Templefield Lower School

KS2 Maths Workshop

Helping our children to achieve and enjoy maths.

Fundamental Aims

- To give children the chance to **explore** ways of finding an answer, and being able to **explain** why it works (reasoning)

- To give them the **key skills** needed to solve **real world** problems and examples (Fluency)

- To provide opportunities to **apply** these skills in practical situations (Reasoning and problem solving)

Why is maths important to your child?

- Enjoy mathematical activities
- Feel confident in tackling mathematical problems in everyday life
- Become creative thinkers
- Be motivated to learn and acquire new skills

Mathematical thinking is important for all members a modern society as a habit of mind for its use in the workplace, business and finance, and for personal decision making!

Dfe statutory programmes of study for mathematics - the importance of mathematics.

- **'I was never very good at maths so my child won't be'**
- **'His dad/mum is the maths person'**
- **'It's boring'**
- **It doesn't make sense'**
- **'I can't understand it'**
- **'When do you need to do this in real life?'**
- **FEAR!**

How are we preparing our pupils?

How do our children think? What is their habit of mind?

- Mathematical thinking as a habit of mind:

- •I'm always wrong
- •I don't know what to do
- •I can't do this
- •Oh no! I'm stuck

Mathematical thinking as a habit of mind:

•What can I figure out?
•Who can I talk to about this?
•What do I know already?
•I'm stuck…..good – I like a challenge

Developing Mathematical understanding

- Pose mathematical challenges which enrich, engage, and challenge their thinking and allow pupils to apply their skills and knowledge - Prompting thinking & questioning
- Providing opportunities to manipulate, experience and see (use of resources) - Linking CPA (concrete, pictorial, abstract)

Five fundamental higher-order thinking skills.

- Problem-solving - Develop thinking through investigation
- Inquiring - Enabling learning through drawing attention to.
- Reasoning and making connections
- Communicating -Engaging in talk
- Conceptualising - Encouraging children to make links and generalise

They need to show "understanding", not simply "procedure"

KS2 need strong understanding of Mental Maths

- H T U – place value, partitioning, flexible partitioning
- Times tables and related division facts
- Number bonds up to 10, 20, 50 then 100
- Doubling and Halving
- Rounding and estimating
- x 10, x 100 (DON'T ADD A 0!)

KS2 need STRONG MENTAL CALCULATION STRATEGIES

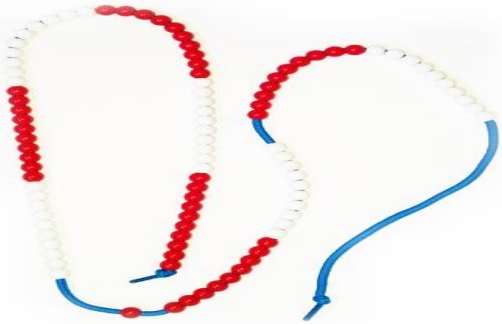
- Quick recall of
- Number bonds to 20, 50 and 100.

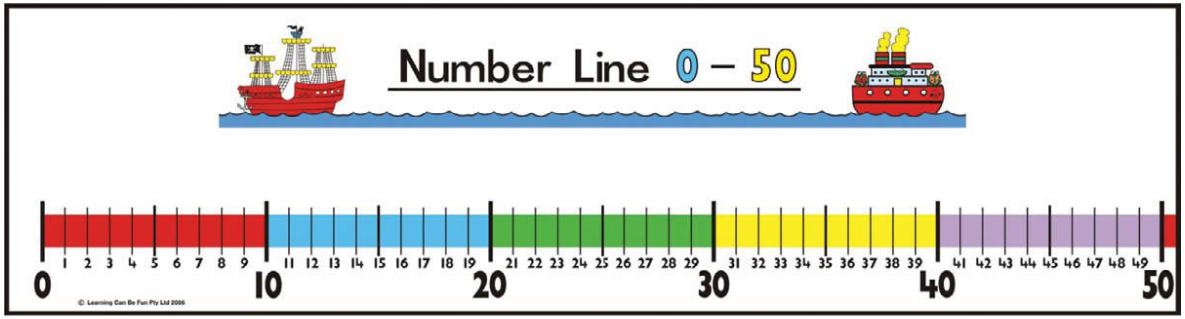
- RapidTimes tables knowledge(links to 100 club)
- 2x, 5x, 10x (year 2)
- 3x, 4x, 8x (year 3)
- 6x, 9x 7x 11x 12x (year 4)
- Strong times table knowledge helps makes maths easy – especially in KS2. It links to more complex multiplication, division and fractions.

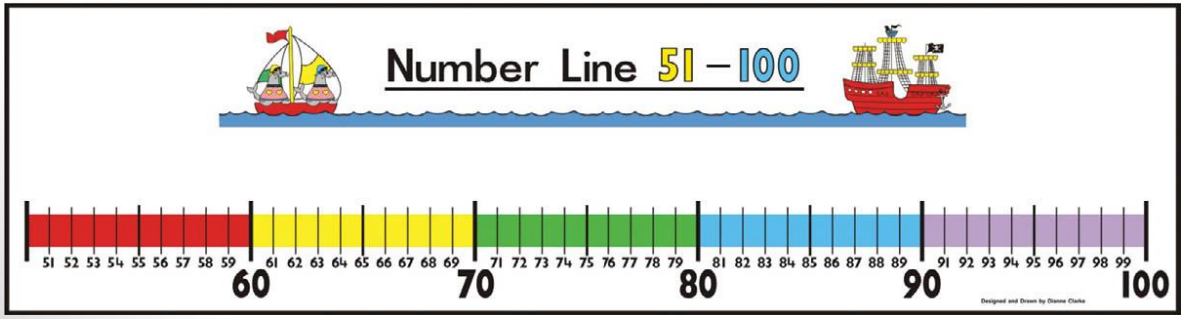
CPA – Concrete Pictorial and Abstract

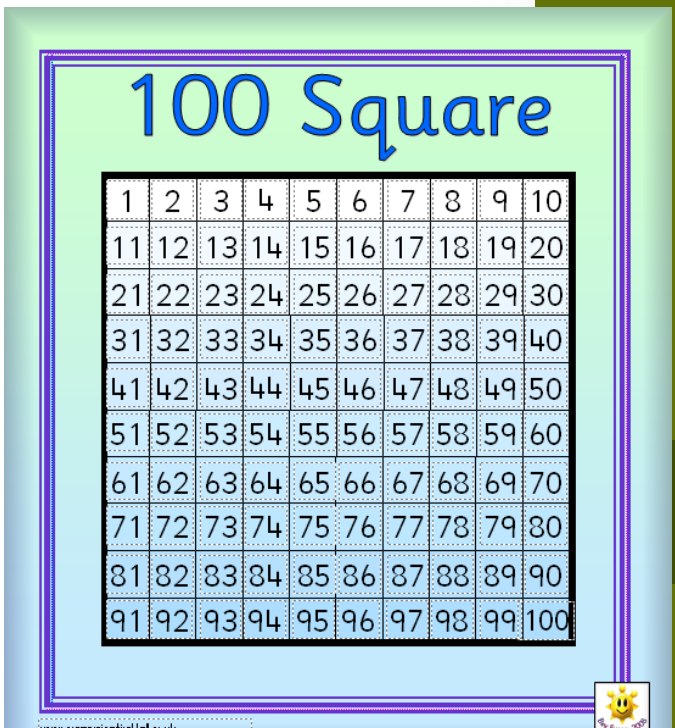
- We believe in the pedagogy behind using the concrete, pictorial and abstract approach in our mathematics teaching because it develops a deep and sustainable understanding of maths for our children.
- Our children regularly use manipulatives in class to aid them to apply their knowledge and skills. This then means that they can model and imagine these manipulatives and in turn they can move on to the next developmental stage of drawing the pictorial representation or 'jotting' to help them solve problems with increasing independence, speed and fluency.
- Once children are confident in using manipulatives and applying this to the pictorial representation we move onto using written number so that the children can make connections and have a greater understanding of number.

Concrete resources to support understanding



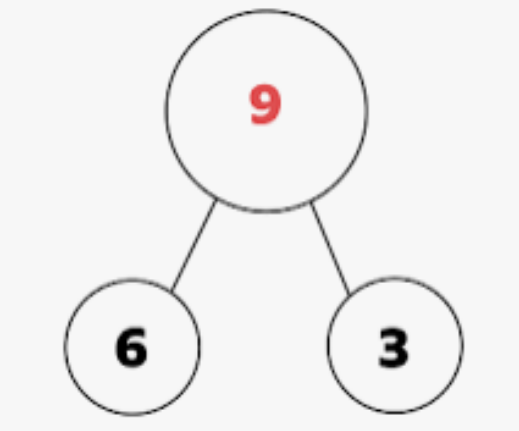


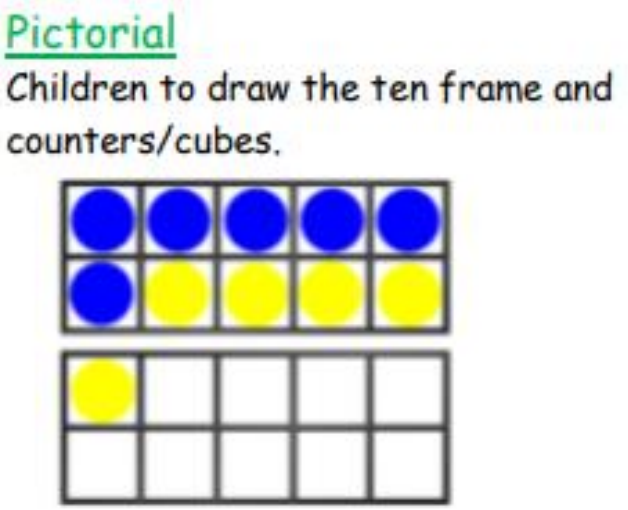




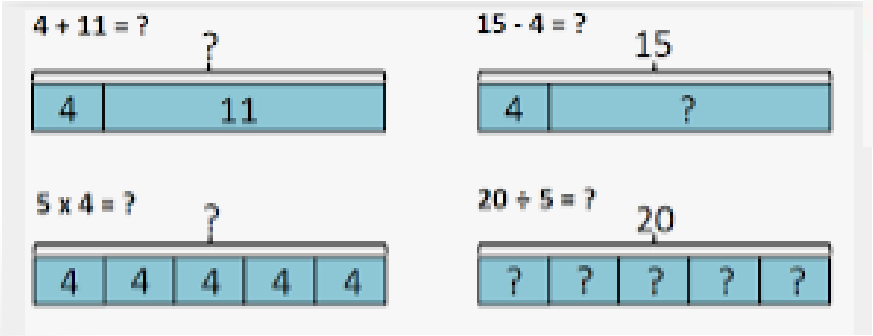
Concrete to Pictorial – common models

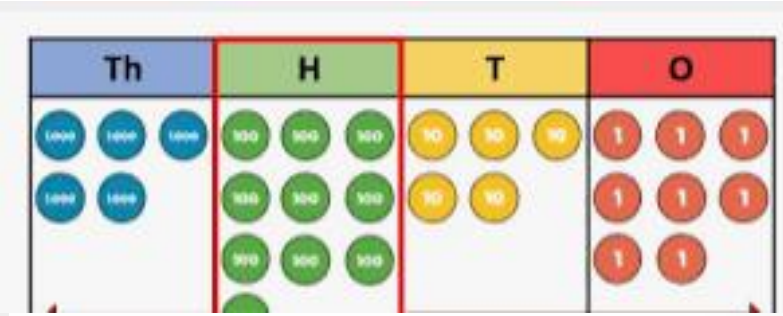
- Part / whole models





- Bar models

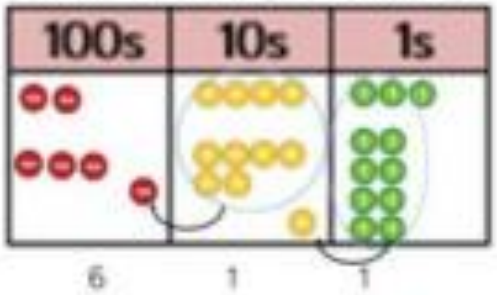




Expanded Column Method leading to Compact Column Method

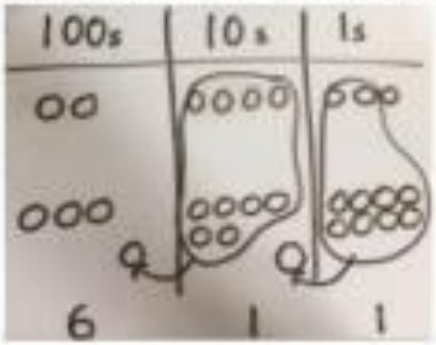
Concrete

Use of place value counters to add HTO + TO, HTO + HTO etc. When there are 10 ones in the 1s column- we exchange for 1 ten, when there are 10 tens in the 10s column- we exchange for 1 hundred.



Pictorial

Chidren to represent the counters in a place value chart, circling when they make an exchange.



Expanded Column Method with carrying and begin to lead to Compact Column Method

245 + 84 = 329

200 + 40 + 5
+ 80 + 4
100

300 20 9

Once the method is secure children are now ready to be introduced to 'carrying' which happens when you cross a boundary in the column method. Make sure children add the ones first and 'carry' numbers above the top line.

116 + 343 = 459

343
+ 116

459

Now children are ready to move on to the traditional column methods. Introduce this initially with numbers that do not cross any boundaries. It is important to remember that it is three hundred add one hundred. NOT 3 +1.

- When ready, the children will move on to more formal written methods.
- We encourage the children to use their knowledge of number bonds, and partitioning numbers to help them break down more complex calculations

Written Methods

for larger numbers, or too many numbers to deal with mentally

When?

Why?

What?

How?

Where?

We will attempt to touch on as many written methods as we can in the time we have.

Addition

- Counting on using objects
- Counting on using number line / tracks
- Counting on using a hundred square
- Blank number line (bridging)
- Partitioning
- Column addition (expanded and compacted)

Plus

All together

Total

More than

Sum

Subtraction

•Counting back using objects
•Counting back using a number line/ a hundred square
•Find difference by counting on-Blank number line
•Partitioning
•Column subtraction (expanded and compact)

MINUS

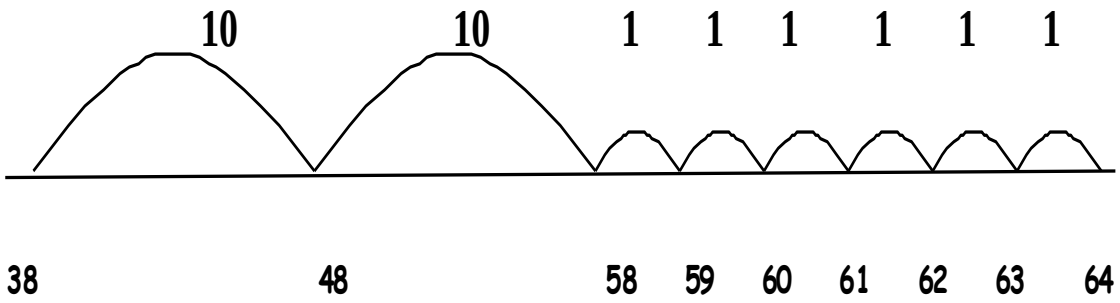
TAKE AWAY

SUBTRACT

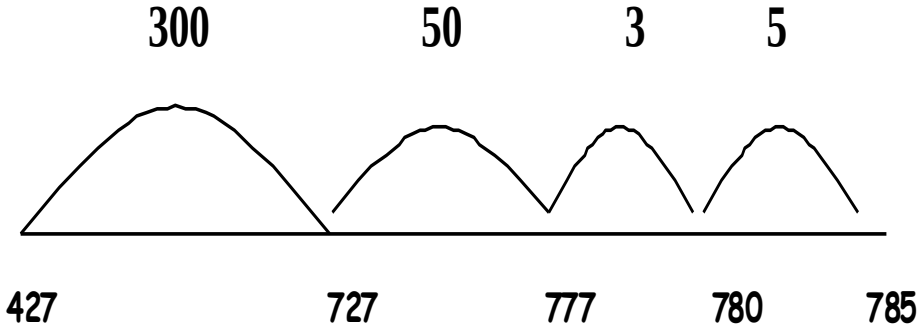
LESS THAN

Addition : Number lines

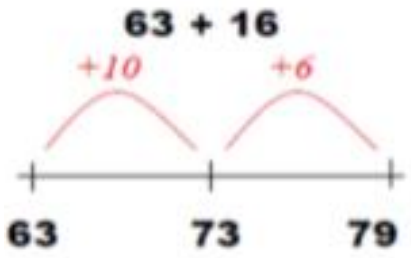
38 +26



427 + 358



Add pairs of 2-digit numbers, moving to the partitioned column method when secure adding tens and ones: (Summer Term) 23 + 34:



	20	+	3
+	30	+	4
	50	+	7
		=	57

STEP 1: Only provide examples that do **NOT** cross the tens boundary until they are secure with the method itself.

STEP 2: Once children can add a multiple of ten to a 2-digit number mentally (e.g. 80+11), they are ready for adding pairs of 2-digit numbers that DO cross the tens boundary (e.g. 58 + 43).

58 + 43:

	50	+	8
	40	+	3
	90	+	11
		=	101

- **Stage 2: Partitioning continued**
-
- Partitioned numbers are then written under one another. This mirrors the column method and also links mental methods.
-
-

$$\begin{array}{rcl} 47 & = & 40 + 7 \\ +\,76 & & 70 + 6 \\ \hline & & 110 + 13 = 123 \end{array}$$

Addition – Year 3

In Year 3 we move onto the traditional column method and to support this children will first apply their partitioning skills to the partitioning column method.

Expanded Column Method

246 + 132 = 378

200 + 40 + 6
100 + 30 + 2

300 + 70 + 8 = 378

Introduce the partitioning column method with numbers that do not cross the tens and hundreds boundaries so children become

337 + 188 = 525

300 + 30 + 7
100 + 80 + 8

400 + 110 + 15 = 525

Once children are confident they can start using the partitioning column method to solve problems that cross the tens and hundreds boundaries.

Expanded Column Method with carrying and begin to lead to Compact Column Method

245 + 84 = 329

200 + 40 + 5
+ 80 + 4
100

300 20 9

Once the method is secure children are now ready to be introduced to 'carrying' which happens when you cross a boundary in the column method. Make sure children add the ones first and 'carry' numbers above the top line.

116 + 343 = 459

343
+ 116

459

Now children are ready to move on to the traditional column methods. Introduce this initially with numbers that do not cross any boundaries. It is important to remember that it is three hundred add one hundred. NOT 3 +1

Addition – Year 4

In Year 4 children will now consolidate their use of the traditional column method and will be able to use it confidently to add numbers up to 4 digits. This could include carrying ones, tens and hundreds.

4267 + 1584 = 5851

4000+200+60+7
1000+500+80+4
+ 100 10
5000+800+50+1

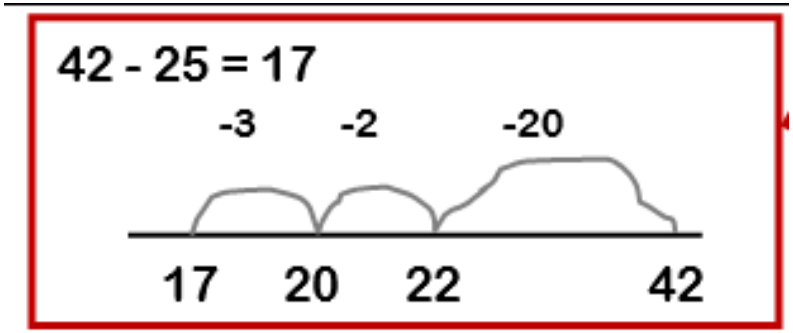
4267 + 1584 = 5851

4267
+ 1584
1 1
5851

Children should already be familiar with the column method from Year 3 but it is very important to go over the method again ensuring children understand why they start with the ones, have to carry a number etc.

Subtraction from year 2

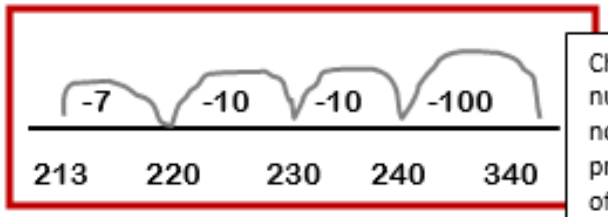
- Lots of methods consolidating both mentally and using blank number lines.
- Children would also have partitioned and used lots of concrete apparatus , such as Dienes



Subtraction Year 3

Children will consolidate their knowledge of subtraction by counting back and counting on using a blank number line. They will use these methods both written and mentally. Once children become fully confident they will be ready to move on to the partitioning column method of subtraction.

Number Line Method



Children will continue to subtract on a number line using efficient jumps and now apply these to 3 digit number problems. Here is an efficient example of 340 – 127=

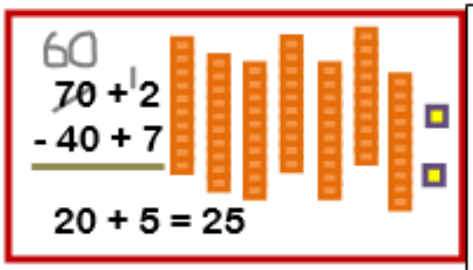
Expanded Column Method without Exchanging

80 + 9
- 30 + 5

50 + 4 = 54

Children will now have the mental skills required to approach the partitioning column method of subtraction. At first they should attempt this where no exchanging is required. Here is an example for 89 – 35 = 54

Expanded Column Method with Exchanging



Through practical subtraction children should be introduced to exchanging. **Base 10 is a vital tool here** as is a solid grounding with partitioning in different ways. It is important children realize that the value has not changed, we have just partitioned in a different way. As you can see here for 72 – 47, before subtracting 7 units, a tens row will need to be exchanged for 10 ones.

238 – 146 = 92

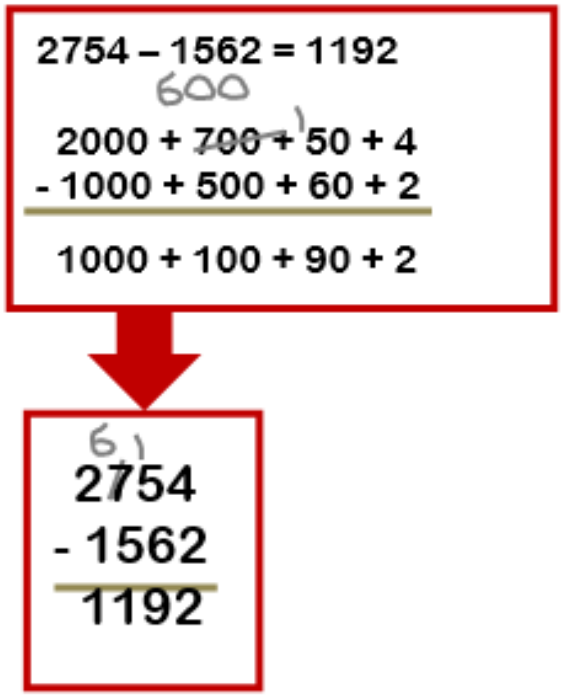
100
200 + 30 + 8
- 100 + 40 + 6

0 + 90 + 2

Year 4

Expanded Partitioning Column Method

Children will consolidate their learning of the partitioning column method of subtraction and exchanging by solving calculations with more complex numbers. Place value counters will come in handy here when building children's confidence. Money can also be partitioned for subtraction e.g. £1 + 30 + 5 - £1 + 10 + 2 =



Compact Column Method

Once confident children are ready to move on to the compact method of subtraction. Encourage children to complete a calculation in the partitioning column methods and then model compact method. See if children can see how they are linked and discuss which is simpler. Although this is seen as the 'easiest' method it does not mean that it is necessarily the best method and they need to carefully select the best method for the problem they are solving.

Multiplication

- Doubles – objects / beadstring
- Counting in steps of 2,5,10
- Counting objects
- Pictures
- Number lines
- Times tables
- Arrays
- Grid method

GROUPS OF

MULTIPLY

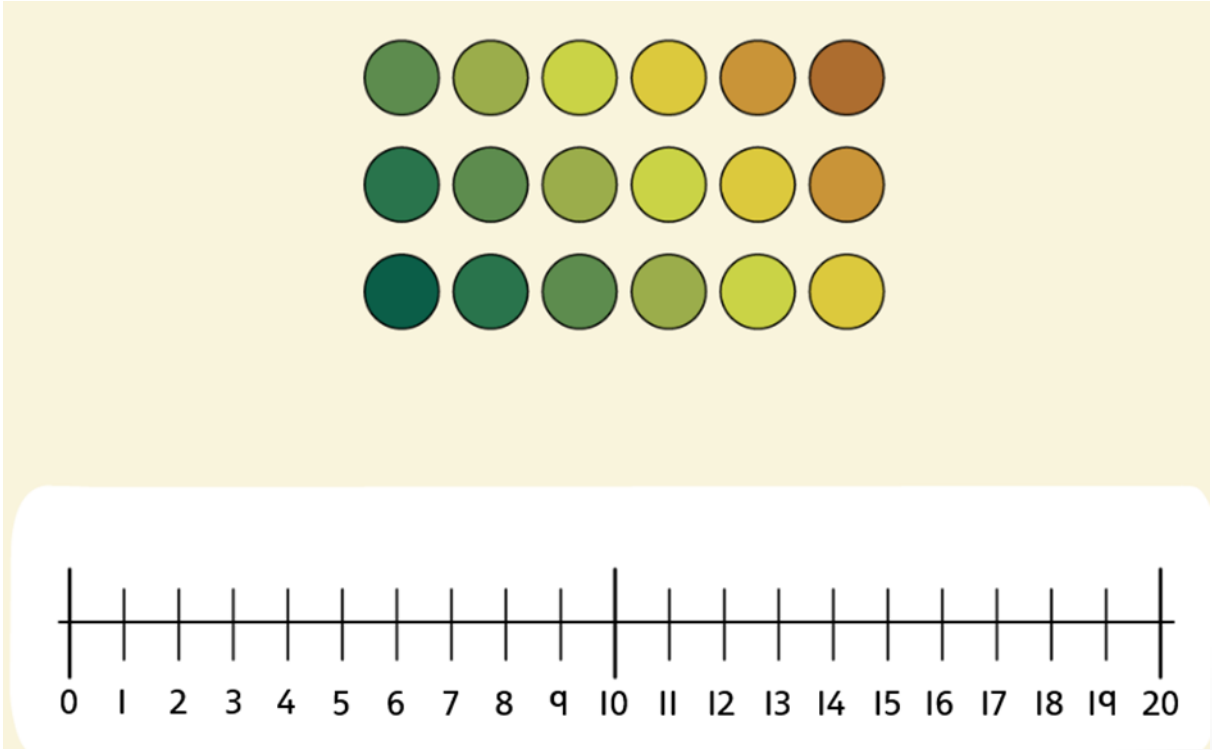
TIMES

LOTS OF

Arrays and numberline

- Children represent by drawings, counters, cubes

and begin to link to number line as repeated addition



From year 2

Array Method

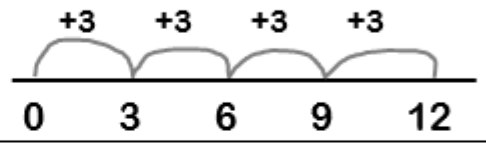
Arrays are super for children to solve the answer to simple problems. They are also great for showing children the commutative law, for example, if you turned this array for 3 x4 = 12 sideways you would see that 4 x 3 also equals 12.

4 x 3 = 12

3 x 4 = 12

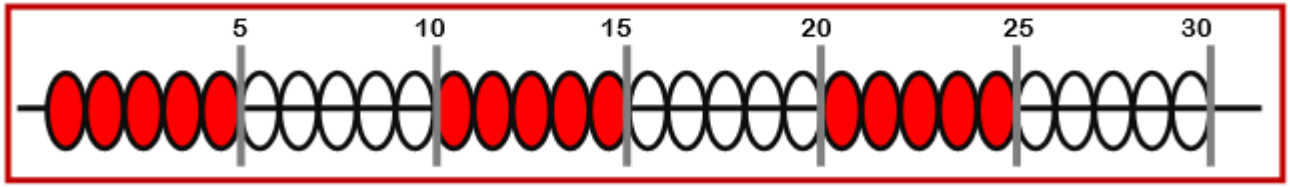
4 x 3 = 4 + 4 + 4 = 12
3 x 4 = 3 + 3 + 3 + 3 = 12

Repeated Addition on a Number Line

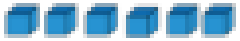


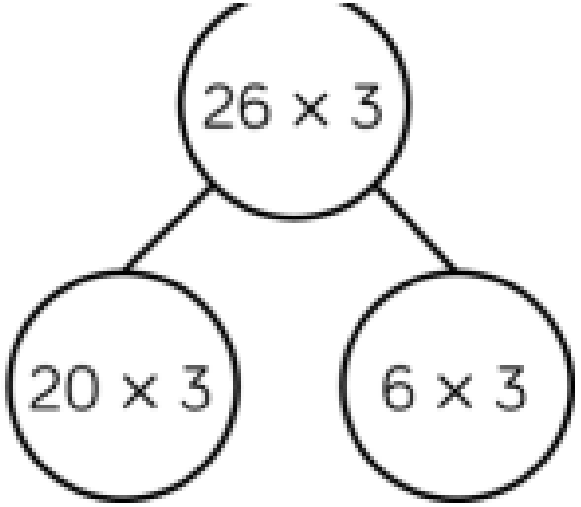
Repeated addition is a good progression from arrays. It encourages the children to use addition facts on a blank number line and count up to their answer as shown on the example above which models that 3 x 4 = 12.

Beadstring Method



Mental methods and practical apparatus are still very important at this stage. Visual images such as the bead string to the left that demonstrates 6 x 5 = 30. This will support children's visualization of multiplication and allow them to develop stronger mental skills.

Tens	Ones
	
	
	



leading to grid method

X	20	6	
3	60	18	= 78

Grid Method

613 x 5 = 3065

X	600	10	3
5	3000	50	15

3000 + 50 + 15 = 3065

The grid method is extended in year 4 so children will now multiply 3 digit numbers by 1 digit numbers. When adding the 3 answers up to create a total, column addition could be used to ensure accuracy, especially where bridging will be needed.

Column Method

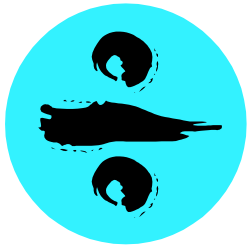
The compact 'short multiplication' method is tricky and needs to be approached carefully. At first children should solve a problem using grid method and then observe the teacher solving a problem using short multiplication and make comparisons. How are they similar? Children need to go through it very slowly and carefully, unpicking each step until they are fully confident.

It is at this stage that approximation and estimation should become a regular part of classroom practice. Children should approximate an answer before using a method so they know if there answer is accurate or not.

24 x 31 =

×	20	4
30	600	120
1	20	4

Division



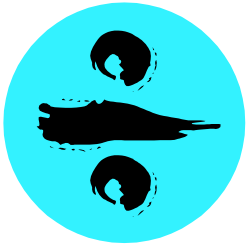
- Halving
- Sorting hoops and objects
- Pictures
- Related times tables facts

SHARE

GROUP

DIVIDE

Division



‘84 sweets shared equally between 6 children’

How many 6’s go into 84?

84 divided by 6?

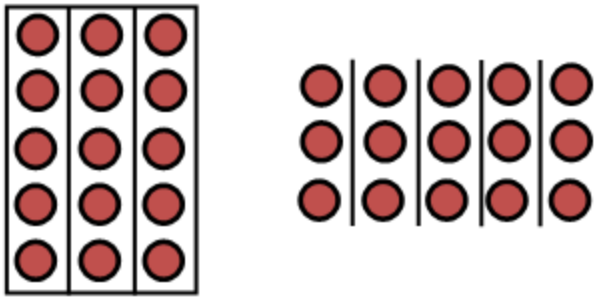
84 shared by 6?

There is no need to divide! Use your tables knowledge!

From year 2

Array Method

To solve problems such as 15 ÷ 3 =, children will share 15 objects into 3 groups like in the first array or make groups of 3 until they get to 15, like in the second image.

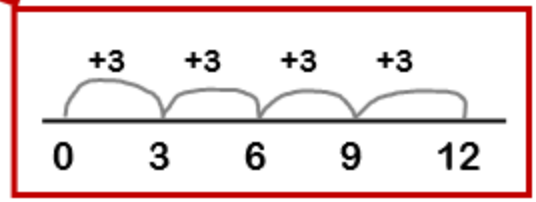


Completing both of these processes will help children see the link between sharing and grouping but also the link between 15 ÷ 3 = 5 and 15 ÷ 5 = 3.

The difference between grouping and sharing should be discussed regularly and visual models and diagrams are very important. Children should solve a variety of contextual problems that will require them to group or share.

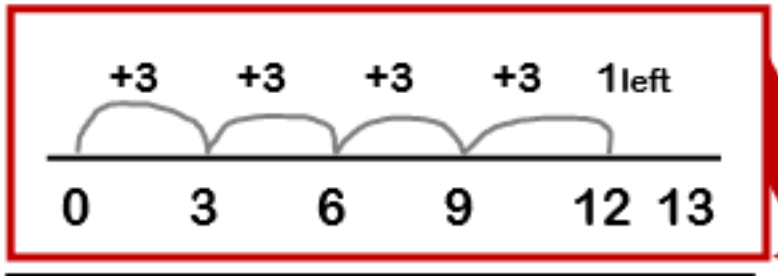
Children will start to group on a number line which will help cement their understanding of division as grouping. When grouping on a number line, children will start with a zero at the beginning and will write the dividend at the end of the line, they will then jump in steps of the divisor. The example to the right shows a number line for the calculation 12 ÷ 3 = 4 as there were 4 jumps of 3 to get to 12.

Number Line without Remainders

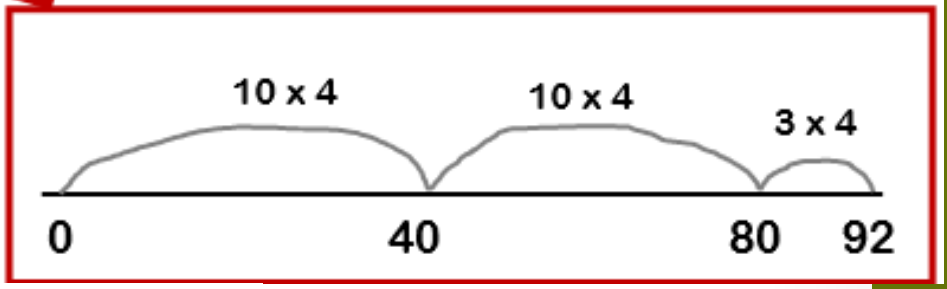


Year 3 – division with remainders

Number Line with Remainders

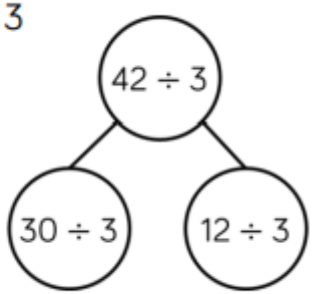


Chunking on a Number Line



Annie uses a similar method to divide 42 by 3

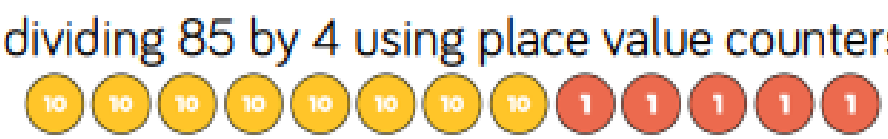
Tens	Ones
10	1 1 1 1
10	1 1 1 1
10	1 1 1 1



Use Annie's method to calculate:

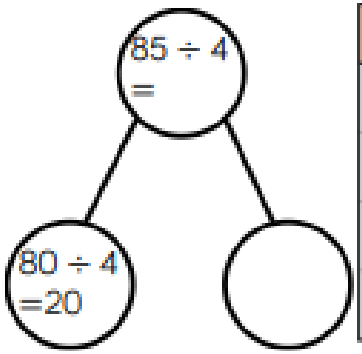
Year 4 division with remainders (up to 3 digit divided by 1 digit)

Teddy is dividing 85 by 4 using place value counters.



First, he divides the tens.

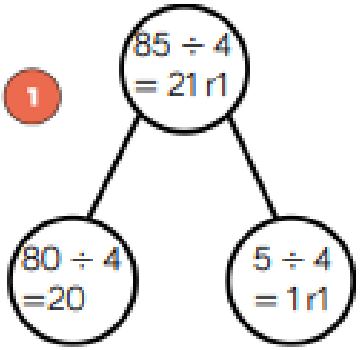
Tens	Ones
10 10	
10 10	
10 10	
10 10	

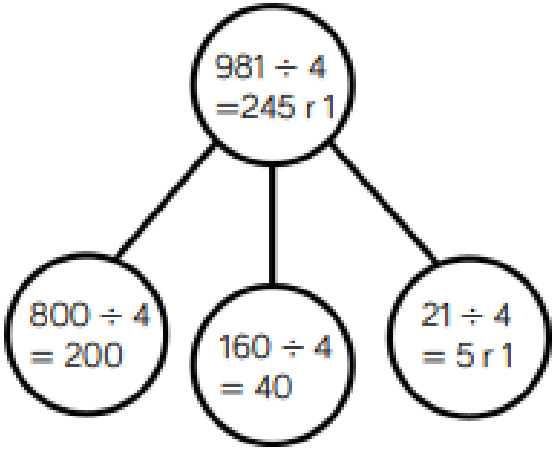


Then, he divides the ones.

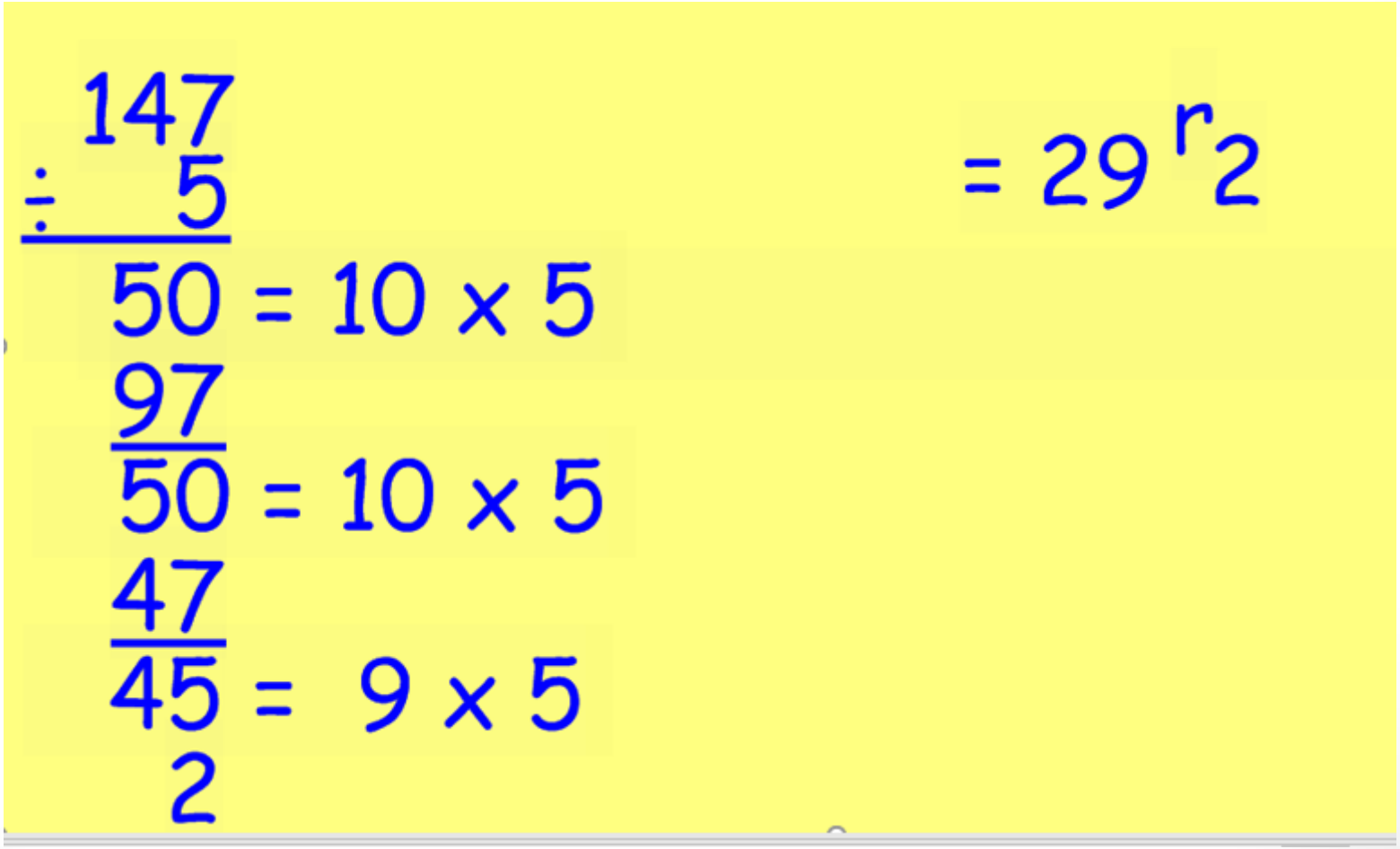
Tens	Ones
10 10	1
10 10	1
10 10	1
10 10	1

1





Leading to beginning of formal methods (chunking)



Helping at home

Some Dos…

- **Play (maths) with your child**
- There are opportunities for impromptu learning in games with real people that you can't get from a DS or Xbox
- **Let your child win or be better than you**
- Otherwise all they learn is that you are better at maths than them
- **Recognise that there is more than one way of doing calculations**
- You may have learned one method, but children are actively encouraged to seek out alternative methods in school and choose one which works for them, no matter how long winded
- **Be an actor**
- Get excited about maths and your child will get excited too!!

…And Some Don'ts!

- **Don't expect them to understand after you've explained it once**
- It is normal for a child to 'get it' one day, and then in a different context not know how to find an answer
- **Don't tell them you are hopeless at maths**
- You may remember maths as being hard, but you were probably not hopeless, and even if you were, that implies to your child, "I was hopeless at maths, and I'm a successful adult, therefore maths is not important"
- **Don't get into an argument over homework**
- It will be something that your child has covered in class, and if they really can't do it without a lot of tears and frustration, leave it and LET US KNOW!

Ideas taken from **Maths for Mums and Dads** Eastaway, R. and Askew, M. (2010)

Props around the house KS2

- **A prominent clock**- digital and analogue is even better. Place it somewhere where you can talk about the time each day.
- **A traditional wall calendar**-Calendars help with counting days, spotting number patterns and
- **Board games that involve dice or spinners**-helps with counting and the idea of chance
- **A pack of playing cards**- Card games can be adapted in many ways to learn about number bonds, chance, adding and subtracting
- **A calculator**- A basic calculator will help with maths homework when required, there are also many calculator games you can play, too.
- **Measuring Jug**-Your child will use them in school, but seeing them used in real life is invaluable.
- **Dried beans**, **Macaroni or Smarties**- for counting and estimating
- **A tape measure and a ruler**- Let your child help when measuring up for furniture, curtains etc
- **A large bar of chocolate** (one divided into chunks)- a great motivator for fractions work
- **Fridge magnets with numbers on**- can be used for a little practice of written methods
- **Indoor/outdoor Thermometer**- especially useful in winter for teaching negative numbers when the temperature drops below freezing
- **Unusual dice**- not all dice have faces 1-6, hexagonal dice, coloured dice, dice from board games all make talking about chance a little more interesting
- **A dartboard with velcro darts**- Helps with doubling, trebling, adding and subtracting.

Ideas taken from **Maths for Mums and Dads** Eastaway, R. and Askew, M. (2010)

Websites to help