Coldfall Primary School

Helping your child develop their mathematics at home

"Tell me, I forget. Teach me, I remember. Involve me, I learn"

Benjamin Franklin

introduction

The aim of this booklet is to support parents at Coldfall with their mathematics. It contains an illustrated guide as to how children develop their calculation skills in addition, subtraction, multiplication and division. Some of these may be significantly different to how many of us were taught! It should be noted that this is not exhaustive but merely presents the key steps in how children progress their thinking, efficiency and recording.

At the back of the booklet are various ideas and suggestions for maths activities that you may enjoy doing with your children at home. There are many other opportunities or resources out there. Further support can be found through the following websites:

Websites

- www.mathletics.co.uk – subscription. A focus on basic skills, challenges and competitions.
- www.familieslearningtogether.co.uk – improves children's mathematical knowledge and ability with parental support. Video tutorials, demonstrations, games and worksheets. Annual subscription cost.
- www.bbc.couk/revisewise - all key concepts and elements of maths are covered here as well as games and activities to support children's understanding.
- www.primaryhomeworkhelp.co.uk/maths/ - as well as homework support this website offers links to fun games and activities.
- http://www.teachingtables.co.uk/ - times tables
- http://www.transum.info/Software/Tablesmaster/Tablesmaster.asp - times tables

Songs

The times tables songs that the children learn come from a CD called 'Times Tables Party'. These are fun and catchy aiding the children's recall. They are available on youtube as:

Dancing country **Twos**

Hip Hop **Threes**

Celtic **Fours**

Latino **Fives**

Piano Rock **Sixes**

Eastern **Sevens**

Rockin' **Eights**

Reggae **Nines**

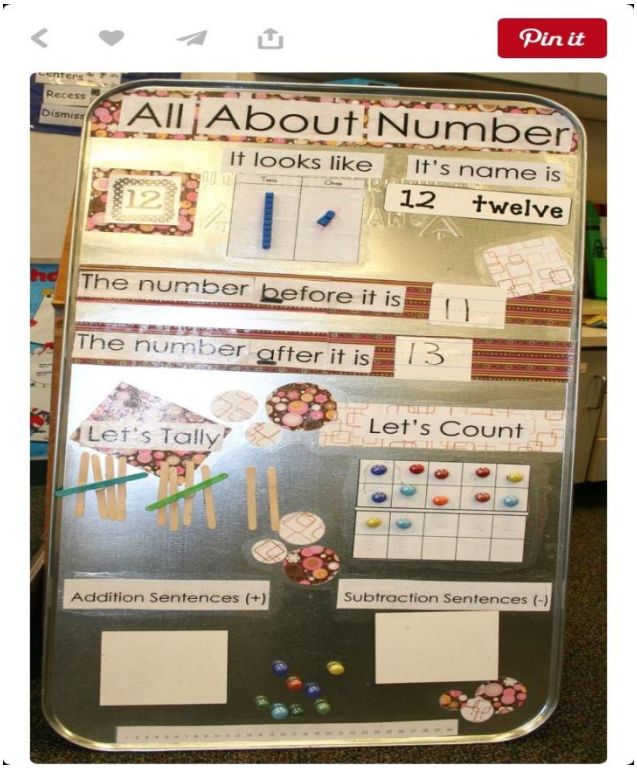
Funky **Tens**

Retro Dance **Elevens**

Happy house **Twelves**

Calculations

A lot of emphasis in numeracy teaching is placed on using mental calculations where possible, using jottings to support thinking. As children progress through the school and are taught more formal written methods, they are still encouraged to think about mental strategies they could use to first and only to use written calculations for those they cannot solve in their heads. The foundation for all calculating is a secure sense of numbers up to 10 and then 20. Being able to understand, represent and make these numbers enables children to manipulate them effectively and apply this knowledge to larger numbers. E.g.



Children are introduced to different methods of calculating numbers in their heads. Concrete objects (such as cubes or Numicon), Number lines, hundred squares and other apparatus may be used to support this understanding. Practice is important and skills are built on throughout the school from the foundation years.

Discussing the efficiency and suitability of different strategies is an important part of the maths lessons. Explaining processes orally helps to develop the use of appropriate mathematical language.

When faced with a calculation problem, encourage your child to ask:

- Can I do this in my head?
- Could I do this in my head using written jottings to help me?
- Do I need to use a written method?

Ask your child to estimate and then to check their answer. Encourage them to ask:

- Is my answer sensible?
- Is there another way I can reach the answer?

Key Mental Maths skills from Year R to Year 6

This non-negotiable list is cumulative so the key knowledge needs to be revised year on year. In addition the list is not exhaustive - don't feel that children should be limited by it. However, these skills should be deemed as essential.

Reception

- Count on and back to 20
- Find one more than a number from 1 to 10
- Find one less than a number from 1 to 10
- Days of the week
- Months and seasons of the year
- Know the number stories for all the number 1 to 20

Year 1

- Count on and back in steps of 2, 5 and 10 to and beyond 100
- Count, read and write numbers up to 100
- Know and use the associated vocabulary of 2 (double, pair, bicycle, twins, duet) 5 (pentagon, quintet) and 10 (decade, decathlon, decagon, decimal)
- Pairs that total 10
- Number stories for each number up to 10
- All doubles to 10
- Hours in a day and days in a yea.
- Months of the year – number of days of each month.
- Measure length in cm, m, Mass in g, Capacity in ml
- Measure time using hours, minutes and seconds

Year 2

- 2, 5 and 10 x tables and corresponding division facts
- Count, read and write numbers up to 1000 in numerals and words.
- Associated vocabulary of 10 e.g. decade, decimal, decagon, decathlon.
- Pairs that total 20
- Multiples of 10 to make 100
- Number stories for each number up to 20
- Doubles and halves of all numbers up to 20
- Seconds in a minute, minutes in an hour and half hour.
- Mass in g and Kg
- Capacity in ml and l
- Know and use the £ and p symbols and become fluent recognizing coins

Year 3

- Learn 3, 4, 6 and 8 x tables and corresponding division facts
- Associated vocabulary of 3 (trio, tripod, treble, triplets, trilogy), 6 (sextet, sextuple, hexagon), 4 (quartet, quarter, quadruped) and 8 (Octect, octagon, octopus etc)
- Count up and down in tenths
- Count, read and write numbers up to 10,000 in numerals and words
- Count in multiples of 50
- Know pairs that total 100
- Multiples of 100 to make 1000
- Read and write numbers up to 1000 in digits and in words
- Mental + and – of a 3 digit number and ones, a 3 digit number and tens and a 3 digit number and hundreds
- Doubles of all numbers to 100 and their corresponding halves
- Minutes in a quarter/ three quarters of an hour.
- Add and subtract amounts of money to give change.
- Measure and calculate length in cm, m and mm
- Know and use the terms: decade, century, leap year

Year 4

- Learn 7, 9, 11 and 12 x tables and corresponding division facts
- Count in multiples of 25 and 1000 and in simple decimals and fractions
- Read and write numbers up to 100,000 in numerals and words
- Associated vocabulary of 7 (Septet, septuagenarian) 9 (nonagon)
- Pairs of numbers that total 1000
- Doubles and halves of 3 digit multiples of 10 e.g. 240
- + and – of any 2 digit numbers e.g. 40 + 99 = 139 and 60 – 28 = 32
- Measure length in cm, m and mm and km
- Know and use the terms: noon, am, pm
- Know and use the 24 hour clock and be able to convert between 12hr and 24hr clocks

Year 5

- Consolidate all x tables up to 12 x 12 and all corresponding division facts
- Read and write numbers up to 1,00,000 in numerals and words.
- Read Roman numerals to 1000 (M)
- Read and interpret negative numbers e.g. on a temperature scale.
- Know all prime numbers up to 50
- Recognise and used square and cubed numbers
- Pairs of one place decimal numbers that make 1
- Simple equivalence of fractions, decimals and percentages (½ ¼ 1/3 1/5 1/10 2/10 3/10 4/10 5/10 6/10 7/10 8/10 9/10 ¾)
- Be able to convert confidently between units of mass, length and capacity (e.g. cm to mm to km)

Year 6

- Prime numbers up to 100
- Read and write numbers up to 10,000,000 in numerals and words
- Know all square numbers from 1 to 12
- Be able to find 2 place decimal numbers that total 10
- Equivalence of fractions, decimals and percentages ($^{2}/_{5}$ $^{3}/_{5}$ $^{4}/_{5}$ 2/3 $^{1}/_{20}$ $^{1}/_{100}$)
- Metric and imperial equivalence and conversion e.g. km to miles
- Be able to do an approximate conversion between degrees centigrade and degrees Fahrenheit
- Know and use some key imperial measures of:

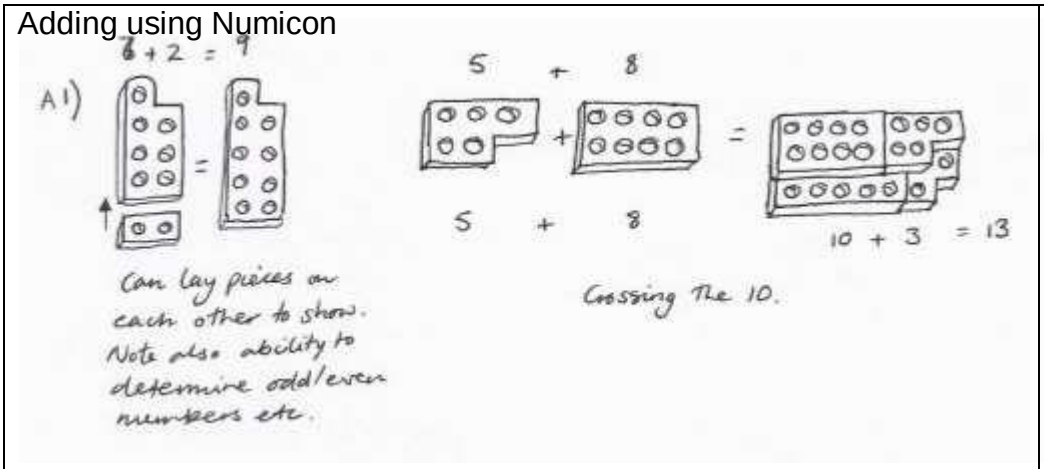
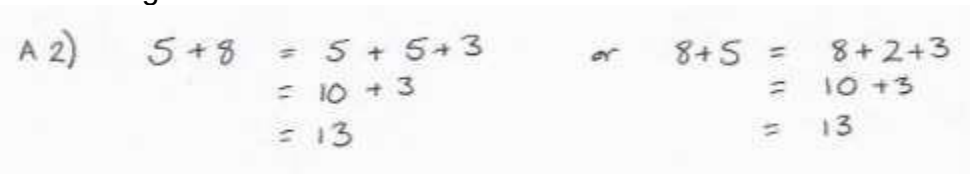
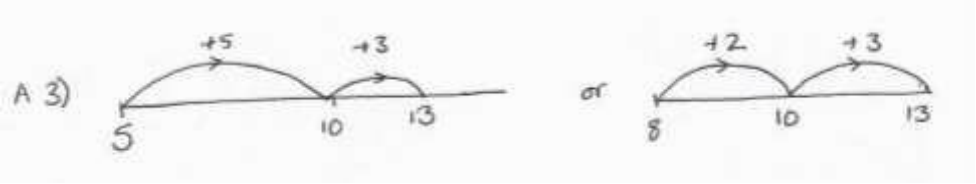
  Length - yards, feet, inches

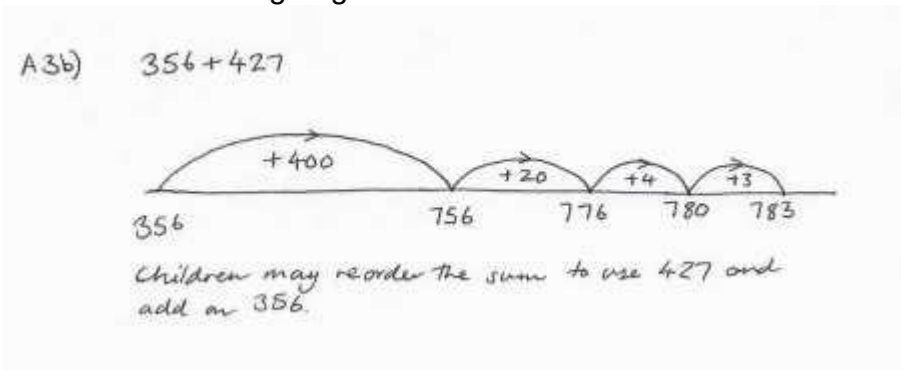
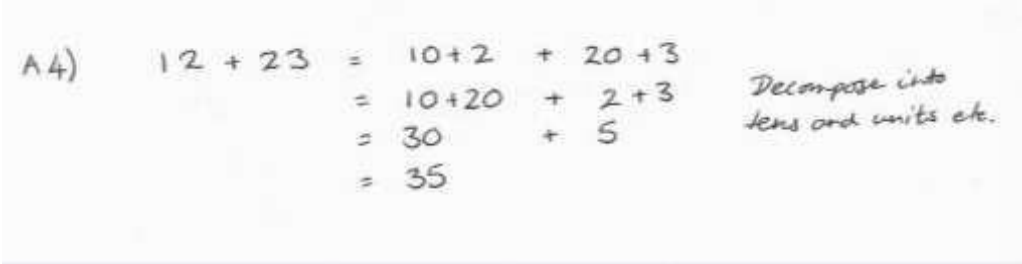
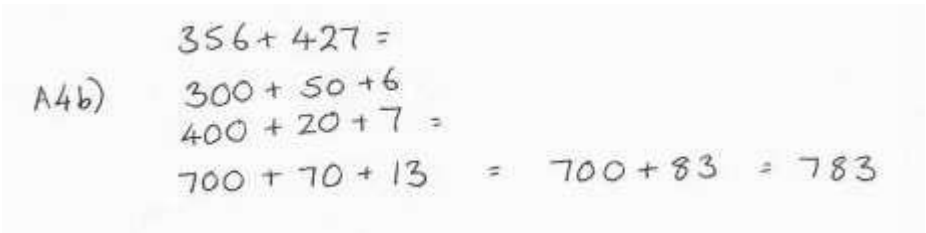
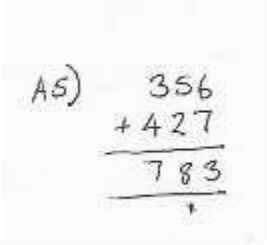
  Mass – ounce, pound, stone

  Capacity – pints, gallons

Addition

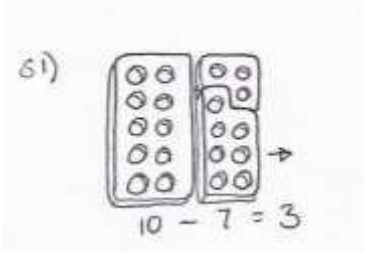
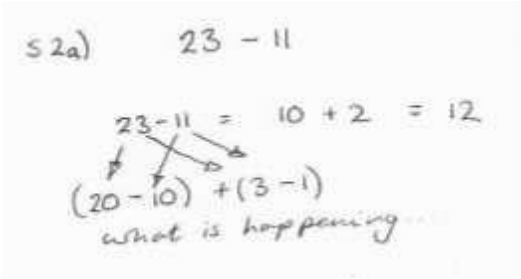
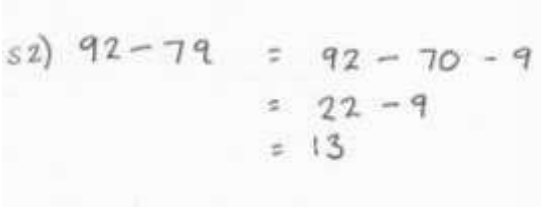
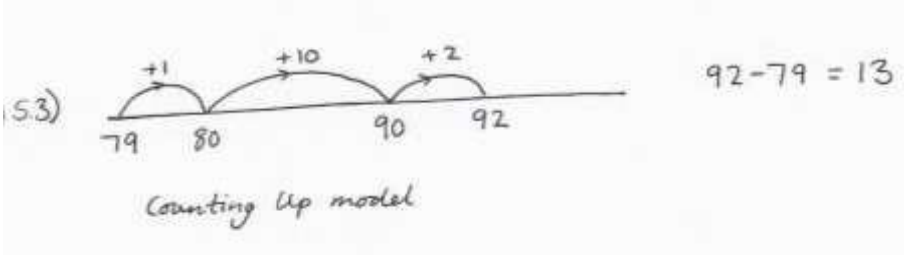
Children are taught to understand addition as combining sets and counting on. Calculations are put into practical contexts so that the child sees the relevance of the method they are learning.

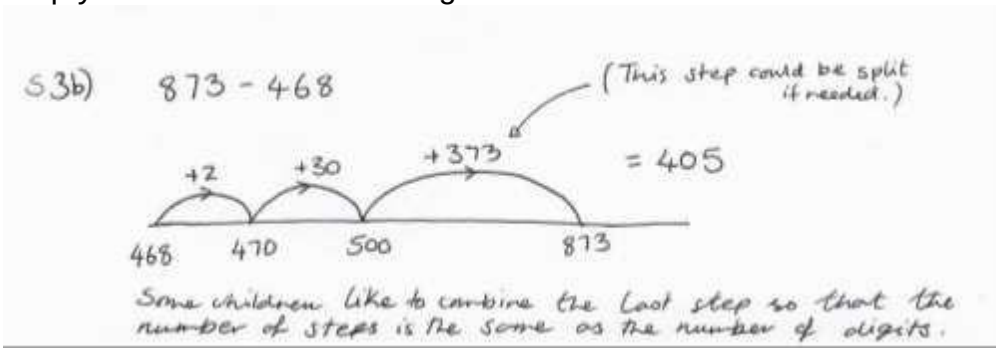
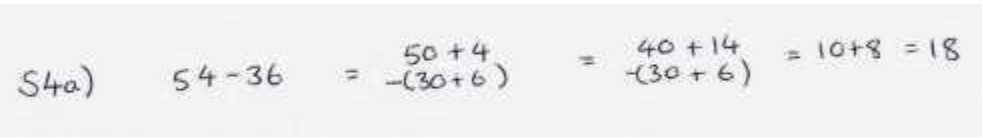
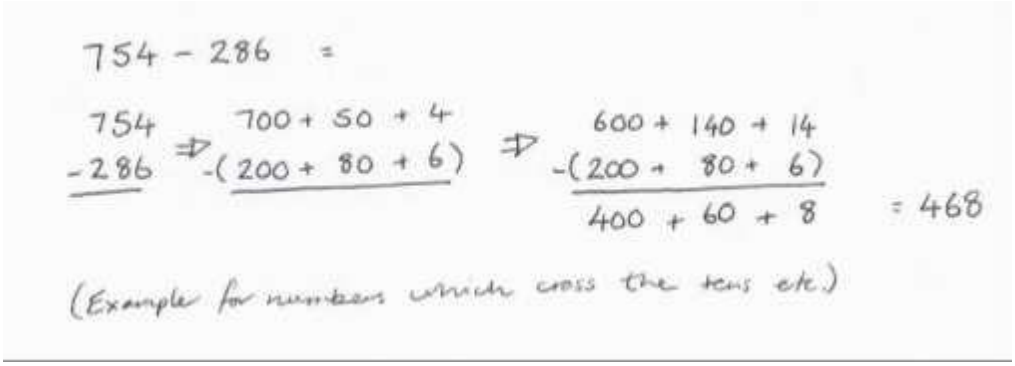
Adding using Numicon  	Children will use Numicon to add. This is where all children are taught to start. The use of physical equipment helps children to understand what is happening to numbers when they add them.
Partitioning  	By partitioning (splitting) both numbers into tens and units, each part can be added separately and then the answers combined to give the total.
Using a Number Line  	Children can count along a number line, making 'jumps' to reach the answer. They can also see that the addition can be done in any order, developing awareness that it is often more efficient to put the larger number first. Drawing an empty number line helps children to record the steps they have taken in a calculation. Start on 47, +20, +5. This is more efficient than counting on in ones. Empty number lines can be used with numbers of any size.

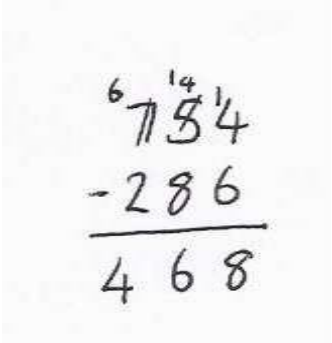
Number Lines using larger numbers 	Children build on earlier work using a number line and work with HTU (Hundreds, tens and units).
Long Addition  	Children are taught written methods for those calculations they cannot do in their heads. Expanded methods build on mental methods and make the value of the digits clear to children. The language used is very important – 400 + 300, 50 + 20, 6 + 7 and then 700 + 70 + 13 OR starting with the units, tens and then hundreds. Children are taught the importance of placing digits with the same value underneath each other to aid their calculations.
Short Addition 	Children move onto using more compact standard written methods only when secure with the previous methods. The units column is added first with the ten carried over and placed underneath the tens column. The tens column is added up with the hundred carried over and placed underneath the hundreds column. They are taught to place digits with the same value underneath each other.

Subtraction

Children are taught to understand subtraction as taking away (counting back) and finding the difference (counting on/up). Calculations are put into practical contexts so that the child sees the relevance of the method they are learning.

Numicon 	Children will use Numicon to see what is happening when one number is subtracted from another. This will first occur when reinforcing the subtraction facts that link to number bonds to 10. The children will then progress to using larger numbers using Numicon.
Partition and Recombine 	This can also be supported by the use of apparatus.
Partition and Recombine (extension) 	The calculation is broken into more manageable parts.
Empty Number Lines – counting on 	Children can count up from the smallest number to the biggest using an empty number line. It is easiest to count up to a multiple of 10 or 100 (‘friendly numbers’). The steps can also be recorded vertically, making sure that digits of the same value are always underneath each other.

Empty Number Lines – counting on extension  	Using a number line and the counting on method is particularly helpful when numbers are actually quite close to each other but cross a tens, hundreds or thousands barrier and so look harder than they actually are.
Decomposition   	Children progress onto subtraction using decomposition – where there are fewer units, tens, hundreds etc in the larger number. The use of the expanded written method helps them understand the process and they then move onto the move compact standard written method for decomposition. Starting with the units, 4 – 6 we can't do, so we carry over a ten to make 14 units leaving 4 tens. 14 – 6 equals 8 units. Moving onto the tens column, 4 tens subtract 8 tens we can't do, so we carry over a hundred to make 14 tens leaving 6 hundreds. Now 14 tens subtract 8 tens equals 6 tens. Finally the hundreds column, 6 hundreds subtract 2 hundreds equals 4 hundreds. Decomposition can be used with any numbers provided the child has checked that a mental strategy and a number line jotting would not be more efficient. Children are encouraged to see that by adding the answer to what was taken away, they will end up with what

	they started with – a bit of maths magic!
Formal written method  	Children will only be taught this formal method when they are secure with the previous steps outlined above. This ensures that children are clear about what is happening to the numbers, not just following a method.

Multiplication

Times tables

A good knowledge and quick recall of times tables is essential to children's mathematical progress. The children are taught up to 12 x 12. **The target is for all children to know their tables by the end of year four.**

When learning their tables, children are taught to look for patterns such as odd and even number answers, or patterns made by adding together the separate digits in the answers.

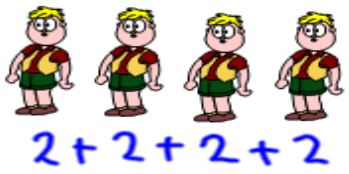
Children are taught to recognise the reversible effect so that they know 6 x 2 is the same as 2 x 6. They are also taught the relationship with division so that knowing 6 x 2 = 12 means they also know that 12 ÷ 2 = 6 and 12 ÷ 6 = 2. For each known times table fact, they also know three others:

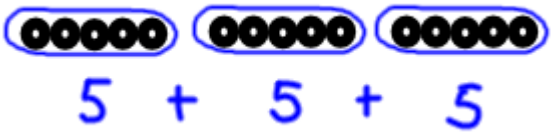
6 x 7 = 42 so they know that 7 x 6 = 42
42 ÷ 6 = 7
42 ÷ 7 = 6

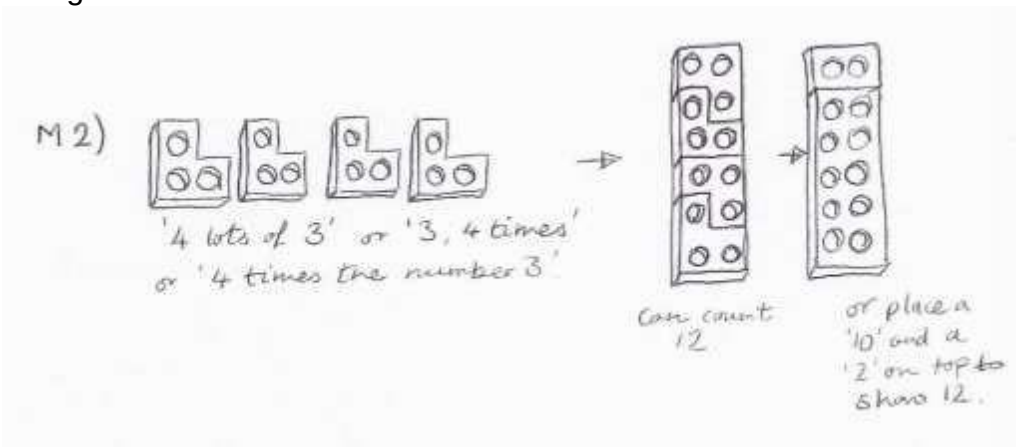
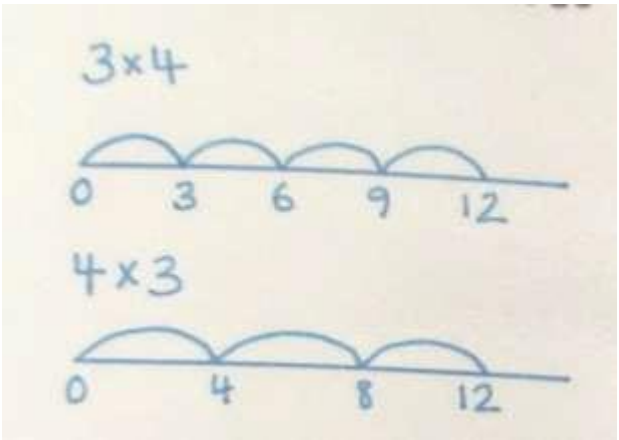
To help children with their multiplication, one of the ways we use is to find all the factors that are used to make up a number. For example the factors of 18 are 1,18, 2, 9, 6, 3 because 18 x 1, 1 x 18, 3 x 6, 6 x
3, 9 x 2, 2 x 9 all equal 18.

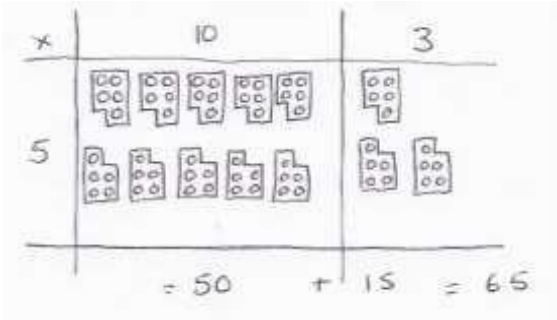
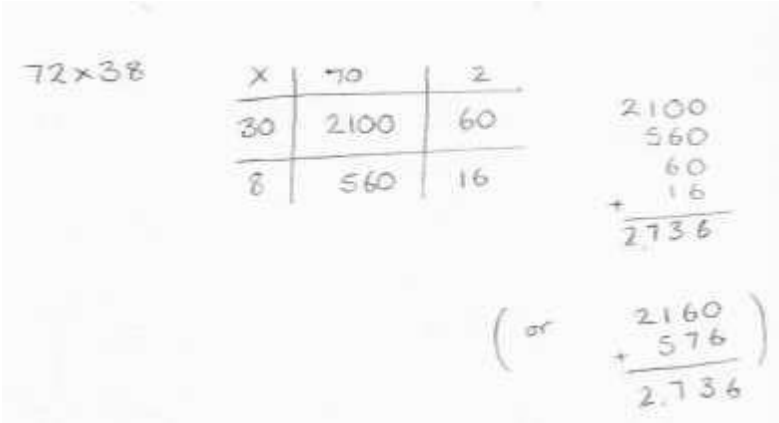
Multiplication Methods

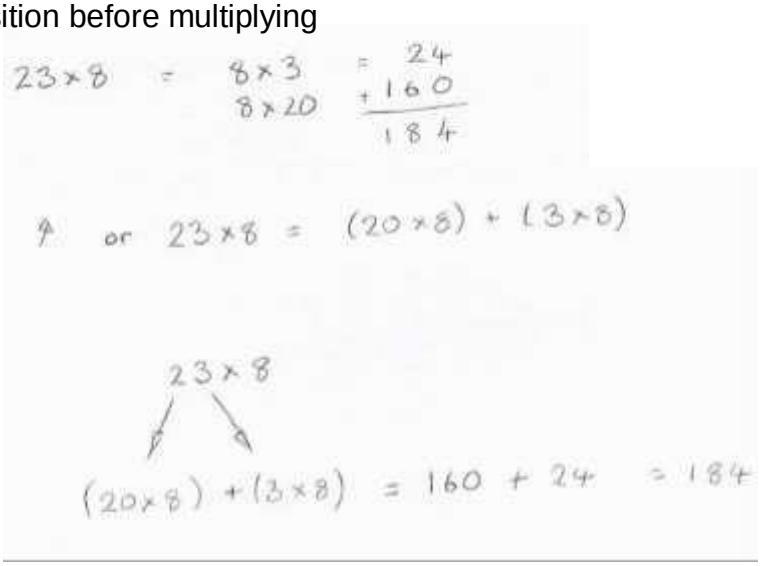
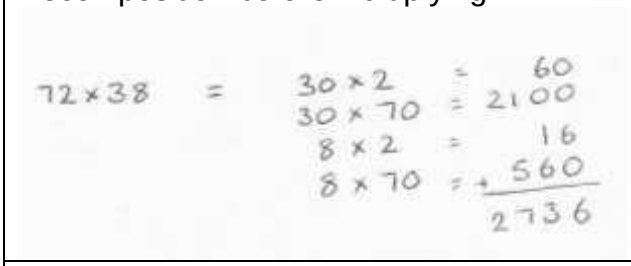
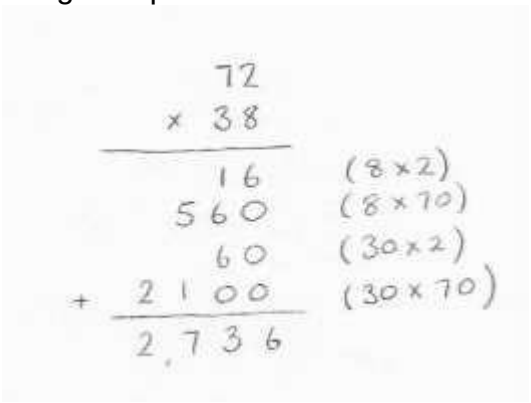
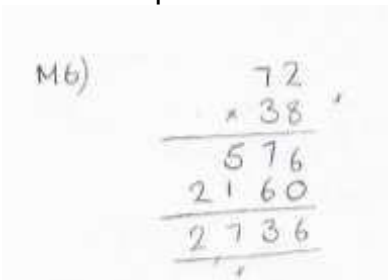
Children are taught to understand multiplication as repeated addition and scaling. It can also describe an array. Calculations are put into practical contexts so that the child sees the relevance of the method they are learning.

Repeated Addition Introduced in Year 1 **2 x 4 =** Each child has two eyes. How many eyes do four children have?  	Drawing a picture is a helpful way to visualise a problem.

Repeated Addition Introduced in Year 1 **5 x 3 =** There are five cakes in a pack. How many cakes are in three packs?  	Dots or tally marks are often drawn in groups. This shows three lots of five. The children can clearly see the repeated addition.

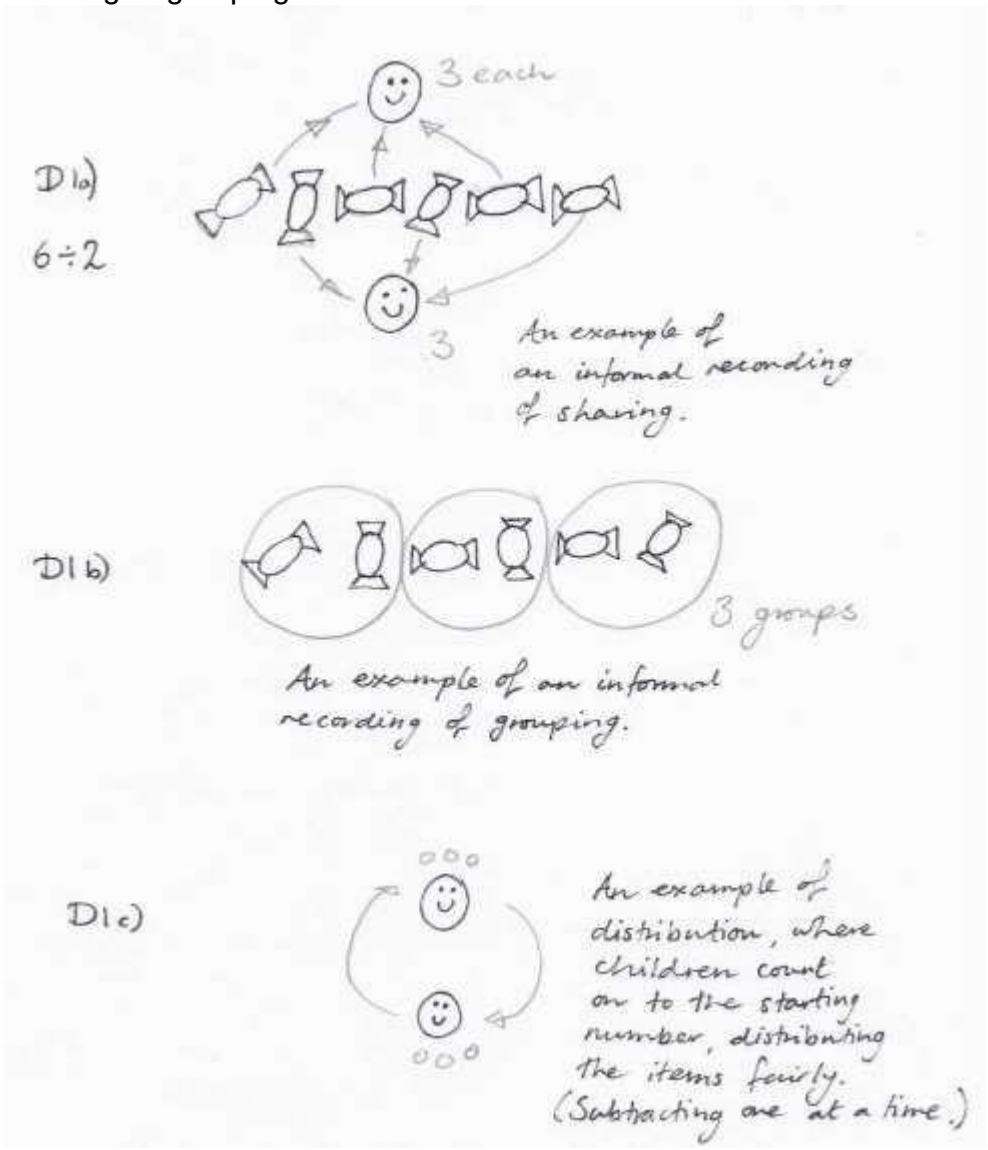
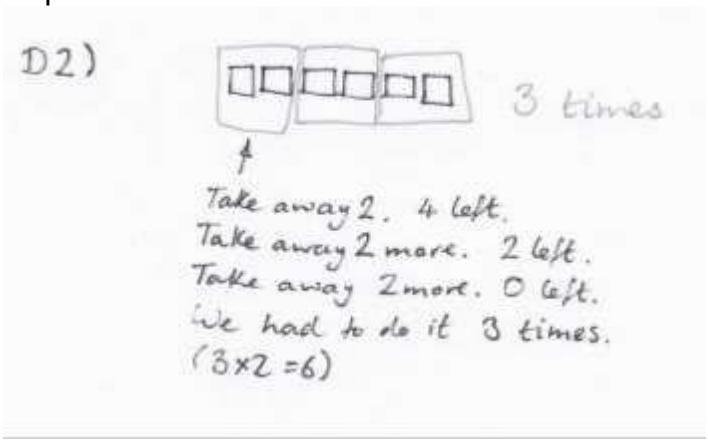
Introduced in Year 1 Using Numicon  	Using Numicon allows the children to continue working on repeated addition. They can lay them in a line and then count them. Then they can also place other pieces of Numicon on top to see what the total is, e.g. a ten and a 2.
Number line  	Building on using the Numicon, the children will learn how to use a number line to show multiplication. This also follows on from the repeated addition.

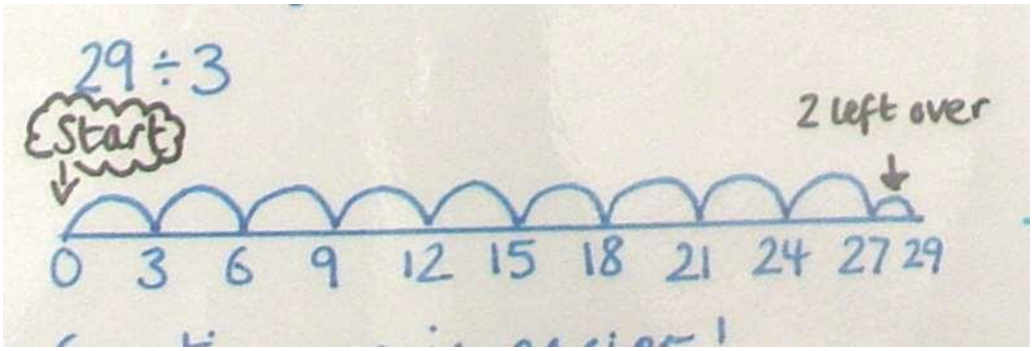
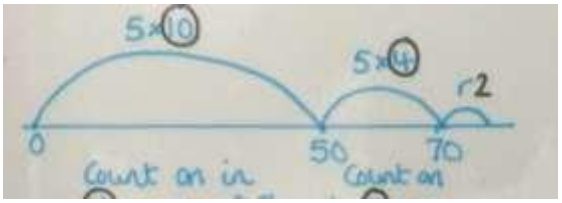
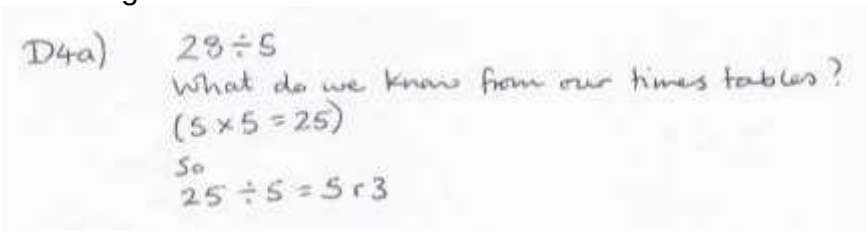
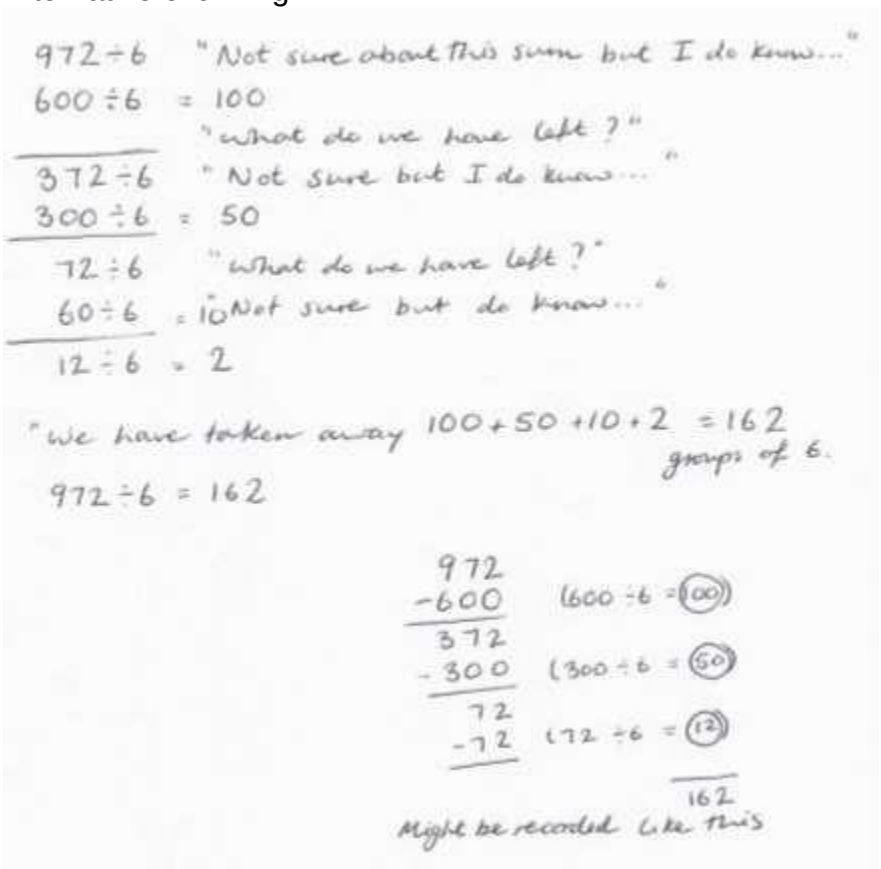
An array **4 x 3 =** A chew costs four pence. How much do three chews cost?  	Drawing an array (3 rows of 4 or 3 columns of 4) gives children an image of the answer. It also helps the understanding that 4 x 3 is the same as 3 x 4.
The Grid Method  	This is called the grid method. 13 is partitioned (split) into tens and units. Each part is then multiplied by five. The answers are then added together mentally or set out vertically. The children can use Numicon to help them see what is happening in each section of the grid.
The Grid Method cont. **6 x 124 =** 124 books were sold. Each book cost six pounds. How much money was taken? 600 + 120 + 24 = 744 **x** | 100 | 20 | 4 6 | 600 | 120 | 24	The grid method is continued with more complex numbers. 124 is partitioned (split) into hundreds, tens and units. Each part is then multiplied by six. The answers are then added together mentally or set out vertically.
The Grid Method cont.  	The children can then move on to 2 digit x 2 digit numbers when they are confident with this method.

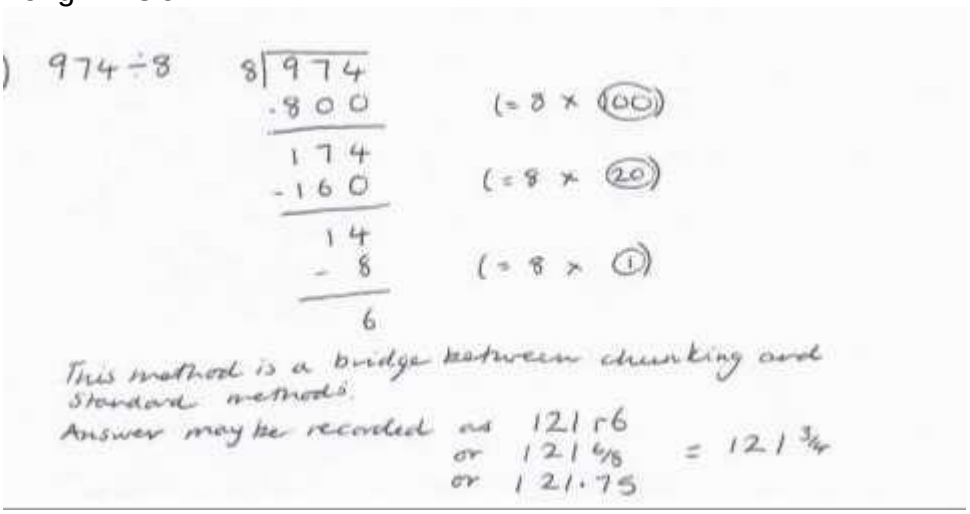
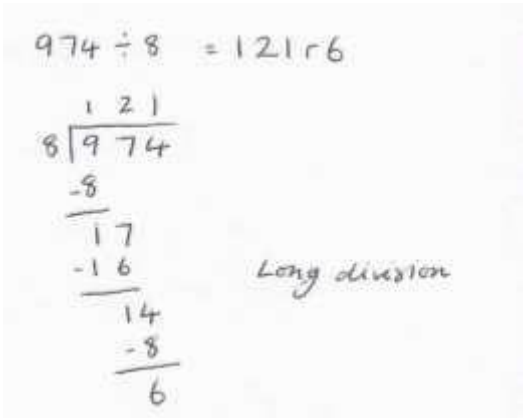
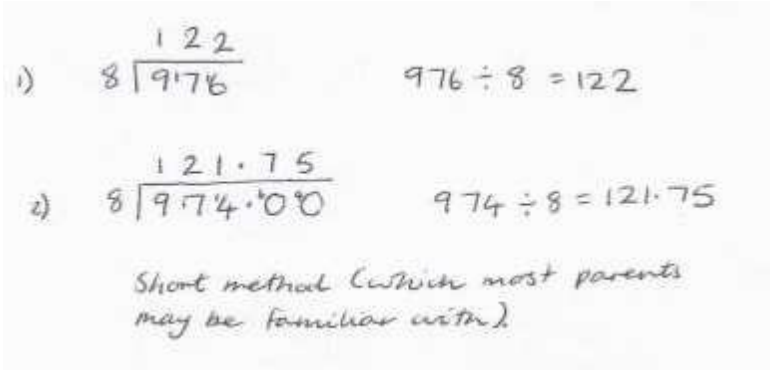
Decomposition before multiplying 	In effect this is the same method (or a progression) which is recorded in a different way.
Decomposition before multiplying 	This is the next step from the above method.
Long Multiplication 	All the previous work builds up to using the more compact standard written method for long multiplication. They begin by multiplying 8 x 2, then they multiply 8 by 70, then 30 x 2 and then 30 x 70. They then total the calculations to find the answer.
Short multiplication 	The children only move on to short multiplication when they are secure with every previous step outlined above.

Division

Children are taught to understand division as sharing and grouping. Multiplication and division are interlinked. Calculations are put into practical contexts so that the child sees the relevance of the method they are learning.

Drawing or grouping  	Drawing pictures makes it easy for the child to visualise the problem and often makes it easier to solve. Practical equipment is also used to model and solve the problem. Children are encouraged to record in their own 'informal ways' at first.
Repeated Subtraction  	Dots or tally marks can either be shared out one at a time or split up into groups. This then clearly shows how many groups or how many in each group.

Number line   	To work out how many threes there are, children can use their fingers to count up in groups of three. They can also draw these as jumps along a number line. This example shows you need nine jumps you have 2 left over.
Chunking  	The children then move on to chunking. They use facts that they know to work out the division.
Alternative chunking  	This method is another way of chunking. In this example, you are taking away chunks of six. First subtract 600 (100 lots of 6) and you are left with 372. Then subtract 300 (50 lots of six) to leave 72. If you then subtract 72 (12 lots of 6) you are left with zero. So looking down the column you can see we had chunks of 100 + 50 + 12 = 162.

Long Division   	The children can then move on to long division when they are confident with chunking. This method allows the children to move on from chunking to a more formal method.
Short Division  	The children are only taught this method once they are secure with every previous step outlined above.

How can you help your child at home?

It is most important that you TALK and LISTEN to your child about their work in maths. It will help your child if they have to explain their process to you. Be positive at maths, even if you don't feel confident about it yourself. A lot of maths can be done in everyday situations (the shop, cooking etc) and will not need pencil and paper methods. Most importantly, play games and have fun with maths. Remember regular practice for short periods of time is the best way.

Counting

- Collections of objects –shells, stones, buttons, shoes, etc
- Cars on a journey e.g. How many red cars?
- Animals in a field e.g. sheep, cows.
- Stairs up to bed, steps etc.
- Sports scores – averages.
- Pages in a story book.
- Look for numbers in the environment – buses, house numbers etc
- Make mistakes when counting. Can your child spot them? Correct them?

Measuring

- Calculating distances in a journey e.g. How much further?
- Recording heights of family members on a wall – Who is the tallest? How much by? How much did you grow?
- Measuring weights of ingredients when baking.
- Playing with plastic jugs and containers in the bath?
- Reading the scale on weighing machines.
- Weigh a child on the scales when they are holding family pet. Can they work out how much heavier they are? Can you calculate how much does the pet/object weighs?
- Can you find two things heavier than your child? Two things lighter?

Time

- Looking at the clock - identify the numbers telling the time using analogue and digital clocks.
- Calculating how long a journey will take looking at the train/bus/airline timetables.
- Using the TV guide to calculate the length of programmes. How long left?
- Programming the microwave.
- Discussing events in the day e.g. teatime, bed time, bath time.
- Setting the alarm clock.

Shopping

- Looking at prices.
- Calculating change - which coins? Which combinations?
- Weighing fruit and vegetables in the supermarket.
- Counting pocket money. How much more in 10 weeks?
- Reading labels on bottles, packets in order to discuss capacity, weight or even 3d shape.
- Estimating the final bill when shopping at the till.
- Adding up the bill at a restaurant.
- Working out a 10% tip at a restaurant.
- Calculating the cost of the family going to the cinema.

Fractions

- Practise fractions by cutting pizzas, sandwiches or fruit. Ask questions such as: Is there a different way I could cut my sandwich into quarters? Eat one piece. How much is left? Etc.

- Your pizza costs £3.60. Cut it into 6 equal slices. How much does each slice cost?

  How much is half a slice?
  How much do 2 slices cost?
  How much does ½ of the whole pizza cost?

- What if you cut your pizza into 4 equal slices (quarters)?

  How much does one slice ¼ costs now?

  How much does half cost now?

  Is it the same, more or less than above?

Simple Maths Games

There are many websites and games that can be used to help your child with their maths (please see list on page) but although useful are no substitute for real games or activities played between you and your child. Many family games involve aspects of mathematics:

- Monopoly ~ *Money*
- Dice Games (e.g. Yahtzee) ~ *Probability*
- Dominoes ~ *Number Skills & Problem Solving*
- Mastermind ~ *Logic & Problem Solving*
- Battleships ~ *Grid References & Charts*
- Card Games ~ *all sorts of maths!*
- Snakes & Ladders, Ludo ~ *Counting & Number Skills*