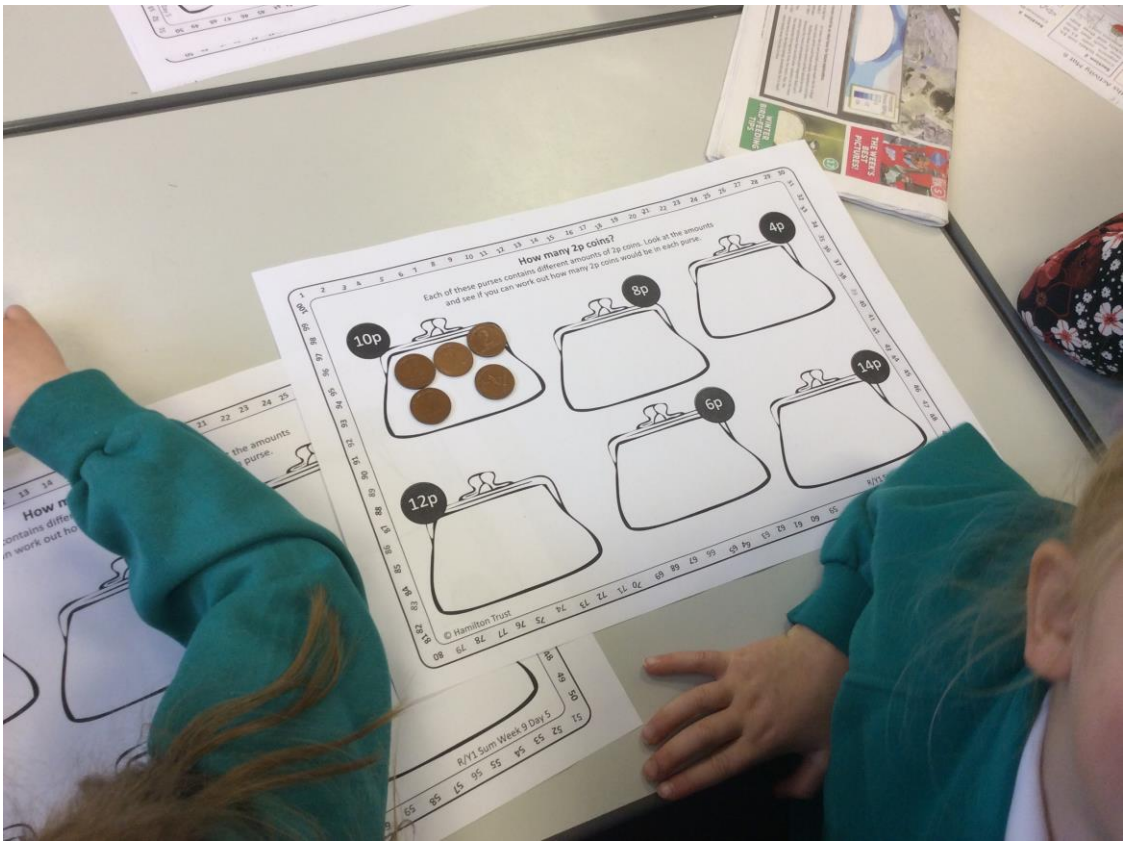
How can I help my child with maths?

An information book for parents to support the work of school in the teaching of maths.

Contents:



Maths in school

Our calculation policy (available to view on the school website) forms the basis of the maths teaching in school. This shows a progression through the different methods to teach and to secure understanding at every stage of learning in maths. Throughout this document, examples are given from this calculation policy

Usually, maths lessons happen every day and tend to follow a given topic for a week or few weeks. We aim first of all to teach the children to understand how to add for example, then use and apply all calculation skills in different contexts such as measuring, play shopping and sharing resources equally. Where possible, links are made between maths and other subjects, for example in gathering and processing data in science, or measuring performance in PE. We also aim to take maths 'out of the classroom' where possible, for example in estimating the number of blackberries on a bush in the meadow, or by collecting and processing data for the RSPB 'Big Schools' Birdwatch'.

Teaching to mastery and supporting understanding

Underpinning all of our maths work is a desire to develop maths mastery - defined by the NCETM as "A deep, long-term, secure and adaptable understanding of the subject." In our school, this means that we will talk about maths, ask questions to deepen our understanding, and will apply maths skills in other areas - for instance using data handling or measuring in science. At home, this can be extended by carrying out daily tasks such as paying for shopping and calculating change, or by weighing and measuring ingredients for cooking.

Understanding place value

At the heart of all our maths teaching is an understanding of place value - how are numbers organised and named? In line with Government guidelines, we use these place names to talk about numbers with the children:

Number	Place Value (of the red digit)	Value of the Digit (of the red digit)
1,234	Ones	4
1,234	Tens	30
1,234	Hundreds	200
1,234	Thousands	1,000
7,891,234	Ten Thousands	90,000
7,891,234	Hundred Thousands	800,000
7,891,234	Millions	7,000,000
57,891,234	Ten Millions	50,000,000

Understanding place value helps us to talk about calculations e.g. ‘regrouping from the tens to the ones’, or ‘two thousand add five thousand’.

For addition, we say:
- ⇒ **Count on**
- ⇒ **Add on**
- ⇒ **More than**
- ⇒ **How many more?**
- ⇒ **Plus**
- ⇒ **Total of**

Addition and subtraction

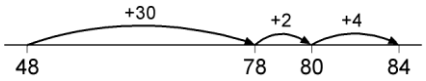
Addition and subtraction begins in the Acorns class with recognising numbers and then counting on and back, usually using a number line or mat to help. The number snake in the playground helps with this - a similar one could be drawn with chalk on any surface, or a ruler makes a good portable number line.

As children develop confidence in using a number line, this can be adapted to make bigger jumps of several numbers, as detailed below.

Steps in addition can be recorded on a number line. The steps often bridge through a multiple of 10.

8 + 7 = 15

48 + 36 = 84



or:

A similar approach is used to teach subtraction: Instead of jumping forward, we jump back, for instance. This can help make links between the two calculations: "If I start at 10 and jump back 3, I get to 7. If I jump forward 3, I get back to 10!" Or for slightly older children: "If I start at 100 and subtract 30, I get to 70. If I add 30, I get back to 100."

For subtraction, we say:
- ⇒ **Count back**
- ⇒ **Less than**
- ⇒ **How many to the 10 before**
- ⇒ **Difference between**
- ⇒ **Subtract**
- ⇒ **Minus**
- ⇒ **Take away**

The next step on from number line work is to partition the numbers - to separate the different place value segments. This might look like this:

47 + 76

40 + 70 = 110

7 + 6 = 13

110 + 13 = 123

Partitioned numbers are then written under one another, for example :

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

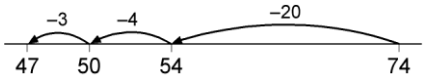
For subtraction, this may look like this:

74 – 27

74 – 20 = 54

54 – 7 = 47

This requires children to subtract a single-digit number or a multiple of 10 from a two-digit number mentally. The method of recording links to counting back on the number line.



We move to **column methods** for adding and subtracting approximately in Year 2, starting with a development of the partitioning method shown above.

Write the numbers in columns.

Adding the tens first:

$$\begin{array}{r} 47 \\ +\ 76 \\ \hline 110 \\ \ \ 13 \\ \hline 123 \end{array}$$

To support place value, we say:

- ⇒ **Seven add six**
- ⇒ **Forty add seventy**
- ⇒ **Sixty take away forty**
- ⇒ **Five hundred take away two hundred**

For subtraction, this would be recorded as follows:

Expanded method

$$\begin{array}{r} 500 + 60 + 3 \\ -\ 200 + 40 + 1 \\ \hline 300 + 20 + 2 \end{array}$$

Start by subtracting the ones, then the tens, then the hundreds

When we get to a 'more tricky' subtraction with adjustment needed, our calculation might look like this:

			50		13	
	500	+	~~60~~	+	~~3~~	
-	200	+	40	+	6	
	300	+	10	+	7	= 317

There's a tricky bit here! 3 minus 6 can't be done. So let's regroup one ten as ten ones. Now we have 5 tens (50) and 13 ones.

A more formal column method is taught in a way that will hopefully seem quite familiar! These should be increasingly used from Year 3 onwards. Addition first:

```
  258
+  87
 345
  11
```

We say:

Regroup! 8+7=15, so let's regroup that as one ten and 5 ones. Carry the one ten into the tens column.

And subtraction:

```
 4 1
 5 3
-2 7
 1 2
```

We say:

We can't do 6 tens take away 7 tens. Borrow a hundred and regroup this into ten tens. Now we have 16 tens take away 7 tens.

Ideas for adding and subtracting at home:

- ⇒ Counting on and back can be practised through many board games such as snakes and ladders. Model this for your children as well as encouraging them to count out loud.
- ⇒ How many lego bricks will it take to build a tower as tall as you? Estimate then count (maybe use the colours to make groups of 10).
- ⇒ When you go shopping, give children a budget (depending on age this could encourage adding/subtracting decimals) - what can they buy up to the amount of their budget? How much change will they have?

For multiplication, we say:

- ⇒ **Groups of**
- ⇒ **Lots of**
- ⇒ **Multiply**
- ⇒ **Times**

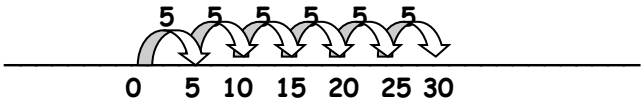
Multiplication

We start teaching multiplication by using the idea of 'groups of', using real objects and pictures to develop a mental image of multiplying.

How many wheels on 3 bikes?

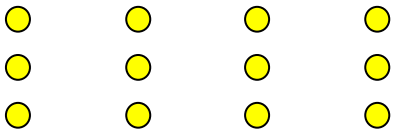
This would then move onto counting 'groups of' on a number line - either written or using a physical line.

6 X 5 =



This would then lead us to look at arrays as a model for understanding multiplication, and in particular, understanding why, for example, 3x4 = 4x3.

3 groups of 4
3 X 4

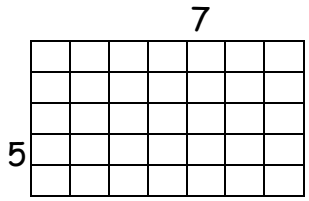


4 groups of 3
4 X 3

Arrays are a very good visual tool to explore lots of the mental maths side of multiplication, such as finding different factors of a number ("How many ways can you arrange the 12 counters as a rectangle?"), and in building up a picture of multiplication as repeated addition ("If you add another row of 3 too this array, how many 3s have you got now?). We use arrays through drawing colouring on a grid, or by manipulating counters, beads, plastic dinosaurs etc!

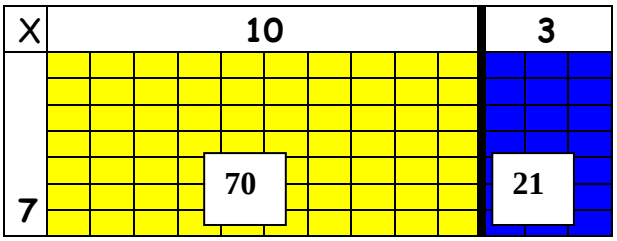
Arrays then lead us onto the next step in recording multiplication calculations:

7 X 5 = 35



Creating a grid like this links closely to the array model.

13 X 7



Working in this way clearly demonstrates the way we can partition numbers to get an answer: in this case
7x10= 70
7x3=21
70 + 21 = 91
This provides a strong visual link to work done before to 'scaffold' understanding.

This then can be moved onto a 'grid method' for multiplying which relies more on number recall than counting arrays, and which allows for larger numbers to be multiplied. Note the way that place value is used to multiply larger numbers: we would say, for instance "30 x 20 = 600"

X	30	8	
7	210	56	= 266

X	100	30	8	
20	2000	600	160	2760
4	400	120	32	552
				3312

From here, we move onto an 'expanded method' of multiplying, partitioning numbers into their place value parts and recording each stage of the calculation.

30 + 8
x 7
210 30 X 7
56 8 X 7
266

These stages are then added to give a final product.

A formal written calculation leads on from this and includes 'carrying' digits as already practised with column addition:

$$\begin{array}{r} 38 \\ \times\ 7 \\ \hline 266 \\ \hline 5 \end{array}$$

We say:
8x7=56. 6 ones go in the ones column, carry the 5 tens to the tens column. Put them below - there may be more tens when we've multiplied the tens column. 3 tens x 7 = 21 tens - don't forget to add on the 5 tens from earlier.

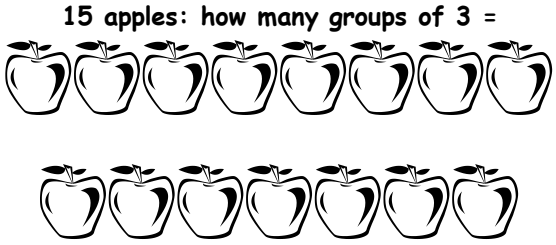
Ideas for multiplying at home:

- ⇒ For younger children, use real objects to group in different ways: "Put your cars in rows of 2. Can you count in 2s to count them all?"
- ⇒ Practise times tables! A quick recall of tables facts is the most helpful tool a child can have when carrying out longer calculations.
- ⇒ Demonstrate times when multiplying is useful, e.g. in calculating costs of a day trip "If the bus costs £4 of a child, how much will it cost for you and 6 friends?"

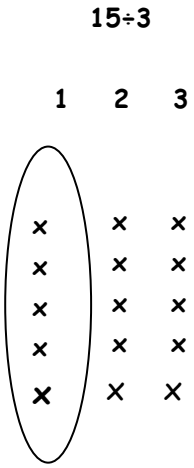
Division

For division, we say:
- ⇒ **Groups of**
- ⇒ **Lots of**
- ⇒ **Share between**
- ⇒ **How many groups of __ in __?**

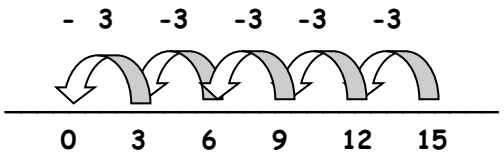
Multiplication and division are linked concepts, so share a lot of teaching methods and vocabulary especially at the early stages of teaching. We begin with the idea of 'groups of', using physical materials to make these groups.



Arrays can also be used to show division facts, and again are very useful to explore patterns and relationships in numbers. By working with similar models in multiplication and division, we can build understanding of the links e.g. between 5x3=15 and 15÷3=5.

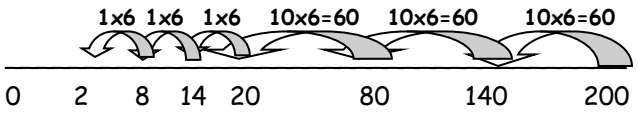


This (like multiplication again) leads onto the number line, this time counting backwards to reinforce the idea that groups are taken from the total.



How many groups of 3 are in 15? Let's count back in 3s to find out. How many are left? Can we make more 3s? Keep going until there are none left.

The first steps towards written division work from the number line – but this time taking more groups at a time. The link between division and multiplication is explicit in this method. For instance, to solve 200 ÷ 6:



We say: 'How many sixes in 200?' as well as 'What is 200 divided by 6?' Then: can we find a larger group of 6s to make this easier?

Finding larger groups of the number will allow this method to be less complicated to record! Moving on from this, the 'groups' can still be subtracted from the total in a calculation method called 'chunking' – we are subtracting 'chunks' of the total.

It is really important with this method to record the groups that have been subtracted or 'chunked' as these will tell you how many groups have been made.

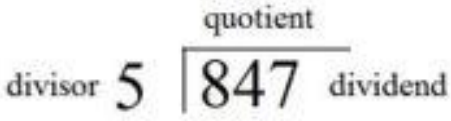
	96	
-	60	10 X 6
	36	
	30	5 X 6
	6	
	6	1 X 6
	0	16

Answer 16

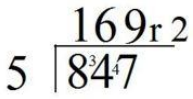
We say: How many groups of six in 96? 10 x 6 = 60. So let's record the groups of 6, then take 60 away as we've made that into groups.
Now we're left with 36. How many more groups of 6 can we take away? 5 x 6 = 30. So record the groups of 6, then take 30 away as we've made that into groups. How many left? 1x6=6 – one last group with none left over. So how many groups of 6 did we make altogether?

At the beginning of Key stage 2, children will be introduced to the short written method of dividing, only when they are secure in understanding the methods outlined above. It is expected that most children will be confidently using a short written method to divide from Year 5 onwards.

As this method is introduced, so are the correct mathematical terms for the different parts of a division calculation:



Calculation is then carried out as follows:



We say:
How many 5s in 8? 1 with 3 remainder. So write the 1 above on the quotient line and move the remainder to the next column. Now, how many 5s in 34? Keep going like this until you can't make any more groups of 5. If there's anything left over, write it as a remainder.

A further stage to this for children at the top end of Year 5 and 6 would be to convert the remainder into a decimal. This is done by inserting a decimal point at the end of the calculation (both on the dividend and quotient), then using 0 as a place holder in the tenths place (just after the decimal point). The remainder can then be carried to the next place as before. This clip demonstrates this in action: https://www.youtube.com/watch?v=mJH4xbG6TMo

Ideas for dividing at home:

- ⇒ For younger children, use real objects to group in different ways: “How many groups of 2 can you make with your cars? Can you share your pens so that we have the same number each?”
- ⇒ Use dividing in real-life contexts: “The café bill is £12. How much would that be if we all shared the cost? How will we work this out?”
- ⇒ Use the link between multiplying and dividing with real objects e.g. pebbles on the beach “How can we arrange these in a pattern? Will they go in rows of 5? How many spiders can I make with stick legs from this handful of twigs? How many starfish can we make with pebbles for legs?”

Useful websites

www.nrich.maths.org is a website that we use a lot in school for problem-solving and investigation activities. It has different sections for KS1 and KS2 work, and 'live' investigations where children can submit their ideas and questions about maths problems. Lots of the activities are interactive: try https://nrich.maths.org/6499 for a version of the TV show 'Countdown'.

BBC Bitesize Key stage 1
http://www.bbc.co.uk/bitesize/ks1/maths/
and Key Stage 2
http://www.bbc.co.uk/bitesize/ks2/maths/ includes explanations of how to calculate and opportunities to practise maths skills.

'Maths is fun' https://www.mathsisfun.com/ is a website that we use a lot in Key Stage 2 as it explains different processes and calculations clearly, giving lots of examples. This is useful up to the top end of Key Stage 2 and beyond!