

KS1 Calculation Meeting
Mathematics Curriculum Team
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22.6.15

Aims for Today's Meeting

Why do we have to learn Maths?

Mental versus written calculations

Calculation methods taught at Clarendon with a focus on KS1

How you can you help at home

Questions?

Why Do We Have to Learn Maths?

It is essential to everyday life, critical to science, technology and engineering, and necessary in most forms of employment.

National Curriculum 2014

Consider this,

How have you used Maths today?

What Does Maths Look Like Today?

Number, measures, geometry, statistics

Fractions

Data Handling

Angles

Time

Money

Area

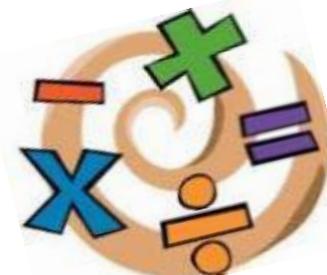
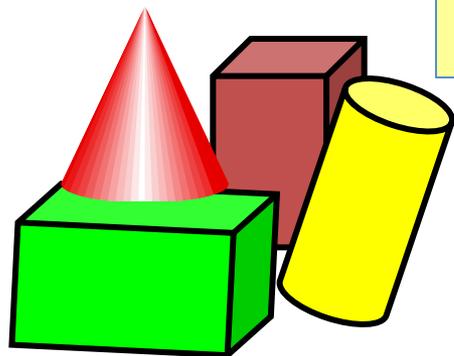
Perimeter

Temperature

Decimals

2 & 3D shape

Percentages



Even before we look at written methods...

Mental calculation skills are vital.

-can I do it in my head?

This is what we do most in real life.

Children need the ability to **estimate**.

For example

If I have 18 sweets in one bag
and 13 sweets in another bag,
how many do I have altogether.



Children can estimate by adding 20 and 10 and know that roughly the answer should be around 30 before they carry out a calculation.

What Else?

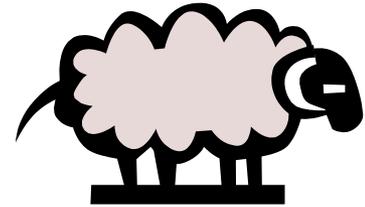
All children need to apply maths into a **real life context**.

This involves different **mathematical** vocabulary.

Children need to be able solve problems

A farmer has 3 fields, each field has 5 sheep in them. How many sheep

are there in total? $3 \times 5 = 15$ sheep



Children need to be able to **explain** how they have calculated something using a method that suits them. If they can't explain it, they don't fully understand it.

Written calculations, are taught but only when children are ready.

Written Calculations

Up to Year 3 the emphasis is on:

working **mentally** and using **practical equipment**

some **jottings** for more challenging numbers

models and images

In Year 3-6 children will be gradually taught more formal written methods of calculation but they will still use mental methods and jottings where appropriate.

Getting Ready for Written Methods

Children need to develop skills such as counting, partitioning and recombining numbers

They need to build an awareness of the number system, value of numbers and number relationships

They need to recall facts such as number bonds, halving/ doubling and multiplication facts

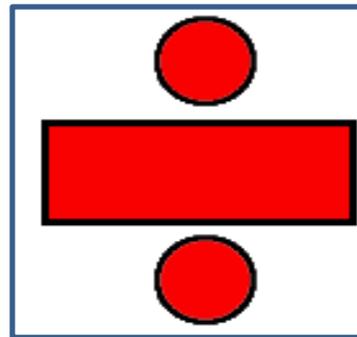
From all of these they begin to develop a **sense of number** they can apply in many different areas

Question?

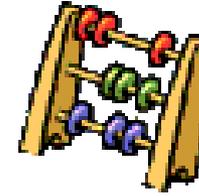
Using the equipment on
your table how many ways can
you show 32?

Calculation Strategies

- There are 4 operations

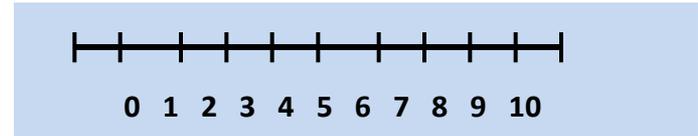


Addition

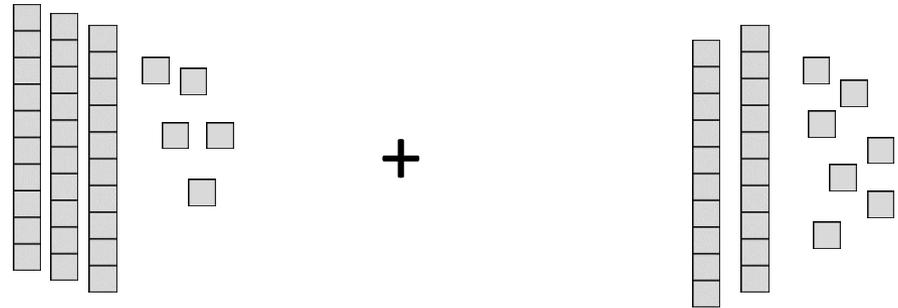


1. **Practical** addition of real objects.
2. **Mental addition** using number facts.

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



4. **Partitioning** to add.

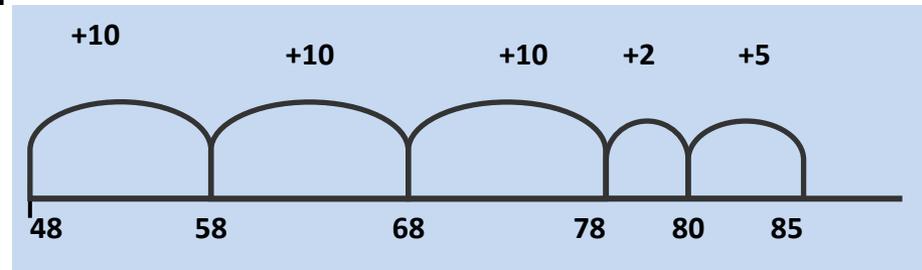


5. Use of an **unstructured number line**.

$$37 + 48 =$$



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 - bridging

Addition cont

6. Beginning to record vertically.
Adding the least significant digit first.
Supported with Diennes apparatus initially.

$$126 + 57 =$$

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

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

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.

$$2856+1095$$

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

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

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

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.

$$\text{£}5.75 + \text{£}3.18 =$$

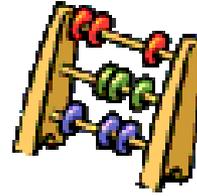
Estimate: £6.00 + £3.00 = £9.00

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

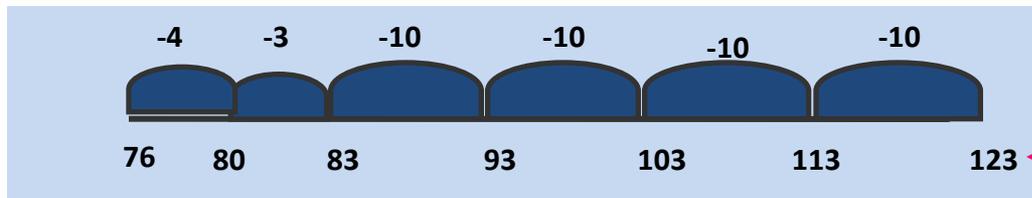
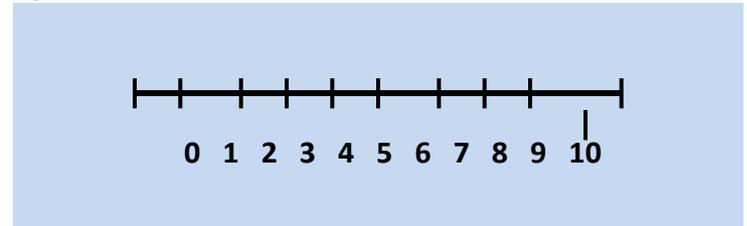
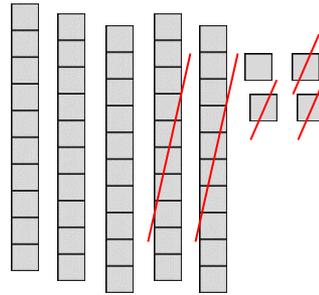
$$\begin{array}{r} \text{£}5.75 \\ +\text{£}3.18 \\ \hline \text{£}8.93 \\ 1 \end{array}$$

Subtraction

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



4. **Use of Diennes**



Start here.

5. 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)

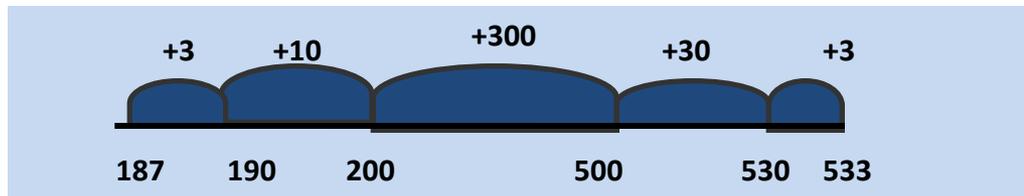
Subtraction cont

5. Counting on

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.

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

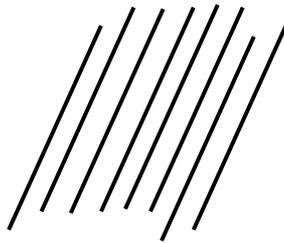


Subtraction cont

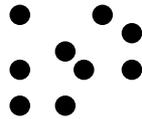
6. Towards standard vertical subtraction supported by Diennes

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

$89 - 57$



80



9

-

50

7

30

2

32



The next step is exchanging or decomposition

Subtraction cont

7. Subtraction by decomposition

Children will then be shown decomposition; they must really understand place value to do this. Again supported with Diennes initially.

$$\begin{array}{r} 83 \\ - 55 \\ \hline \end{array} \text{ is the same as}$$

$$\begin{array}{r} 80 + 3 \\ - 50 + 5 \\ \hline \end{array}$$

Ten is taken from 80 and added to the three.



This can be rewritten as

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

$$\begin{array}{r} 533 \\ - 187 \\ \hline \end{array} \text{ is the same as}$$

$$\begin{array}{r} 500 + 30 + 3 \\ - 100 + 80 + 7 \\ \hline \end{array}$$

$$\begin{array}{r} 500 + 20 + 13 \\ - 100 + 80 + 7 \\ \hline \end{array}$$

A hundred now needs to be moved as well.

$$\begin{array}{r} 400 + 120 + 13 \\ - 100 + 80 + 7 \\ \hline \end{array}$$

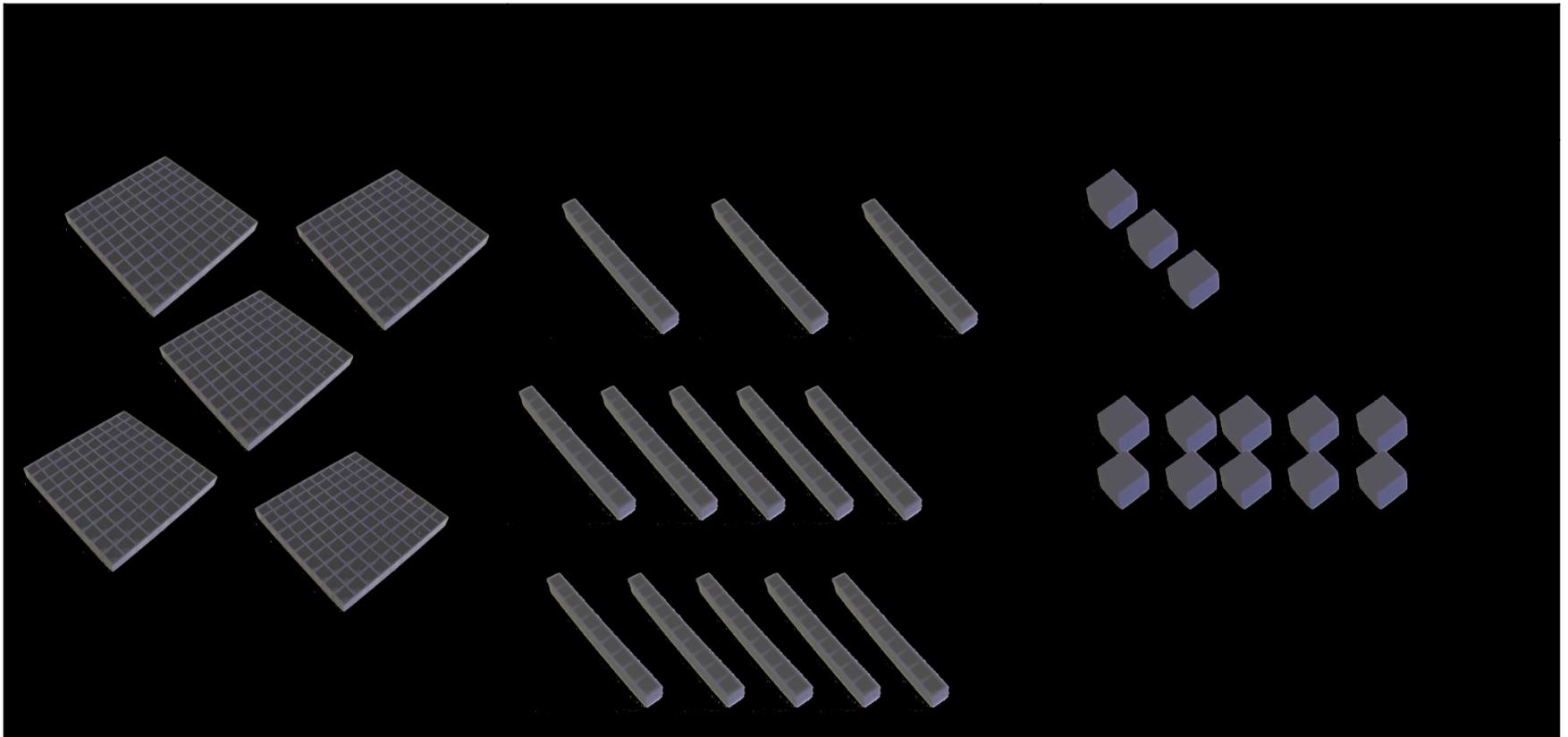
$$300 + 40 + 6 = 346$$

A hundred is taken from 500 and added to 20.



Subtraction continued...

$$\begin{array}{r} 533 \\ -187 \\ \hline \end{array} = 500 + 30 + 3 = 500 + 20 + 13 = 400 + 120 + 13 = 100 + 80 + 7 = 100 + 80 + 7 = 346$$



Subtraction cont

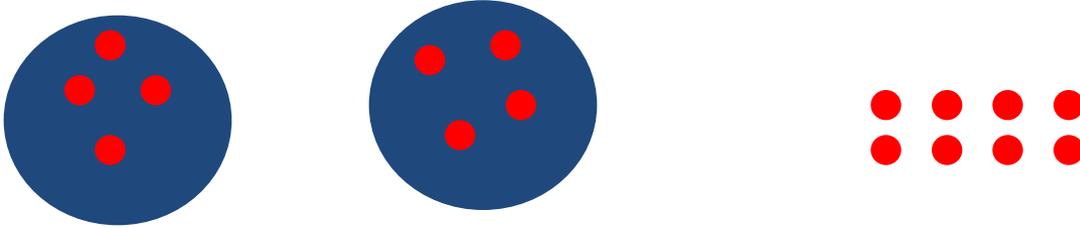
8. Subtraction by decomposition

When children are completely secure in this, they will be taught standard vertical subtraction using decomposition. This will include decimals.

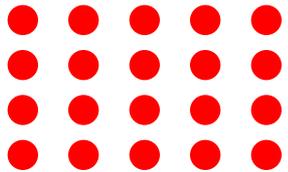
$$\begin{array}{r} ^4 ^{12} ^1 \\ 5 \cancel{3} \cancel{3} \\ - 187 \\ \hline 346 \end{array}$$

Multiplication

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



2. **Use of arrays** 4×5



This is an
array.



3. **Repeated addition**

$$4 \times 5 =$$

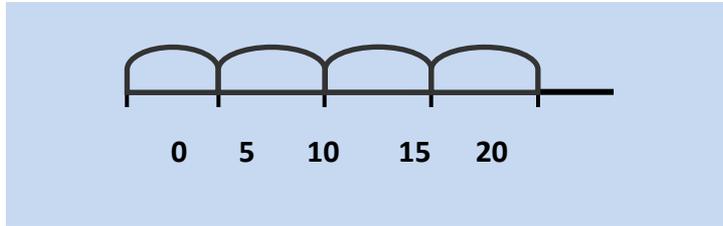
$$5 + 5 + 5 + 5 = 20$$

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

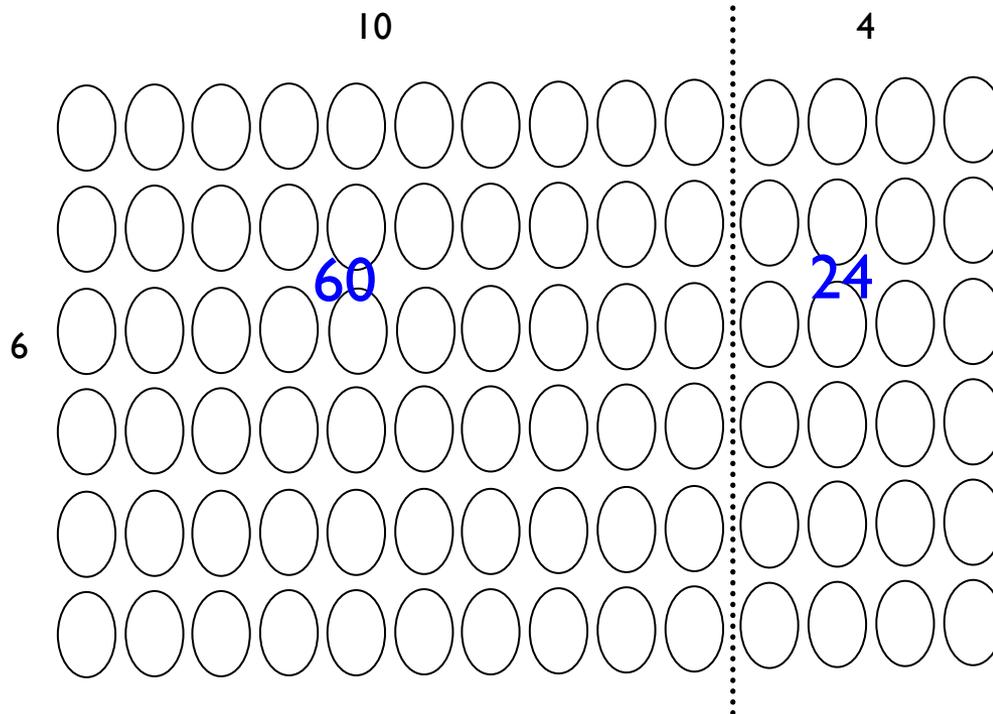
Multiplication cont

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

4×5



5. Partitioning – Simple recording



This is the introduction to the Grid method

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.

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

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

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

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 $180 \times 30 = 5400$.

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

PS A gentle reminder about times tables

A return to some old fashioned Maths teaching!

Children need to learn their times tables.

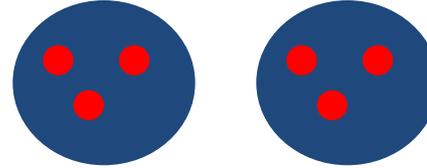
Without their times tables they may know the
method for multiplication, but get the wrong
answer.

Division

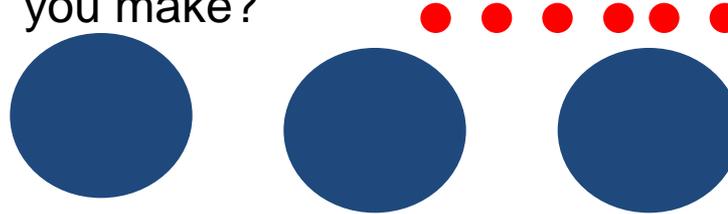
1. **Sharing or Grouping** – Division is initially represented pictorially.

$$6 \div 2 = 3$$

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

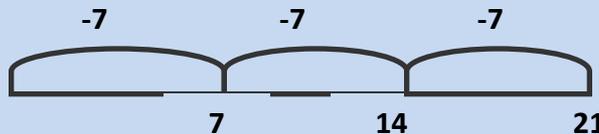


There are 6 people in a room. Put them into **groups** of 2. How many groups can you make?



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

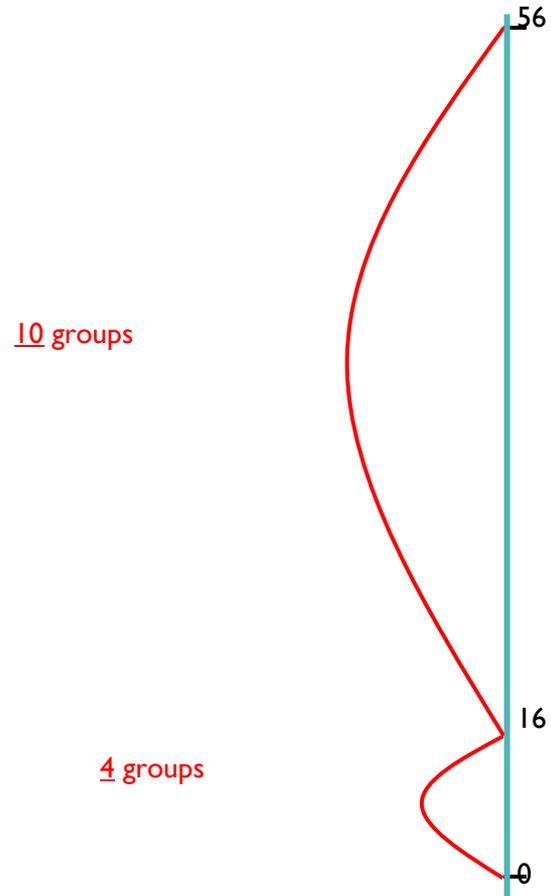
2. Using a number line to show division.



$$21 \div 7 = 3$$

Repeated subtraction

Children will continue to develop their use of grouping (repeated subtraction) to be able to subtract multiples of the divisor, moving on to the use of the 'chunking' method.



$$56 \div 4 =$$

56

$$10 \text{ groups of } 4 = \underline{40}$$

16

$$4 \text{ groups of } 4 = \underline{16}$$

0

Answer 14 groups of 4

Division cont

3. Using Multiples of the Divisor - Chunking.

$$90 \div 5 = 18$$

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



Start with 90 and take away multiples of 5.

4. Short division

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

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



r means remainder.

Division cont

5. Using Chunking with larger numbers.

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

$$\begin{array}{r} 24 \overline{) 875} \\ - \quad 240 \text{ (10 x 24)} \\ \hline 635 \\ - \quad 240 \text{ (10 x 24)} \\ \hline 395 \\ - \quad 240 \text{ (10 x 24)} \\ \hline 155 \\ - \quad 120 \text{ (5 x 24)} \\ \hline 35 \\ - \quad 24 \text{ (1 x 24)} \\ \hline 11 \end{array}$$

6. Leading to calculation with decimals.

Remember!

- **Mental calculations first.**
- The ability to **estimate** – a sensible guess.
- To use maths in a **real life context.**
- To ask children to **explain** how they have calculated something using a method that suits them.
- Teach children **written calculations**, but only when children are ready.



How You Can Help At Home

Take note of numbers in real life e.g. telephone numbers, bus numbers, prices etc

Playing number games like dominoes, snakes and ladders

Reading clocks to tell the time – both analogue and digital

Money - give children opportunities to use money to shop, check your change etc

Measures – estimating, weighing, cooking together

Reinforcement of number bonds, tables ... learning by 'heart'

Consolidating learning - what did you learn today, can you teach it to me? Research has proven that this is the most effective way to learn.

When helping your children calculate use the method that they have been taught.

Be Positive About Maths

Useful Websites

www.clarendon.bolton.sch.uk/

<http://resources.woodlands-junior.kent.sch.uk/maths/>

<http://www.ictgames.com/resources.html>

http://www.bbc.co.uk/schools/websites/4_11/site/numeracy.shtml

<http://nrich.maths.org/primary-lower>

Questions?

I Can Count

- 1, 2, 3, 4, 5, 6, 7, 8 & 9, 10, 11,
- 12, let' s keep counting,
- 13, 14, 15, 16
- 17, 18, 19, 20,
- Let the whole world know, I can count!
- (a little bit faster!)*

The Spider

- 1, 2, 3, 4: There' s a spider on the floor!
- 5, 6, 7, 8: Watch him crawling on my plate!
- 9, 10, 11, 12: In my dinner, see him delve!
- 13, 14, 15, 16: Time for me to start my eating!
- 17, 18, 19, 20: Crunchy dinner, my plate' s empty!

