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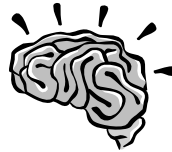
## “They didn’t do it like that in my day!”

Do your children ask for help with their maths homework and start talking in a foreign language, using words like ‘partitioning’, ‘chunking’, ‘grid multiplication’.....?

If so, you may feel the need for some translation. This booklet is designed to explain the methods used to teach calculation in Tatsfield Primary School.

### Which is more important:

mental calculation ٧



or

written ٧



This will depend on the numbers involved and the individual child.

When faced with a calculation, no matter how large or difficult the numbers may appear to be, all children should ask themselves:

Can I do this in my head?

If I can’t do it wholly in my head, what do I need to write down in order to help me calculate the answer?

Do I know the approximate size of the answer?

Will the written method I know be helpful?



## When do children need to start recording?

The following table shows how some sort of recording is relevant throughout the primary years with mental strategies playing an important role throughout.

| Reception                                | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | Year 6 |
|------------------------------------------|--------|--------|--------|--------|--------|--------|
| ← Making a record of a calculation →     |        |        |        |        |        |        |
| ← Jotting to support a mental strategy → |        |        |        |        |        |        |
| ← Explaining a mental strategy →         |        |        |        |        |        |        |
| ← Developing written methods →           |        |        |        |        |        |        |
| ← Formal written methods →               |        |        |        |        |        |        |

It is important to encourage children to look first at the problem and then get them to decide which, is the best method to choose – pictures, mental calculation with or without jottings, structured recording or calculator.

Children attempting to use formal written methods without a secure understanding will try to remember rules, which may result in unnecessary and mistaken applications of a standard method.



Some of the methods explained in this booklet involve 'partitioning' and a set of place value cards are attached which can be pasted onto card and cut out (your child will show you how to use them).

Using an informal method.

# ADDITION

TU + TU

$$86 + 57$$



Start at 86 (the larger number).

*Partition* the smaller number 57 into tens and units and count on the multiples of 10 first and then the units.

$$1) 86 + 50 = 136$$

$$2) 136 + 7 = 143$$

$$86 + 57 = \underline{\underline{143}}$$

# ADDITION

HTU + TU

$$754 + 96$$

Add too much and then subtract  
(*compensate*)

Why are you subtracting  
when you should be  
adding?

I noticed that 96 is close to  
100. 100 is easier to add  
than 96 but that means I've  
added 4 too many. I need to  
subtract 4 from the number  
I reach.



$$\begin{array}{r} \text{HTU} + \text{TU} \\ 754 + 96 \end{array}$$



Start with the larger number 754. Add on 100 and then subtract 4.

$$754 + 96 = \underline{\underline{850}}$$

# ADDITION

HTU + TU

$$625 + 148$$

Why add the units  
(*least significant  
digits*) first?

Expanded method: adding the *least significant digits* first

I know that I can add numbers in any order and the total will be the same. My teacher has told me that I need to practise adding the units first. The next method I will learn works this way. I must remember to line the numbers up in the correct columns.



HTU + HTU

$$625 + 148$$

Add *least significant digits* first:  
(in this example, **units**)

$$\begin{array}{r} 625 \\ 148 \\ \hline 13 \\ 60 \\ 700 \\ \hline 773 \\ \hline \hline \end{array} \quad \begin{array}{l} + \\ + \\ + \end{array} \quad \begin{array}{l} (5 + 8) \\ (20 + 40) \\ (600 + 100) \end{array}$$

$$625 + 148 = \underline{\underline{773}}$$

# ADDITION

HTU + HTU

$$587 + 475$$

Using a standard method

Why do you say  $80 + 70$   
instead of  $8 + 7$ ?

I need to remember the value  
of each digit, so I know the  
size of the numbers I am  
adding and whether my  
answer makes sense.



HTU + HTU  
587 + 475

HTU  
587  
475 +  

---

1062

$7 + 5 = 12$   
Place the 2 in the units column and carry the 10 forward to the tens column to make another ten.

As the carried forward number is added it is crossed out.

$80 + 70 = 150$  then + 10 (carried forward) which totals 160.  
Place 60 in the tens column and carry the 100 forward to the hundreds column.

A trick is to say, '8 tens + 7 tens equals 15 tens plus 1 ten (carried forward) makes 16 tens.'

$500 + 400 = 900$  then + 100 which totals 1000. Place this in the thousands column.

$587 + 475 = \underline{\underline{1062}}$

# SUBTRACTION

Counting on

TU - TU  
**84 - 56**

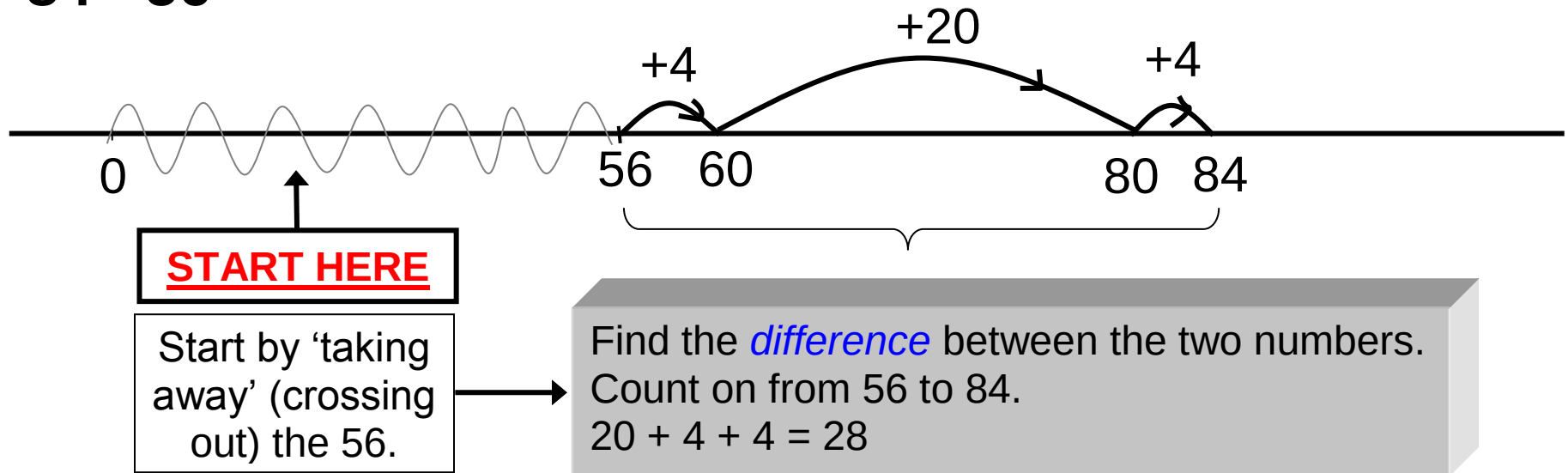
How do you decide  
whether to count on  
or count back?

## Find the difference

If the numbers are close  
together like  $203 - 198$  it's  
quicker to count on. If they're a  
long way apart like  $203 - 5$  it's  
quicker to take away.  
Sometimes I count on because  
that's easier than taking away.



**TU - TU**  
**84 - 56**



$$84 - 56 = \underline{\underline{28}}$$

# SUBTRACTION

HTU - TU

$$154 - 37$$

Working towards a standard method (*decomposition*)

Why do you need to rearrange the numbers  $50 + 4$  and rewrite them as  $40 + 14$ ?

The whole number is 154. I only have 4 units so I don't have enough units to subtract 7 yet. For this method I can exchange one ten from the tens column for ten ones in the units column.



$$\text{HTU} - \text{TU}$$

$$154 - 37$$

Both these numbers are partitioned into their HTU parts, so we can do 3 easier calculations.

54 is the same value as 40 10 4.  
Now 7 can be subtracted from 14.

Subtract the units, tens, then hundreds.

$$100 + 50 + 4 - 30 + 7$$

$$100 + 40 + 10 + 4 - 30 + 7$$

$$100 + 40 + 14 - 30 + 7$$

$$100 + 10 + 7 = 117$$

$$100 - 0 = 100$$

$$40 - 30 = 10$$

$$14 - 7 = 7$$

Here the answers from each calculation are added to give the answer.

$$154 - 37 = \underline{\underline{117}}$$

# SUBTRACTION

HTU - HTU

754 - 286

Standard method (*decomposition*)

Why didn't you use  
the standard  
method straight  
away?

Because all the stages I  
have learnt before have  
really helped me  
understand exactly  
what I'm doing.



# HTU - HTU

## 754 - 286

54 is the same value as 40 + 10 + 4.  
Now 6 can be subtracted from 14.

740 is the same value as 600 + 100 + 40.  
Now 80 can be subtracted from 140.

Or, more efficiently  
the *standard method*.

$$\begin{array}{r} 40 \\ 700 + \cancel{50} + \overset{1}{4} \\ 200 + 80 + 6 \end{array} -$$

$$\begin{array}{r} 600 \\ \cancel{700} + \overset{1}{40} + 14 \\ 200 + 80 + 6 \end{array} -$$

$$\begin{array}{r} 600 + 140 + 14 \\ 200 + 80 + 6 \end{array} -$$

$$400 + 60 + 8 = 468$$

$$\begin{array}{r} \overset{6}{\cancel{7}} \overset{1}{\cancel{5}} \overset{4}{4} \\ 286 \\ \hline 468 \end{array}$$

$$754 - 286 = \underline{468}$$

# MULTIPLICATION

## Introducing multiplication on a number line

$$\begin{array}{r} \text{TU} \times \text{U} \\ 14 \times 5 \end{array}$$

How is multiplication the same as repeated addition?

The number line helps me see each group of 5 clearly.

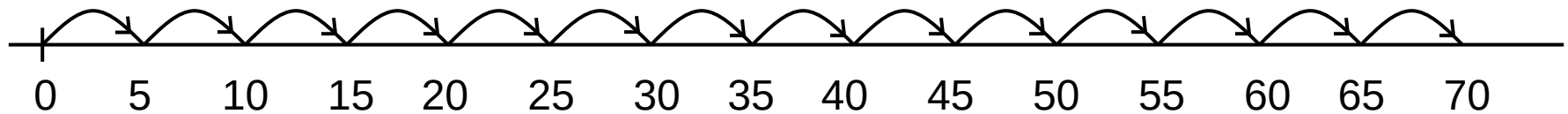
If I add 5 fourteen times, that is the same as 14 multiplied by 5 ( $14 \times 5$ , 14 lots of 5). Or I can make 14 individual jumps of 5 along the number line.

1 jump of  $5 \times 10$  and 1 jump of  $5 \times 4$ . Table facts will help me do this more quickly.

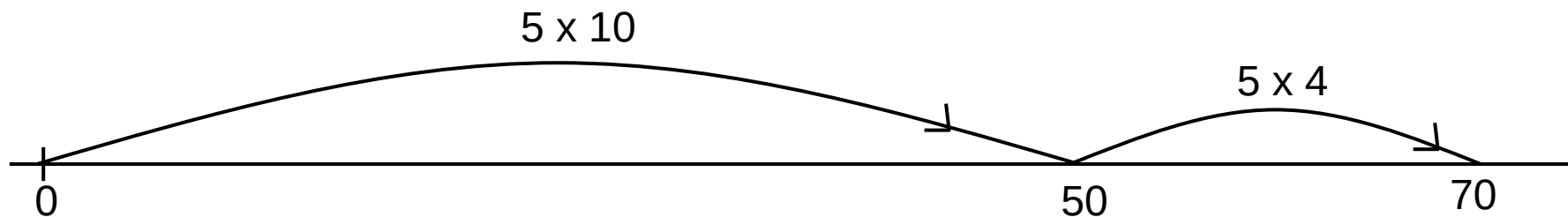


**TU x U**  
**14 x 5**

The number line shows 14 multiplied by 5 (14 jumps of 5 on the number line).



Multiplication is *repeated addition*.



Using table facts to make bigger jumps is more efficient.

**$14 \times 5 = \underline{\underline{70}}$**

# MULTIPLICATION

$$\begin{array}{r} \text{TU} \times \text{U} \\ 23 \times 8 \end{array}$$

What are the brackets for in the expanded method?

Expanded method and Compact method

They remind me which numbers I am multiplying.  
I also have to remember to line the numbers up as hundreds, tens and units.



I multiply the units first so I can carry forward any tens I need to!  
This method is very quick but I have to remember to add on any numbers I carry forward.

## EXPANDED METHOD

8 multiplied by 3 equals 24.  
8 multiplied by 20 equals 160.

HTU  

$$\begin{array}{r} 23 \\ \times 8 \\ \hline 24 \\ 160 \\ \hline 184 \end{array}$$

+ (8 x 3)  
(8 x 20)

Final product from totalling the *part-products*.

## COMPACT METHOD (short multiplication)

HTU  

$$\begin{array}{r} 23 \\ \times 8 \\ \hline 184 \\ \hline \end{array}$$

8 lots of 3 equals 24 (the first *part product*).

2 is the 2 tens that need to be carried forward and added to the next *part product*.

8 lots of 20 equals 160 (2<sup>nd</sup> *part product*), **plus** the 2 tens equals 180.

The digits are put in the correct columns, to give the answer 184.

$$23 \times 8 = 184$$

# MULTIPLICATION

TU X TU  
**46 x 32**

**Expanded method** and **Compact method**

I recognise the long multiplication method. How do you multiply 46 by 30?

Well!... I know that  $46 \times 30$  is the same as  $46 \times 3 \times 10$ . I know my answer will end in zero when I multiply this whole number by 10. So... I put the zero in first. Then I multiply  $46 \times 3$  using the short multiplication method.



## PARTITIONING METHOD

$$\text{TU} \times \text{TU}$$

$$\swarrow 46 \times 32 \searrow$$

$$\text{TU} \times \text{TU}$$

$$46 \times 30$$

$$\text{TU} \times \text{U}$$

$$46 \times 2 = 92$$

Factorise to make  
 $(46 \times 3) \times 10 = 1380$

$$1380 + 92 = 1472$$

## EXPANDED METHOD

The 4 *part products* are set out vertically underneath the calculation.

*Part products* totalled to give final product.

$$\begin{array}{r}
 46 \\
 32 \\
 \hline
 12 \\
 80 \\
 180 \\
 1200 \\
 \hline
 1472
 \end{array}
 \times
 \begin{array}{l}
 \\
 \\
 (2 \times 6) \\
 (2 \times 40) \\
 (30 \times 6) \\
 (30 \times 40)
 \end{array}$$

## COMPACT METHOD (long multiplication)

$$\begin{array}{r}
 46 \\
 32 \\
 \hline
 92 \\
 1380 \\
 \hline
 1472
 \end{array}
 \times
 \begin{array}{l}
 \\
 \\
 (2 \times 46) \\
 (30 \times 46)
 \end{array}$$

$$46 \times 32 = \underline{\underline{1472}}$$

# DIVISION

TU  $\div$  U

27  $\div$  3

Introducing division on a number line

What has  
subtraction got to  
do with division?

I need to see how  
many groups of 3  
there are in 27, so I  
take away groups of 3  
until I can't take any  
more. Using this  
subtraction method  
will help me later on.



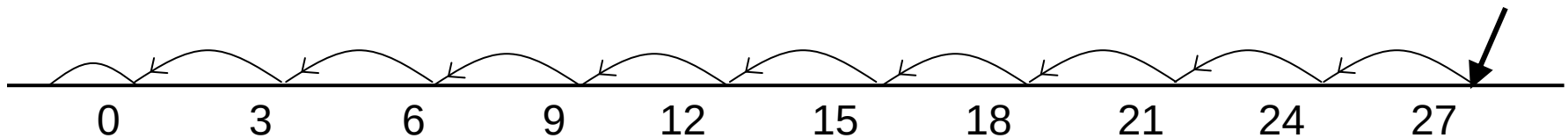
$$TU \div U$$

$$27 \div 3$$

Counting back in groups of 3 on a number line.

9 groups of 3 on a number line.

**START**  
**HERE**



There are 9 groups of 3 in 27

$$27 \div 3 = \underline{\underline{9}}$$

# SHORT COMPACT DIVISION

Isn't it easier to say  
'how many 3s in 4?'

I need to remember the value  
of each digit so I know  
whether my answer makes  
sense. I will only use this  
method when I am confident  
with mental methods of  
division.



# LONG COMPACT DIVISION

It is advisable to teach long division first as it is easier to move from long division to the short division method.

When teaching long division, it is wise to start by using a one digit divisor.

432 ÷ 15 becomes

$$\begin{array}{r}
 28 \text{ r } 12 \\
 15 \overline{) 432} \\
 \underline{- 30} \phantom{0} \downarrow \\
 132 \\
 \underline{- 120} \\
 12
 \end{array}$$

The remainder **MUST** always be smaller than the divisor.

$$\begin{array}{r}
 28.8 \\
 15 \overline{) 432.0} \\
 \underline{- 30} \phantom{0} \downarrow \\
 132 \phantom{0} \downarrow \\
 \underline{- 120} \phantom{0} \downarrow \\
 120 \\
 \underline{- 120} \\
 0
 \end{array}$$

Answer: 28.8

**HTU ÷ U**  
**471 ÷ 3**

$$\begin{array}{r} 1 \\ 3 \overline{) 471} \end{array}$$

**Q:** What is the largest number of hundreds that will divide exactly by 3?

**A:** 300 divided by 3 = 100. This leaves 100 which is exchanged for ten tens in the tens column.

$$\begin{array}{r} 15 \\ 3 \overline{) 471} \end{array}$$

**Q:** What is the largest number of tens that will divide exactly by 3?

**A:** 150 divided by 3 = 50. This leaves 20 which is exchanged for 20 units in the units column.

$$\begin{array}{r} 157 \\ 3 \overline{) 471} \end{array}$$

**Q:** What is the largest number of units that will divide exactly by 3?

**A:** 21 divided by 3 = 7

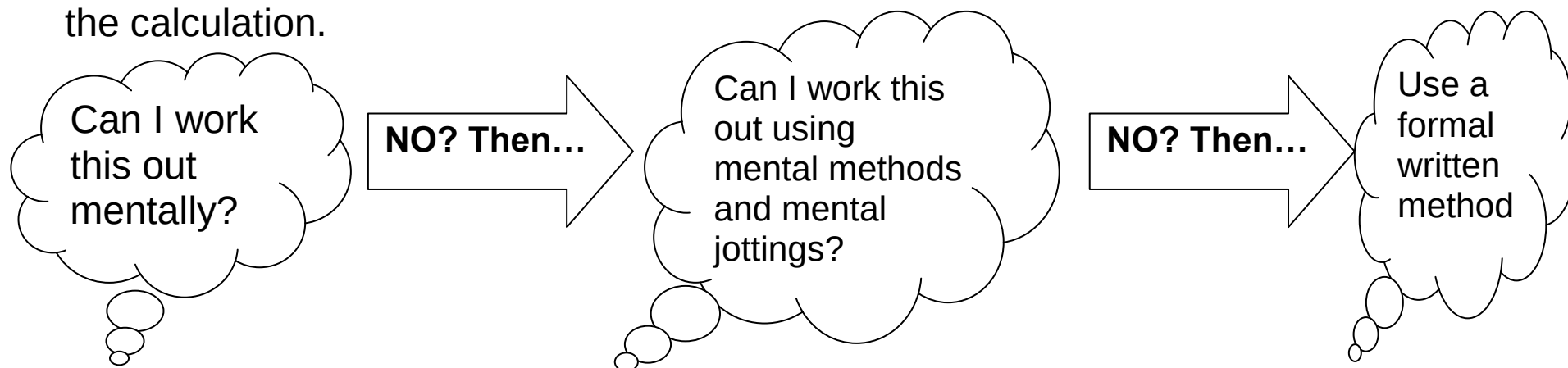
**471 ÷ 3 = 157**

# CALCULATIONS IN CONTEXT

Children must always answer these questions when starting to solve a problem:

All the methods in this booklet support children in using their mental and written skills to solve calculations. Children need to be encouraged to use the method that they understand and can use confidently.

It is important that children are able to choose the most appropriate method for the calculation.



### **4003 - 3998**

These numbers are very close together and so counting up on a number line (actual or imagined) would be the most efficient method.

### **$200 \div 4$**

Dividing by 4 is the same as halving and halving again. As it is easy to halve 200 and easy to halve 100, this would be the most efficient method.

Using and applying appropriate skills is very important, when calculations are needed to solve a problem.

### **4 C.DS at £2.99 – how much altogether?**

£2.99 is almost £3.00 and so round up, multiply, then adjust:

$$4 \times £3.00 = £12.00$$

$$£12.00 - 4p = £11.96$$

# Improving your own skills

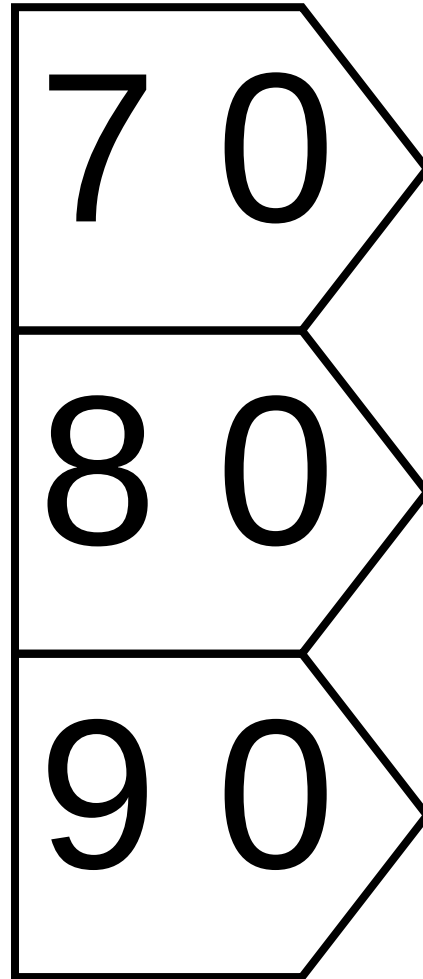
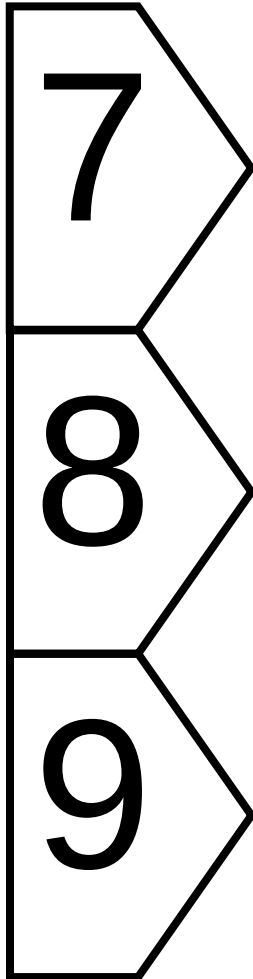
Many adults think that they aren't very good at Maths. If you think it's time that you did something about your own Maths, there are lots of sources of help.

- There are national telephone and internet helplines available to help find an appropriate course.

|                                  |                                                                        |
|----------------------------------|------------------------------------------------------------------------|
| Learndirect:                     | <a href="http://www.learndirect.co.uk">www.learndirect.co.uk</a>       |
| Niace: Promoting adult learning: | <a href="http://www.niace.org.uk/">http://www.niace.org.uk/</a>        |
| BBC Skillswise:                  | <a href="http://www.bbc.co.uk/skillswise">www.bbc.co.uk/skillswise</a> |

- There are several websites designed to help students of all ages find out about different topics in Maths:
  - The BBC site ([www.bbc.co.uk](http://www.bbc.co.uk)) has excellent sections for revision at KS2 and KS3 ([www.bbc.co.uk/revisewise](http://www.bbc.co.uk/revisewise)), and the GCSE and Skillswise sections also give worked examples of mathematical problems - particularly useful when your child doesn't understand her homework and you don't either.....

## Place Value Cards



1 0 0 0

2 0 0 0

3 0 0 0

4 0 0 0

1 0 0

2 0 0

3 0 0

4 0 0

5 0 0 0

6 0 0 0

7 0 0 0

8 0 0 0

5 0 0

6 0 0

7 0 0

8 0 0

