounds 3.18 =$$

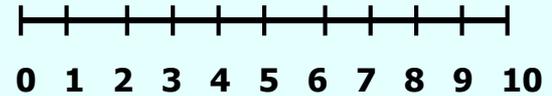
$$\text{Estimate: } \pounds 6.00 + \pounds 3.00 = \pounds 9.00$$

$$\begin{array}{r} \pounds 5.75 \\ + \pounds 3.18 \\ \hline 0.13 \text{ (0.05+0.08)} \\ 0.80 \text{ (0.70+0.10)} \\ 8.00 \text{ (5.00+3.00)} \\ \hline \pounds 8.93 \end{array}$$

$$\begin{array}{r} \pounds 5.75 \\ + \pounds 3.18 \\ \hline \pounds 8.93 \\ 1 \end{array}$$

Subtraction

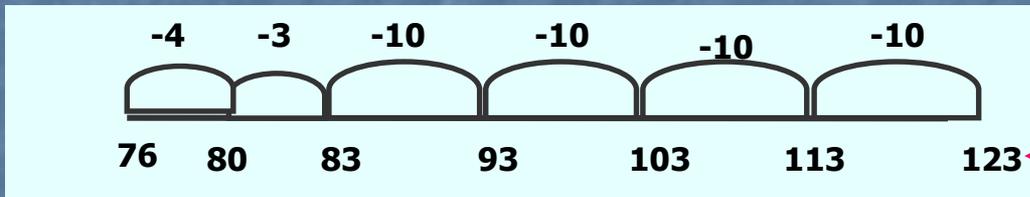
1. **Practical** subtraction of real objects.
2. **Mental subtraction** of number facts.
3. Use of a **structured number line** to add.



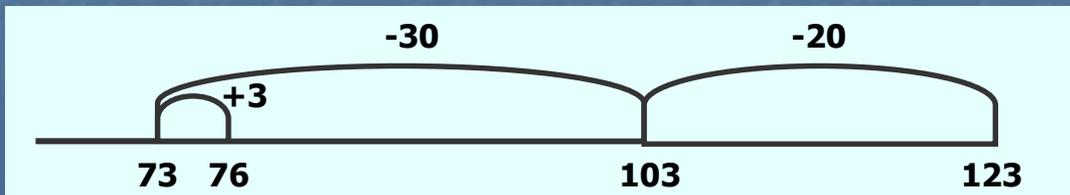
4. Use of an **unstructured number line**.
 $123 - 47 =$

Estimate first $120 - 50 = 70$

Counting back- (most significant digit first, in this case tens, then units)



Start here.



or

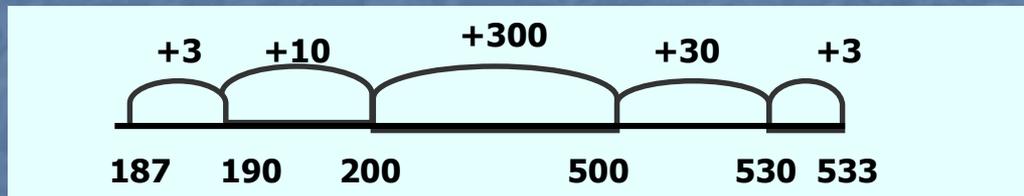
Subtraction cont

5. Counting on (Complimentary addition)

How shopkeepers counted out change (before the till took over!) Children will be taught to find the **difference** by counting on in the following ways.

$$533 - 187 =$$

Estimate : $530 - 190 = 340$ (carried out mentally as $530 - 200 + 10 = 340$)



Start at
this
end.

Add the numbers
on top of the
number line to
get the answer.

$$\begin{aligned} \text{The difference is: } & 3 + 10 + 300 + 30 + 3 \\ & \text{or } 300 + 40 + 6 \\ & = 346 \end{aligned}$$

Subtraction cont

6. Towards standard vertical subtraction

When children are confident in finding the difference between larger numbers using number lines, they will begin to be introduced to a more efficient vertical procedure.

$$\begin{array}{r} 533 \\ - 187 \\ \hline 13 \text{ (to make 200)} \\ 300 \text{ (to make 500)} \\ 33 \text{ (to make 533)} \\ \hline 346 \end{array}$$

This first vertical method is again based on counting up.



Subtraction cont

7. Subtraction by decomposition

Children will then be shown decomposition; they must really understand place value to do this.

$$\begin{array}{r} 83 \\ - 55 \\ \hline \end{array} \text{ is the same as } \begin{array}{r} 80 + 3 \\ 50 + 5 \\ \hline \end{array}$$

Ten is taken from 80 and added to the three.



This can be rewritten as

$$\begin{array}{r} 70 + 13 \\ - 50 + 5 \\ \hline 20 + 8 = 28 \end{array}$$

A hundred is taken from 500 and added to 20.



$$\begin{array}{r} 533 \\ - 187 \\ \hline \end{array} \text{ is the same as } \begin{array}{r} 500 + 30 + 3 \\ - 100 + 80 + 7 \\ \hline \end{array} \begin{array}{r} 500 + 20 + 13 \\ - 100 + 80 + 7 \\ \hline \end{array}$$

A hundred now needs to be moved as well.

$$\begin{array}{r} 400 + 120 + 13 \\ - 100 + 80 + 7 \\ \hline 300 + 40 + 6 = 346 \end{array}$$

Subtraction cont

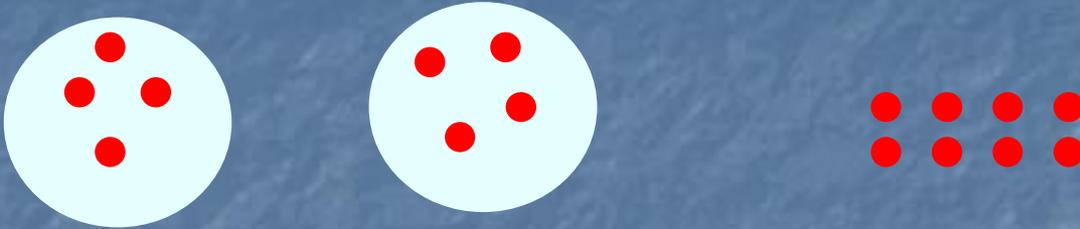
8. Subtraction by decomposition

Only when children are completely secure in this we will teach them standard vertical subtraction using decomposition.

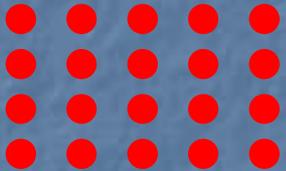
$$\begin{array}{r} 4 \quad 12 \quad 1 \\ 533 \\ - 187 \\ \hline 346 \end{array}$$

Multiplication

1. Practical Multiplication - 2×4 2 lots of 4.



2. Use of arrays 4×5



This is
an
array.



3. Repeated addition

$$4 \times 5 =$$

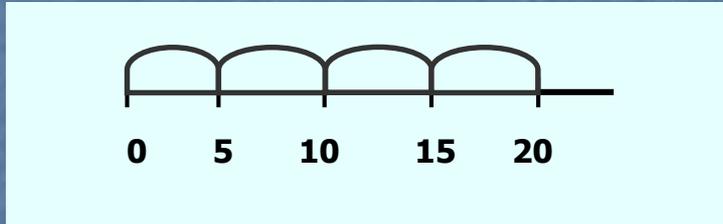
$$5 + 5 + 5 + 5 = 20$$

$$\text{or } 4 + 4 + 4 + 4 + 4 = 20$$

Multiplication cont

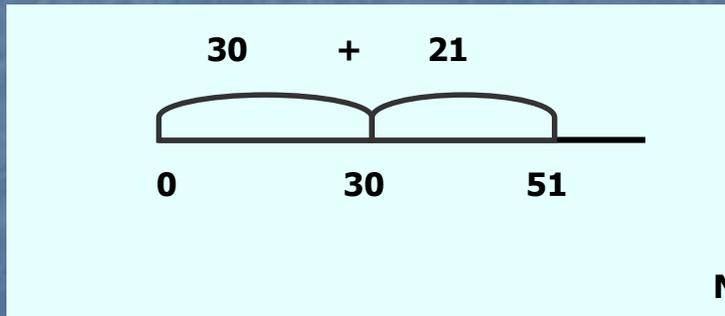
4. Repeated addition can also be done on a number line.

$$4 \times 5$$



5. Partitioning – Simple recording

$$17 \times 3 = (10 \times 3) + (7 \times 3)$$
$$30 + 21 = 51$$



Number lines
can be used
to do the
addition part!

Multiplication cont

4. **The Grid Method** This is our key strategy for beginning to formally record multiplication. $17 \times 3 = (10 \times 3) + (7 \times 3)$

$$\begin{array}{r} X \quad 10 \quad 7 \\ 3 \quad \boxed{30} \quad \boxed{21} \end{array}$$

$$30 + 21 = 51$$

Add the numbers inside the grid together to get the answer.



5. **Multiplying two 2 digit numbers** 18×23
Estimate $20 \times 20 = 400$.

$$\begin{array}{r} X \quad 10 \quad 8 \\ 20 \quad \boxed{200} \quad \boxed{160} \\ 3 \quad \boxed{30} \quad \boxed{24} \end{array}$$

$$200 + 160 + 30 + 24 = 360 + 54$$

$$360 + 54 = 414$$

Try to add the numbers together mentally. If not, use a written method.

$$\begin{array}{r} 360 \\ + 54 \\ \hline 4 \\ 110 \\ 300 \\ \hline 414 \end{array}$$

Multiplication cont

6. 3 digit by 2 digit $156 \times 25 =$

Estimate $160 \times 20 = 3200$

x	100	50	6
20	2000	1000	120
5	500	250	30

$$\begin{array}{r} 3120 \\ + 780 \\ \hline 3900 \\ 1 \end{array}$$

7. 3 digit by 3 digit $152 \times 385 =$

Estimate $150 \times 400 = 60000$.

x	100	50	2
300	30000	15000	600
80	8000	4000	160
5	500	250	10

$$\begin{array}{r} 45\ 600 \\ + 12\ 160 \\ \hline 760 \\ \hline 58\ 520 \\ 11 \end{array}$$

Multiplication cont

8. Once children are confident with the grid method, they will be introduced to the following strategies for recording.

Short multiplication

17×3

$$\begin{array}{r} 17 \\ \times 3 \\ \hline 21 \text{ (7x3)} \\ 30 \text{ (10 x 3)} \\ \hline 51 \end{array}$$

leads to

$$\begin{array}{r} 17 \\ \times 3 \\ \hline 51 \\ 2 \end{array}$$

9. Long multiplication 184×32
Estimate $180 \times 30 = 5400$.

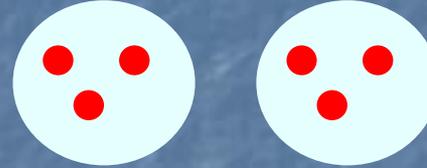
$$\begin{array}{r} 184 \\ + 32 \\ \hline 368 \text{ (184 x 2)} \\ 5520 \text{ (184 x 30)} \\ \hline 5888 \end{array}$$

Division

1. **Sharing or Grouping** – Division is initially represented pictorially.

$$6 \div 2 = 3$$

6 sweets **shared** between 2 people. How many each?

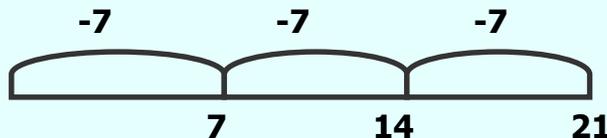


There are 6 people in a room. Put them into **groups** of 2. How many groups can you make?



Sharing and grouping are two totally different concepts that children need to understand.

2. Using a number line to show division.



$$21 \div 7 = 3$$

Division cont

3. Using Multiples of the Divisor - Chunking.

$$90 \div 5 = 18$$

$$\begin{array}{r} 90 \\ - 50 \quad (10 \times 5) \\ \hline 40 \\ - 40 \quad (8 \times 5) \\ \hline 0 \end{array}$$



Start with 90
and take away
multiples of 5.

4. Short division

$$87 \div 4 = 21 \text{ r } 3$$

$$\begin{array}{r} 4 \overline{) 87} \\ - 40 \quad (10 \times 4) \\ \hline 47 \\ - 40 \quad (10 \times 4) \\ \hline 7 \\ - 4 \quad (1 \times 4) \\ \hline 3 \end{array}$$

Division cont

5. Using Chunking with larger numbers.

$$875 \div 24 = 36 \text{ r } 11$$

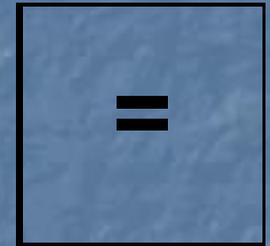
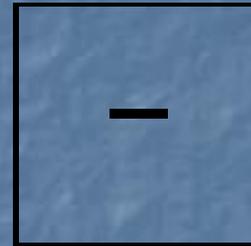
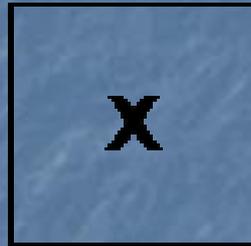
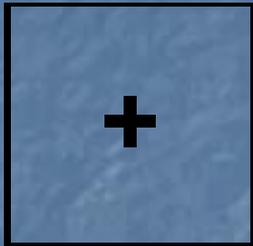
$$\begin{array}{r} 4 \overline{) 875} \\ - \underline{240} \quad (10 \times 24) \\ 515 \\ - \underline{240} \quad (10 \times 24) \\ 275 \\ - \underline{240} \quad (10 \times 24) \\ 35 \\ - \underline{24} \quad (1 \times 24) \\ 11 \end{array}$$

6. Leading to sums using decimals.

Fluency, reasoning and problem solving...

- This is all about applying Mathematical skills into many different context
- It is it not always the case that the higher the numbers the harder the questions – 'depth' is key...

Look at these signs.



Use the signs to make this one correct.

14



2



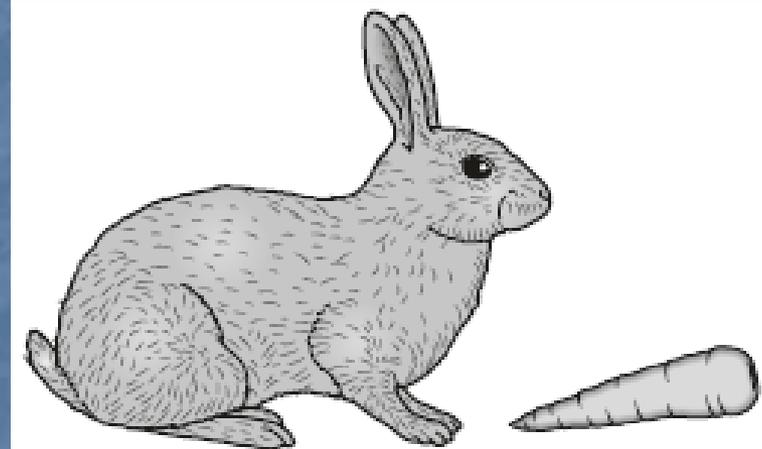
12

- Write a digit in each box to make the sum correct.

$$\begin{array}{|c|} \hline 7 \\ \hline \end{array} \begin{array}{|c|} \hline \\ \hline \end{array} + \begin{array}{|c|} \hline \\ \hline \end{array} = \begin{array}{|c|} \hline 8 \\ \hline \end{array} \begin{array}{|c|} \hline 3 \\ \hline \end{array}$$

Amy plants 4 rows of carrots.

There are 3
carrots in each
row.



A rabbit eats 2
of the carrots.

How many carrots are left?

Write numbers in the boxes to make this calculation correct.

$$50 - \boxed{} = \boxed{} + 10$$

Supporting your child at home

- Mental maths skills are really important – in particular with the younger children – number bonds!
- Learning times tables – it is really important that children have rapid recall of their times tables up to 12×12 by the end of Year 6
- Use Maths in real life contexts
- Support your child with their Maths homework