



HELPING YOUR CHILD WITH WRITTEN CALCULATIONS

By Etwall Primary School

Calculation

If you were brought up on pages of 'hard sums' you may think maths is difficult and boring. Worse than that, you may think you're not very good at it! That's a real shame because it is a fun subject and for most people, if they are taught to understand numbers, they should be reasonably easy to grasp and use.

You may sometimes feel confused when your child's maths book contains writing, pictures, diagrams, jottings or blank number lines and not many 'formal calculations'. This is because written calculations are not the ultimate aim: the aim is for children to do calculations in their heads and, if the numbers are too large, to use a way of writing them down that helps their thinking.

Some of the children have made videos to explain each method. Please look on our website for these videos. We will keep adding to these until they are all complete.

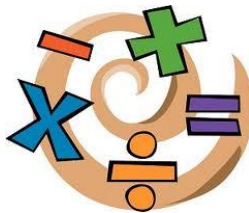
Talk to your child about how they work things out.

Ask your child to explain their thinking.



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

- Can I do this in my head?
- Can I do this in my head using drawings or jottings?
- Will it help me to use a pencil and paper method?



Also help your child to estimate and then
check the answer. Encourage them to ask ...

- Is the answer sensible?
- What calculation will help me to check the answer?

COUNTING IDEAS

- Practising the number names. Encourage your child to join in with you. When they are confident, try starting from different numbers, -4, 5, 21...
- Sing number rhymes together - there are lots of commercial CDs available.
- Give your child the opportunity to count a range of interesting objects (coins, pasta shapes, buttons etc.) Encourage them to touch and move each item as they count them.
- Count things you cannot touch or see (this is more difficult!). Try lights on the ceiling, window panes, jumps or claps.
- Play games that involve counting e.g. snakes and ladders, dice games, games that involve collecting objects.
- Look for numbers in the environment. You can spot numbers at home, in the street or when out shopping.
- Cut out numbers from newspapers, magazines or birthday cards. Then help your child put them in order.
- Make mistakes when chanting, counting or ordering numbers. Can your child spot what you have done wrong?


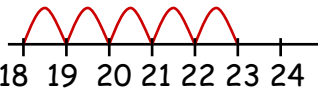
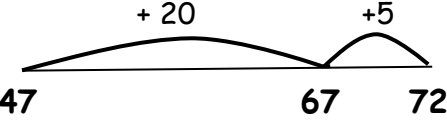
-2, -1, 0, 1, 2, 3, 4, 5, 6, 7, 8

PRACTISING NUMBER FACTS

- Find out which number facts your child is learning at school (addition facts to 10, times tables, doubles etc). Try to practise for a few minutes each day using a range of vocabulary. Use the rapid number recall fact your child is working on as a good starting point.
- Have a 'fact of the day'. Put this fact up around the house. Practise reading it in a quiet, loud, squeaky voice. Ask your child over the day if they can recall the fact.
- Play 'ping pong' to practise compliments with your child. You say a number, they reply with what is needed to make 10. You can also play this game with numbers totalling to 0.1, 1, 20, 100 or 1000. Encourage your child to answer quickly.
- Throw 2 dice. Ask your child to find the total of the numbers (+), the difference between them (-) or the product (x). Can they do this without counting?
- Give your child an answer. Ask them to write as many calculations as they can with this answer. E.g. $10 = ? + ?$, $10 = ? \times ?$ etc.
- Give your child a number fact (e.g. $5+3=8$). Ask them what else they can find out from this fact (e.g. $3 + 5 = 8$, $8-5 = 3$, $50 + 30 = 80$, $500 + 300 = 800$, $15 + 3 = 18$). Add to this list over the next few days.

Addition

Children are taught to understand addition as combining two sets and counting on.

<p>COMBINING SETS (Using pictures and objects)</p>	<p>Children could draw a picture to help them work out the answer.</p>
<p>$2 + 3 =$</p> <p>At a party, I eat 2 cakes and my friend eats 3.</p> <p>How many cakes did we eat altogether?</p> 	<p>Children could use dots or tally marks to represent objects (quicker than drawing a picture).</p> <p>Children also need to understand that the answer can be written either side of the = sign. e.g. $2 + 3 = 5$ or $5 = 3 + 2$.</p>
<p>NUMBER TRACK / NUMBER LINE - (Jumps of 1)</p>	<p>Using a number line helps children to visualise what they are doing when they add.</p>
<p>$18 + 5 = 23$</p> <p>+1 +1 +1 +1 +1</p> 	<p>Encourage children to put the largest number first when they are using this method to help them count on more easily.</p>
<p><u>COUNTING ON A NUMBER LINE</u></p>	<p>Drawing an empty number line helps children to record the steps they have taken in a calculation. (Start on 47, +20 then +5). This is much more efficient than counting on in ones.</p>
<p>$47 + 25 =$</p> 	<p>This method can also be used for 3 digit and 4 digit numbers.</p>

<p><u>PARTITIONING</u></p> $ \begin{array}{r} 47 + 76 = 40 + 7 \\ \quad = 70 + 6 \\ 110 + 13 = 123 \end{array} $ $ \begin{array}{r} 375 + 567 = 300 + 70 + 5 \\ \quad \quad 500 + 60 + 7 \\ 800 + 130 + 12 = 942 \end{array} $	<p>When adding larger numbers, it becomes less efficient to count on, so partitioning is used.</p> <p>Children will be taught to partition into tens, ones, tenths, hundredths etc, add to form partial sums and then recombine to find the answer.</p>
<p><u>EXPANDED COLUMN METHOD</u></p> <p>546 + 487 =</p> <p>There are 546 boys and 487 girls in a school. How many children are there altogether?</p> $ \begin{array}{r} 546 \\ +487 \\ \hline 13(6+7) \\ 120(40+80) \\ 900(500+400) \\ \hline 1033 \end{array} $	<p>Children will be taught written methods for those written calculations they cannot do 'in their heads'. Expanded methods build on mental methods and make the value of the digits clear to children.</p> <p>The language used is very important (6+7, 40+80, 500+400, then 900+120+13 - <i>Add this mentally NOT in columns</i>)</p>
<p><u>COLUMN METHOD</u></p> <p>366 + 458 =</p> <p>366 people visited the museum last year. The numbers increased by 458 this year. How many people visited this year?</p> $ \begin{array}{r} 11 \\ 366 \\ +458 \\ \hline 824 \end{array} $	<p>When children are confident using the expanded method, this can be 'squashed' into the traditional compact column method.</p> <p>Ensure the columns are lined up as this will help the children to not make so many mistakes with recognising the value of each digit.</p>

REAL LIFE PROBLEMS

- Go shopping with your child to buy two or three items. Ask them to work out the total amount spent and how much change you will get.
- Plan an outing during the holidays. Ask your child to think about what time you will need to set off and how much money you will need to take.
- Use a TV guide. Ask your child to work out the length of their favourite programs. Can they calculate how much time they spend watching TV each day/week?
- Help your child to scale up or down a recipe to feed the right amount of people.
- Work together to plan a party or meal on a budget.
- Use a bus or train timetable. Ask your child to work out how long a journey between two places should take? Go on the journey. Do you arrive earlier or later than expected? How much earlier/later?



These are just a few ideas to give you a starting point. Try to involve your child in as many problem-solving activities as possible. The more 'real' a problem is, the more motivated they will be to try and solve it.

Subtraction

Children are initially taught to understand subtraction as taking away (counting back) in single steps. Finding the difference (counting up) is then introduced.

PICTURES AND OBJECTS/SYMBOLS

$$5 - 2 =$$

I had five balloons. Two burst.
How many did I have left?



Drawing a picture helps the children to visualise the problem.

Using dots or tally marks is quicker than drawing a detailed picture.

COUNTING ON/BACK A COMPLETED NUMBER LINE

$$11 - 6 = 5 \quad \longleftarrow \quad \text{OR} \quad \longrightarrow$$



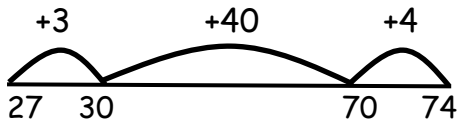
Children count back or forward from a given number using a number line.

Children draw the jumps as they make them. When children are more confident with this method, they will be encouraged to make larger jumps.



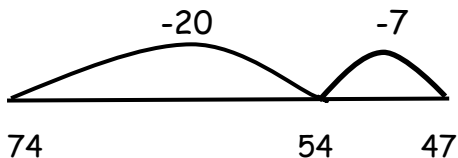
USING AN EMPTY NUMBER LINE TO COUNT ON OR BACK

$$74 - 27 =$$



$$3 + 40 + 4 = 47$$

OR



The mental method of counting up from the smaller to the larger number can be recorded on number lines. Counting back can also be recorded on an empty number line.

The number of 'jumps' can vary depending on the confidence of the child.

This method can also be used for larger numbers and decimals.

DECOMPOSITION (FORMAL COLUMN METHOD)

$$741 - 367 =$$

Alan has 741 marbles in his collection. He gives 367 to his friend. How many does he have left?

$$\begin{array}{r} \overset{6}{7} \overset{13}{4} \overset{11}{1} \\ - 367 \\ \hline 374 \end{array}$$

If children become confident in this method, then the more traditional method of borrowing will be introduced.

LEARNING TIMES TABLES

Did anyone ever tell you that you only needed to learn about half of the multiplication tables in order to know them all? If they didn't it was a bit mean because if you know $3 \times 4 = 12$ you also know $4 \times 3 = 12$, so why learn it twice?

You would be amazed at how much of our maths at school is based on tables. It is VERY important that your child regularly practices and learns their multiplication tables. It will help them to improve the speed and accuracy of the methods explained in this booklet.


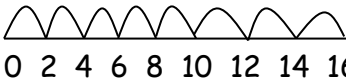
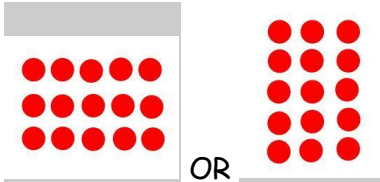
TOP TIPS FOR HELPING YOUR CHILD

- When your child has begun to learn a table, chant the table with them for 5 minutes each day.
- It is important to say the whole table, not just the answers, again and again and again and again!
- Break down each table into manageable chunks. For example ask the 1×5 , 2×5 and 3×5 until they know the answers. Then add the next one.
- Test your child by firing questions at them, in order first and then out of order.
- Keep checking they still know the facts they have learnt.
- Use a range of vocabulary - times, multiply, lots of, sets of.



MULTIPLICATION

Children are taught to understand multiplication as repeated addition. Arrays are also used to introduce multiplication.

COUNTING GROUPS $4 \times 2 =$ Each child has two eyes. How many eyes do four children have? 	Children practice counting up in jumps larger than 1. Children count groups of objects. Pictures or dots can help children do this.
JUMPS ON A BLANK NUMBER LINE. $8 \times 2 =$ There are 8 cats. Each cat has 2 kittens. How many kittens are there altogether? 	Children should count on in equal steps, recording each jump on an empty number line. This shows 8 jumps of 2.
ARRAYS $5 \times 3 =$ A chew costs 5p. How much do 3 chews cost? 	Drawing an array (3 rows of 5 or 3 columns of 5) gives children the image of the answer. It also helps to develop the understanding that 5×3 is the same as 3×5 .

<p><u>PARTITIONING</u></p> <p>43 × 6 =</p> <p>40 × 6 = 240</p> <p>3 × 6 = <u>18</u></p> <p>258</p>	<p>Encourage children to partition the two digit number into tens and ones and then multiply each of these by the single digit number.</p> <p>(If multiplying by a three digit number, partition into hundreds, tens and ones etc.)</p>
<p>EXPANDED VERTICAL</p> <p>237 × 4 =</p> <p>(estimate: 250 × 4 = 1000)</p> <p>237</p> <p>X 4</p> <p>28 (7 × 4)</p> <p>120 (30 × 4)</p> <p><u>800</u> (200 × 4)</p> <p>948</p>	<p>The numbers are again partitioned and each of these are multiplied by each other.</p> <p>As the children become more confident, children can stop writing out the sections in brackets.</p>
<p>SHORT MULTIPLICATION</p> <p>43 × 6 =</p> <p>1</p> <p>43</p> <p>x 6</p> <p><u>258</u></p> <p>4.7 × 8 =</p> <p>(estimate: 5 × 8 = 40)</p> <p>5</p> <p>4.7</p> <p>X 8</p> <p>37.6</p>	<p>Short multiplication is used when multiplying by a single digit number.</p> <p>Initially still use the phrases 6 × 3 = 18, and 40 × 6 = 240. Once children have a clear understanding of where each of the answers is coming from, then this can be shortened to 6 × 3 and 4 × 6. It is crucial however, that children understand the value of each digit so they fully understand the maths involved in the method.</p>

LONG MULTIPLICATION

$$256 \times 18 =$$

(estimate: $250 \times 20 = 5000$)

$$\begin{array}{r} 1 \\ 44 \\ 256 \\ \times 18 \\ \hline 2048 \\ \underline{2560} \\ 4608 \end{array}$$

This method is very similar to short multiplication, the number that has been placed on the bottom of the written method is partitioned and multiplied by each digit above it.

Again, the use of language is important to ensure children have a clear understanding of the maths involved. Once children have a thorough understanding, the maths can be simplified.

DIVISION

Children are taught to understand division as sharing and grouping.

SHARING AND GROUPING

$$6 \div 2 =$$

6 Easter eggs are shared between 2 children. How many eggs do they get each?



Sharing
between
2

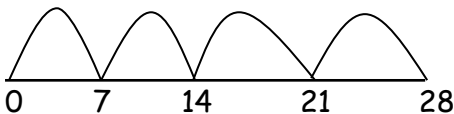
There are 6 Easter eggs. How many children can have two each?



NUMBER LINES - REPEATED ADDITION

$$28 \div 7 =$$

A chew bar costs 7p. How many can I buy with 28p?



Using pictures and objects.

Drawing often gives children a way into solving the problem.

Dots, symbols or tally marks can either be shared out one at a time or split up into groups as the children become more confident.

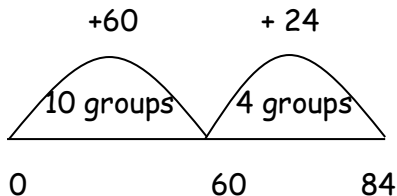
To work out how many 7's there are in 28, draw 4 jumps of 7 along a number line. This shows you need 4 jumps of 7 to reach 28.

This could be modelled in different ways i.e. beads, objects etc.

JUMPS ON A BLANK NUMBER LINE

$$84 \div 6 =$$

I need 6 drawing pins to put up a picture. How many pictures can I put up with 84 pins?

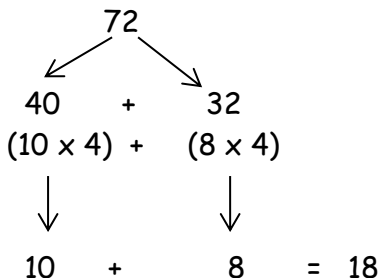


It would take a long time to jump in sixes to 84 so children can jump on in bigger 'chunks'. A jump of 10 groups of 6 takes you to 60. Then you need another 4 jumps of 6 to reach 84. Altogether, that is 14 sixes.

PARTITIONING

$$72 \div 4 =$$

I need 72 chairs for a concert. I arrange them in rows of 4. How many rows do I need?



This method is known as partitioning. In this example you are partitioning the dividend (72) into multiples of the divisor (4).

This is an extension of the previous method. Children may not need to put the sections in brackets down.

BUS STOP METHOD (Short division)

$$291 \div 3 =$$

$$\begin{array}{r} 97 \\ 3 \overline{) 291} \end{array}$$

This traditional method is used when children have a clear understanding of place value. This method works when dividing by a single digit number. It will also work when there is a remainder.

BUS STOP METHOD (long division)

$$560 \div 24 =$$

(estimate: $550 \div 25 = 22$)

$$\begin{array}{r} 23 \\ 24 \overline{) 560} \\ \underline{- 480} \\ 80 \\ \underline{- 72} \\ 8 \end{array}$$

Answer: 23 R 8

This method is very similar to the short division method except chunks of 24 are coming off the total each time.

Encourage children to think of the largest chunk each time (in lots of ten, then ones etc)
e.g. in this example 20 lots of 24 to start with.

USEFUL WEBSITES

<http://interactive-resources.co.uk/> - The pupil username and log in is *epsupil* for both boxes. There are regularly updated games/activities for each class set up by class teachers.

www.woodlands-junior.kent.sch.uk/maths - This website needs no username or password and has activities ideal for all age groups.

www.primarygames.co.uk - Although some of the games on the website require buying, there are many great free ones!

<http://primarygamesarena.com/Maths> - Free games suitable for years 1 - 6.

<http://mathsframe.co.uk/> - Some good activities, and clear descriptions of how to complete many areas of the maths curriculum. Some of the games need you to pay and sign up, but many are free. There are also good ipad and googleplay apps on this website.

Thank you for your continued support in helping your child to achieve. As always if you have any further questions then please come in and ask your class teacher.