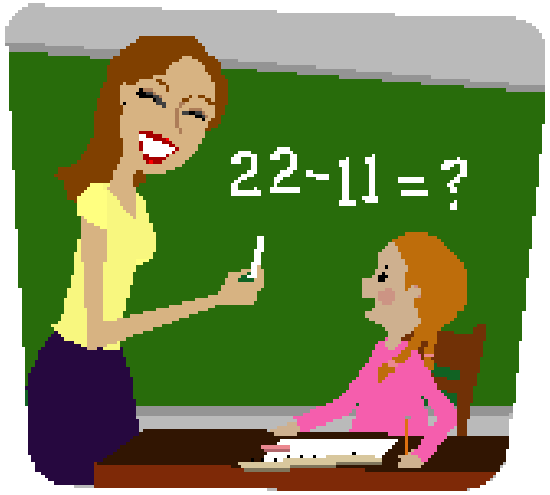
This is how we do it at Tatsfield Primary School



A guide to written calculations in mathematics

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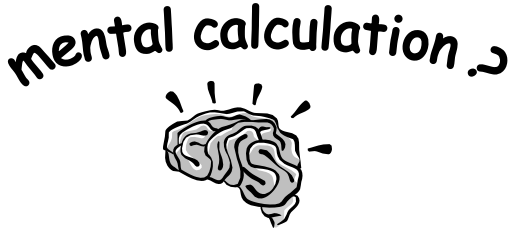
“They didn’t do it like that in my day!”

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.

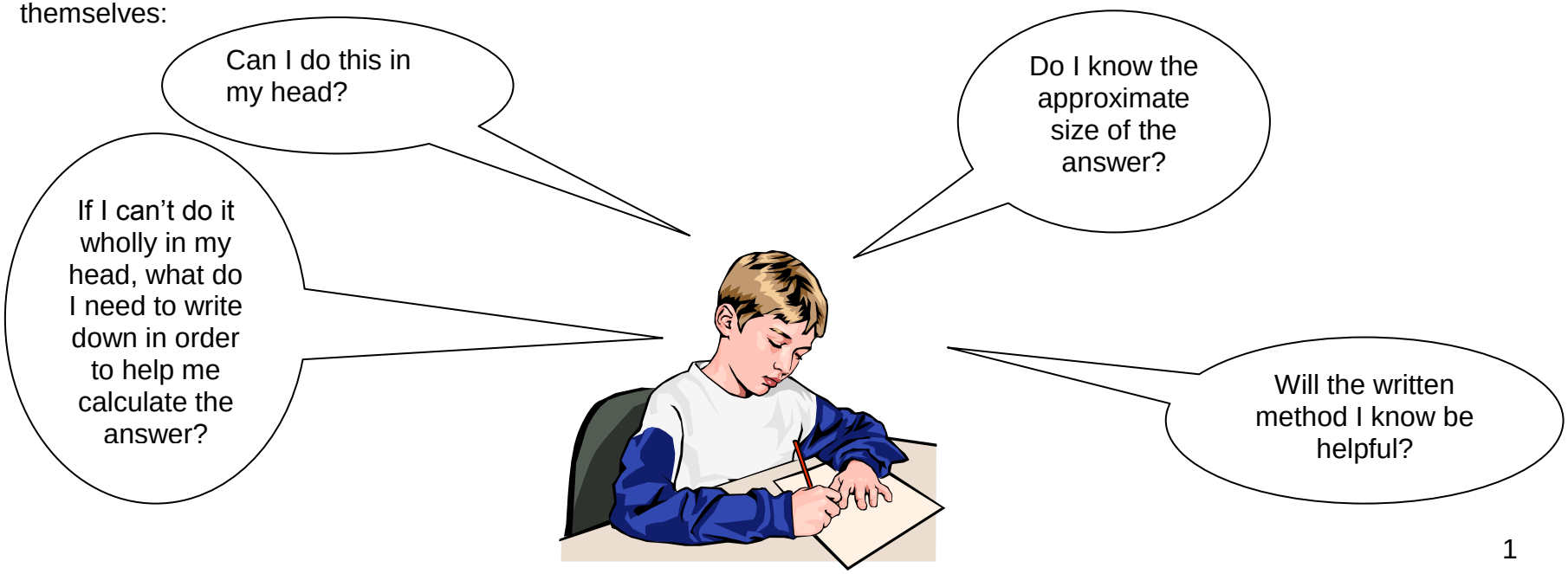
Which is more important:



or

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:



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	Year6
← 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 = 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.

HTU + TU

754 + 96

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

754 + 96 = 850

ADDITION

HTU + TU

625 + 148

Expanded method: adding the *least significant digits* first

Why add the units *(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**)

625		
148	+	
13		(5 + 8)
60	+	(20 + 40)
700		(600 + 100)
773		

625 + 148 = 773

ADDITION

HTU + HTU

587 + 475

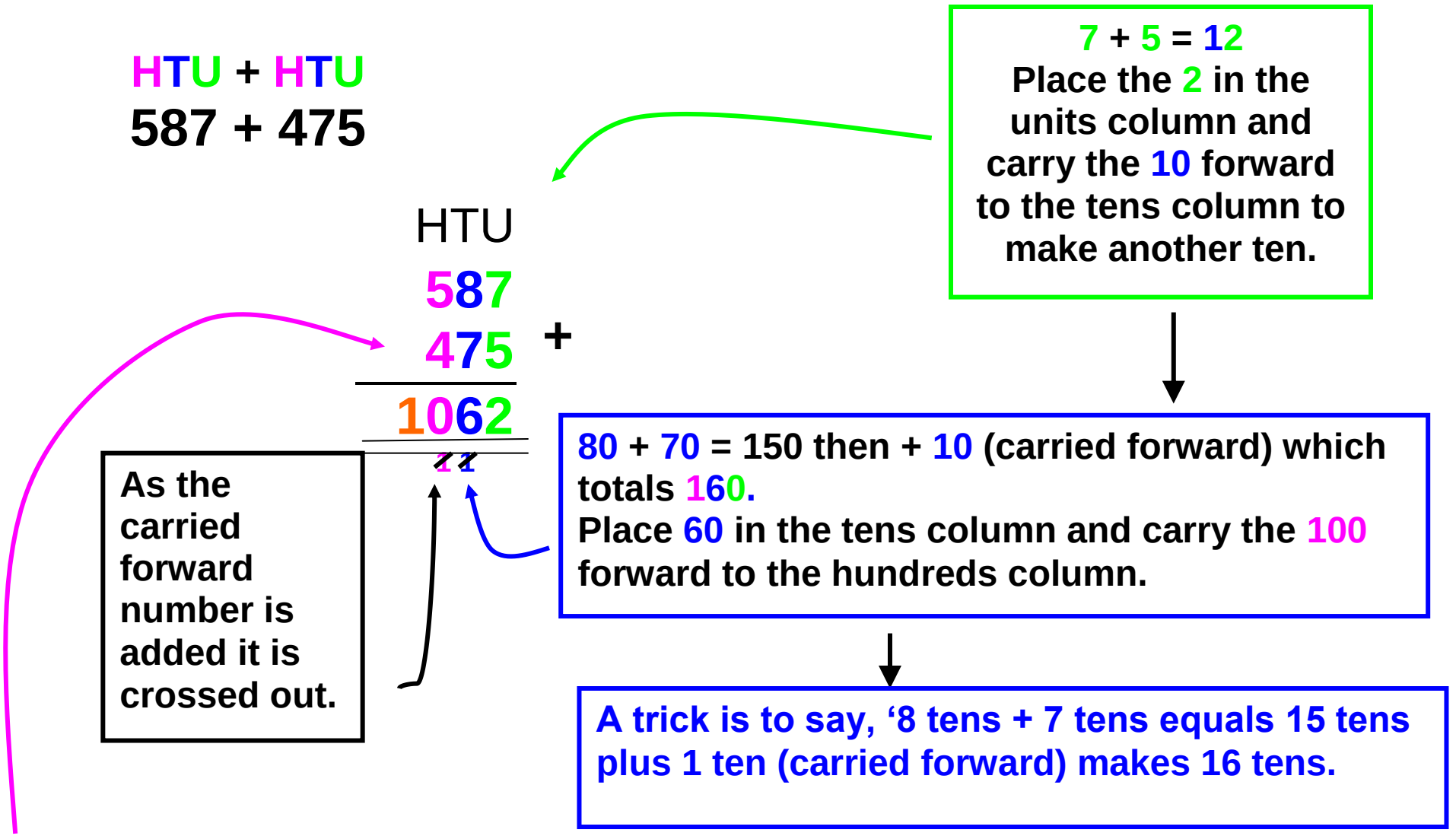
Using a standard method

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



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

587 + 475 = 1062

SUBTRACTION

Find the difference

Counting on

TU - TU

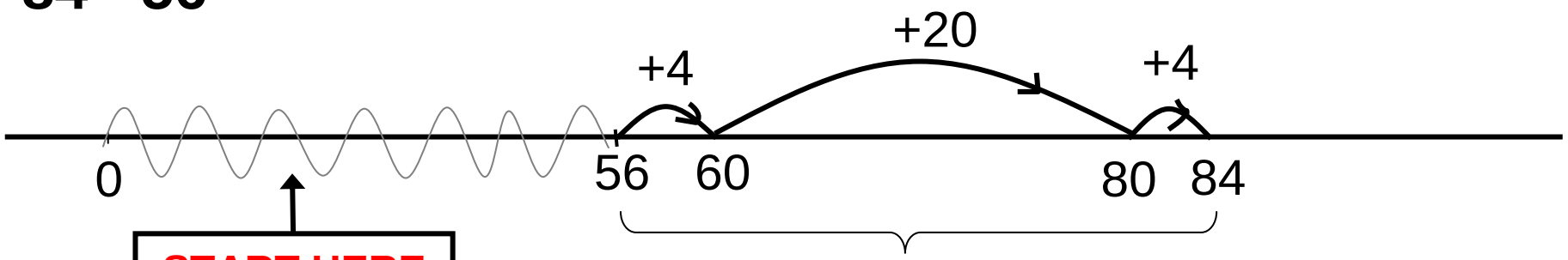
84 - 56

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

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



START HERE

Start by 'taking away' (crossing out) the 56.

Find the *difference* between the two numbers.
Count on from 56 to 84.
20 + 4 + 4 = 28

84 – 56 = 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.

HTU - TU

154 - 37

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

100 + 50 + 4 -
30 + 7

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

40 10
100 + 50 + 4 -
30 + 7

100 + 40 + 14 -
30 + 7

Subtract the units, tens, then hundreds.

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 = 117

SUBTRACTION

Standard method *(decomposition)*

HTU - HTU

754 - 286

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*.

$$\begin{array}{r} {\scriptstyle 40} \\ 700 + \cancel{50} + {}^{1}4 \\ 200 + 80 + 6 \\ \hline \end{array} \quad -$$

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

$$\begin{array}{r} 600 + 140 + 14 \\ 200 + 80 + 6 \\ \hline 400 + 60 + 8 = 468 \end{array} \quad -$$

$$\begin{array}{r} {\scriptstyle 6}\ {\scriptstyle 1}\ {\scriptstyle 4}\ {\scriptstyle 1} \\ \cancel{7}\ \cancel{5}\ 4 \\ 2\ 8\ 6 \\ \hline 4\ 6\ 8 \\ \hline \end{array}$$

754 – 286 = 468

MULTIPLICATION

Introducing multiplication on a number line

TU X U

14 x 5

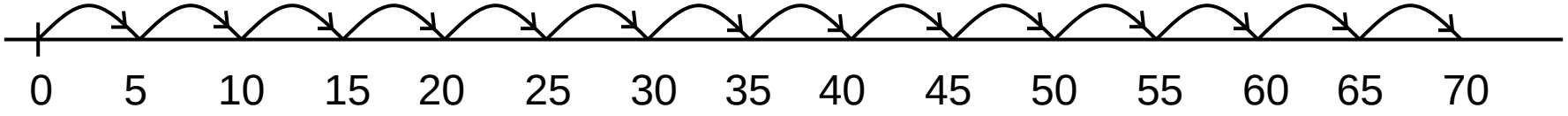
How is multiplication the same as repeated addition?

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 x 5, 14 lots of 5).
Or I can make 14 individual jumps of 5 along the number line.
1 jump of 5 x 10 and 1 jump of 5 x 4. Table facts will help me do this more quickly.

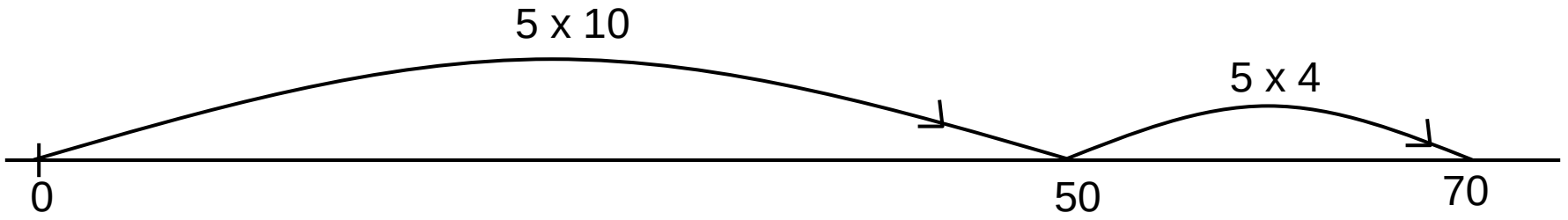
TU x U

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 x 5 = 70

MULTIPLICATION

Expanded method and Compact method

TU X U

23 x 8

What are the brackets for in the expanded 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

HTU	
23	x
8	
24	+ (8 x 3)
160	(8 x 20)
184	

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

Final product from totalling the *part-products*.

COMPACT METHOD
(short multiplication)

HTU	
23	x
8	
184	
2	

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 (2nd *part product*), **plus** the 2 tens equals 180.

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

23 x 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 x 30 is the same as 46 x 3 x 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 x 3 using the short multiplication method.

PARTITIONING METHOD

TU X TU

46 x 32

TU X TU	TU X U
46 x 30	46 x 2 = 92

Factorise to make
(46 x 3) x 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.

```
  46   x
  32
 ----
  12   + (2 x  6)
  80     (2 x 40)
 180     (30 x  6)
1200     (30 x 40)
----
1472
----
```

COMPACT METHOD

(long multiplication)

```
  46   x
  32
 ----
  92   +  (2 x 46)
1380     (30 x 46)
----
1472
----
```

46 x 32 = 1472

DIVISION

Introducing division on a number line

TU ÷ U

27 ÷ 3

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.

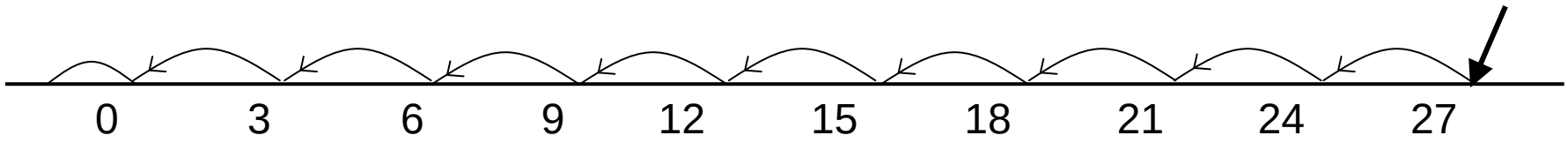
TU ÷ U

27 ÷ 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 ÷ 3 = 9

SHORT COMPACT DIVISION

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

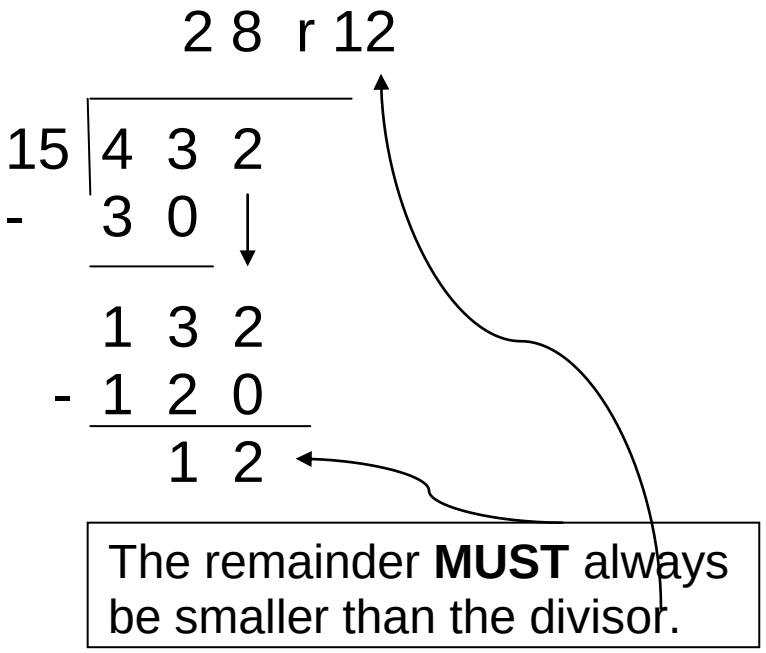
I need to remember the value of each digit so I know whether my answer makes sense. I will only use this method when I am confident with mental methods of division.

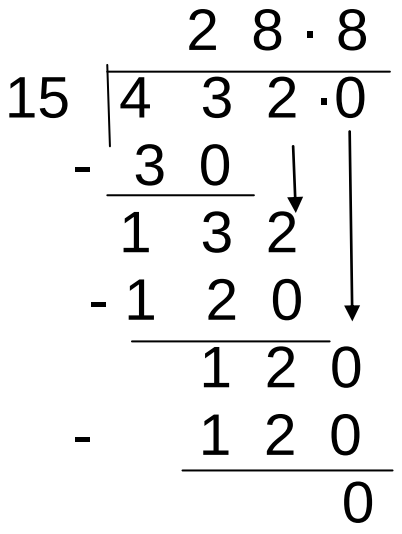
LONG COMPACT DIVISION

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

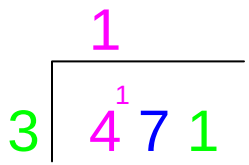




Answer: 28·8

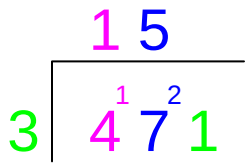
HTU ÷ U

471 ÷ 3



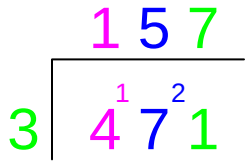
Q: What is the largest number of hundreds that will divide exactly by 3?

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



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.



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

A: 21 divided by 3 = 7

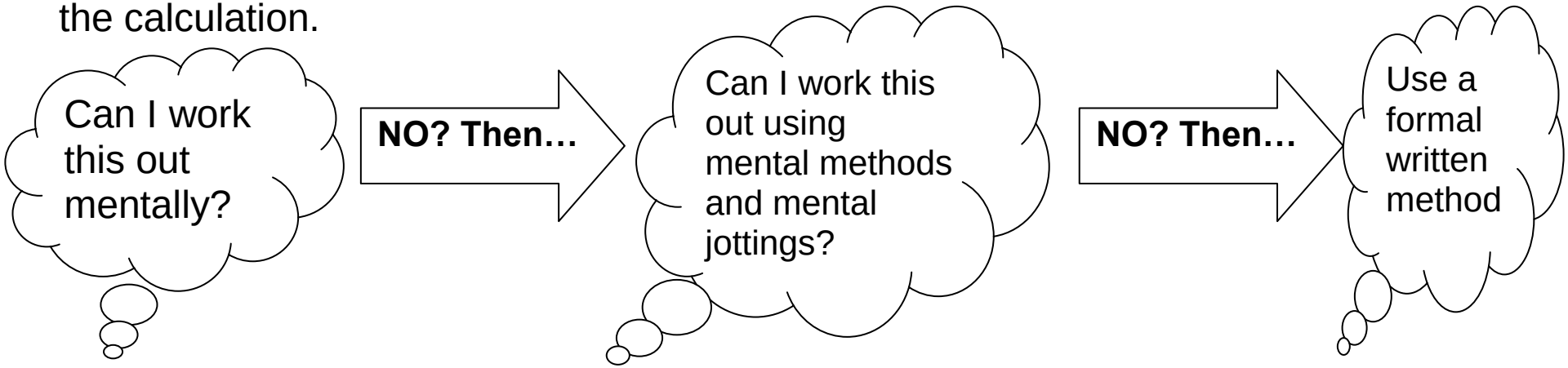
471 ÷ 3 = 157

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 ÷ 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 x £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.

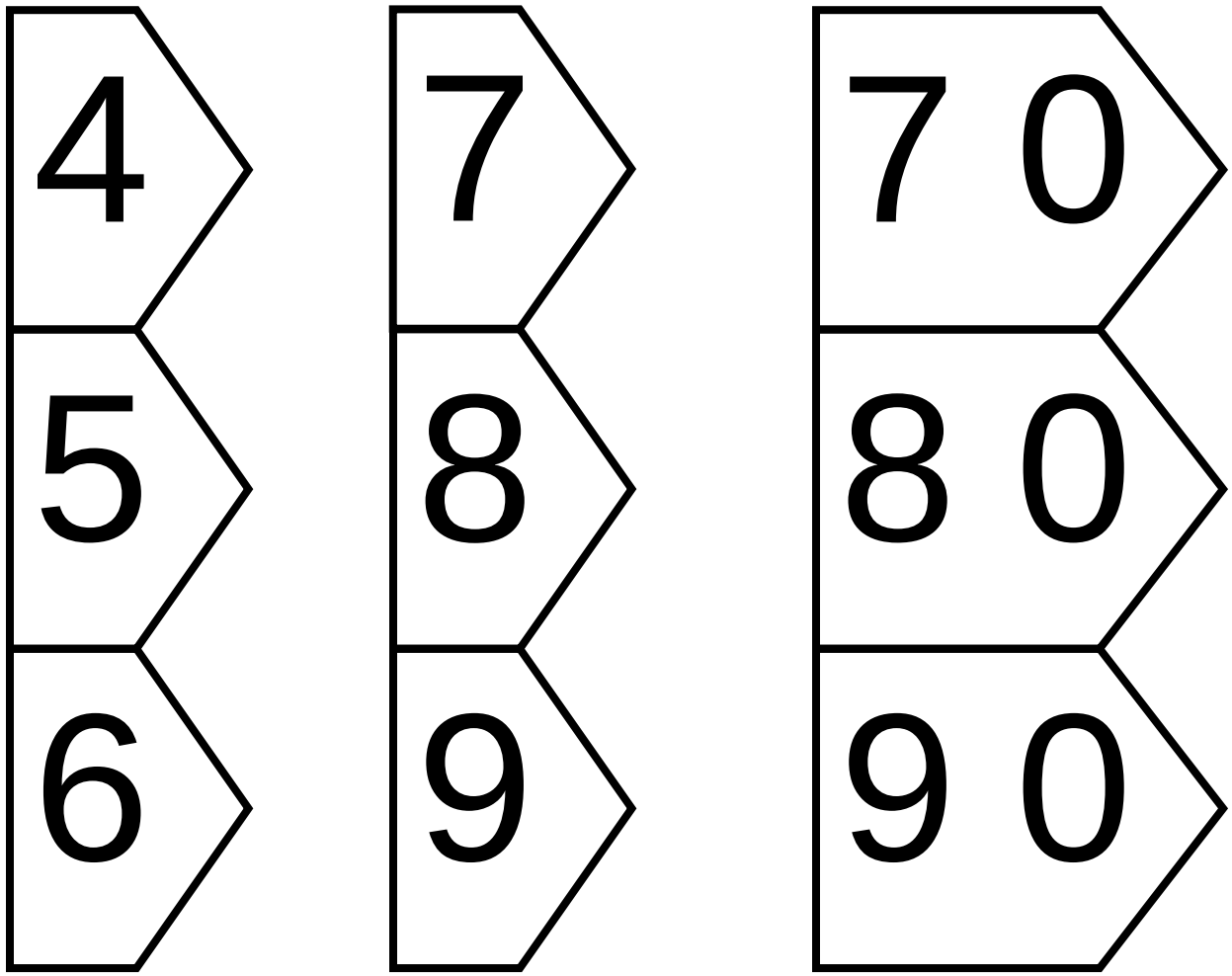
- There are national telephone and internet helplines available to help find an appropriate course.

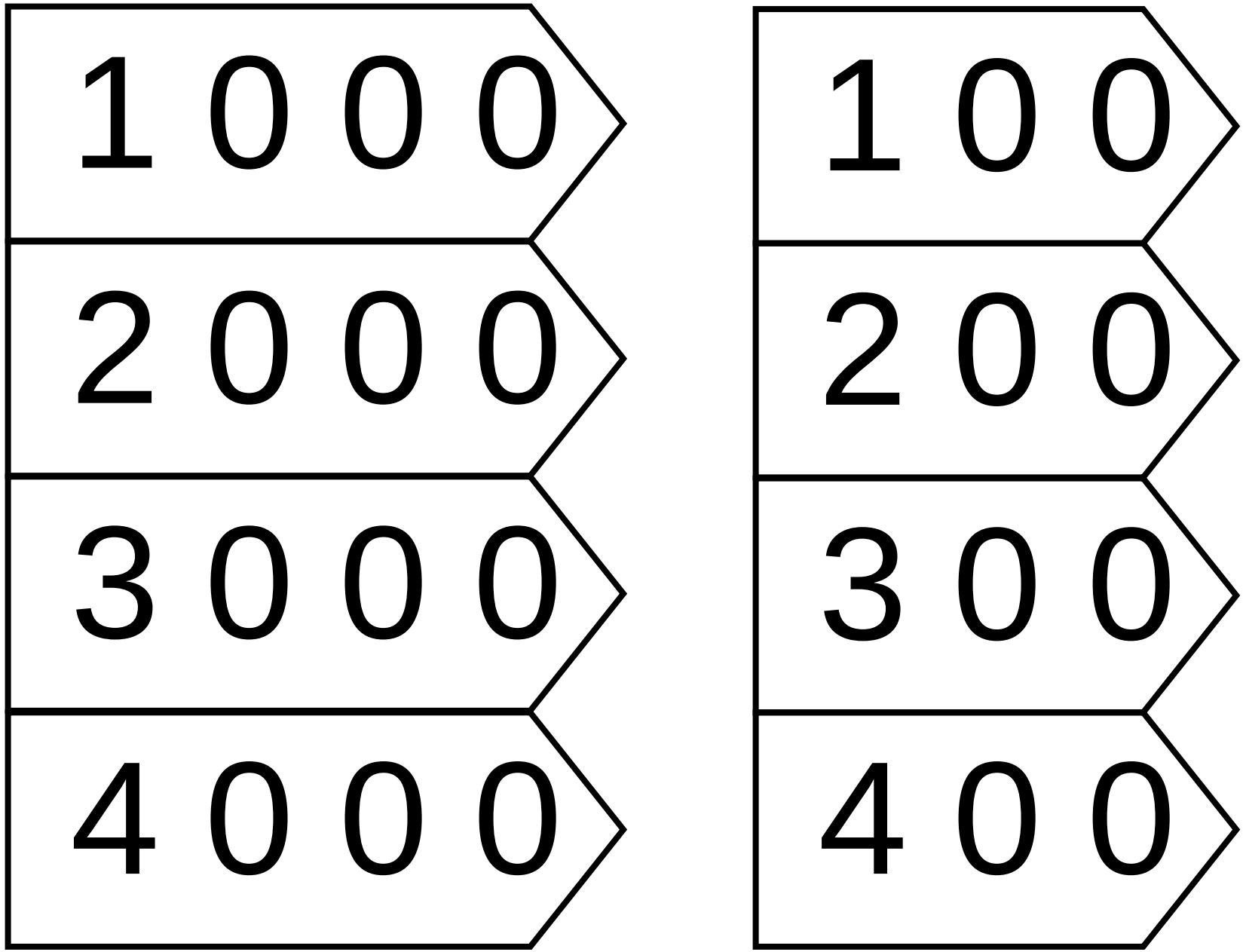
Learndirect:	www.learndirect.co.uk
Niace: Promoting adult learning:	http://www.niace.org.uk/
BBC Skillswise:	www.bbc.co.uk/skillswise

- 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) has excellent sections for revision at KS2 and KS3 (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

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4000
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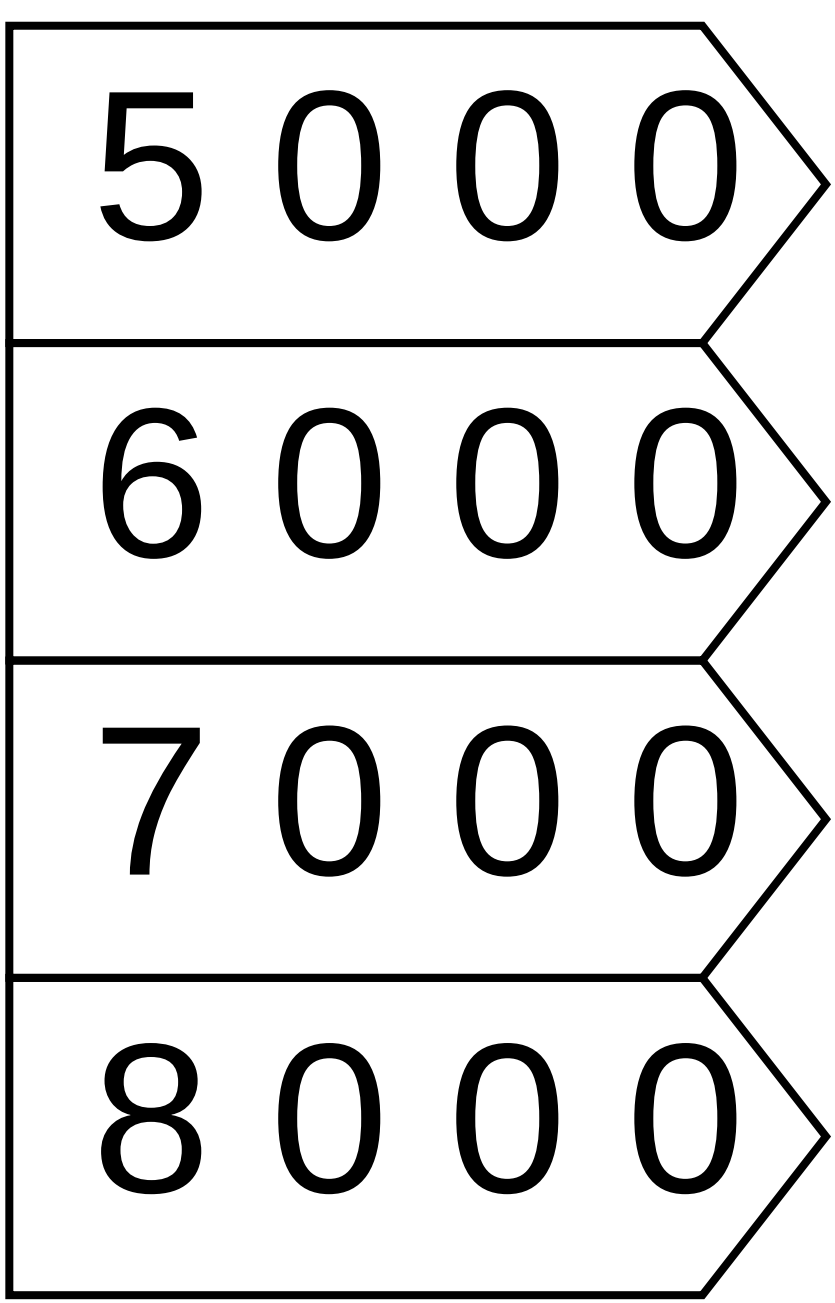
200
300
400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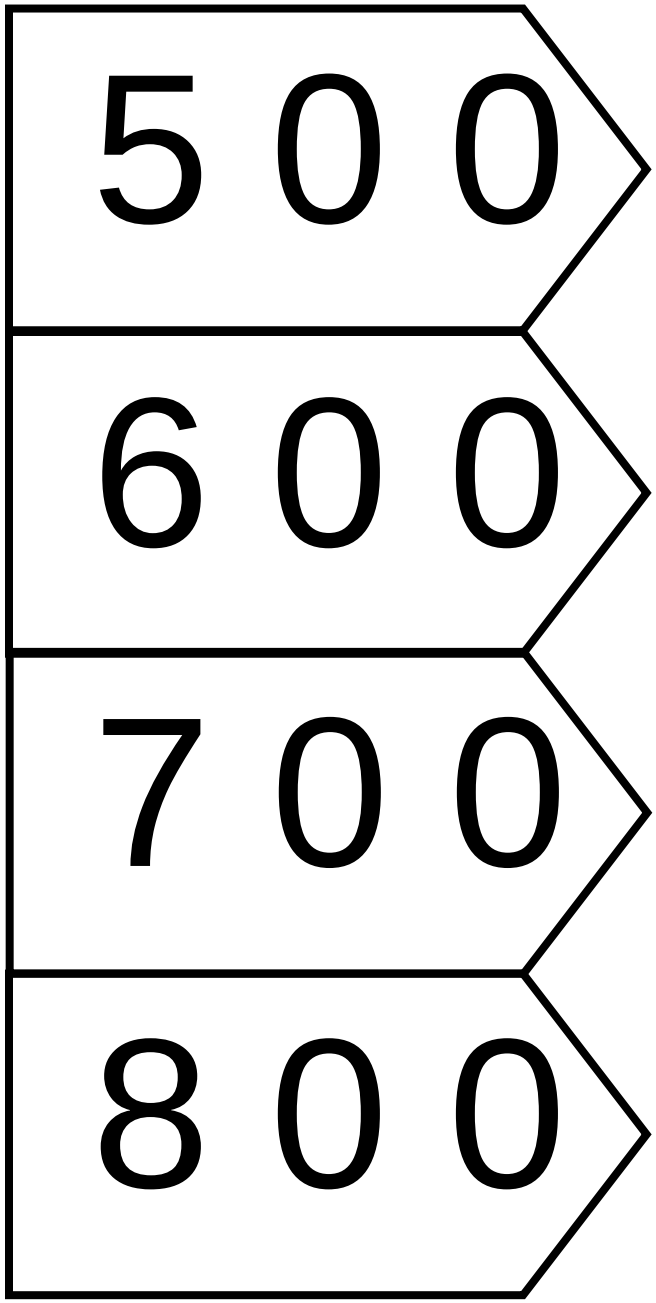
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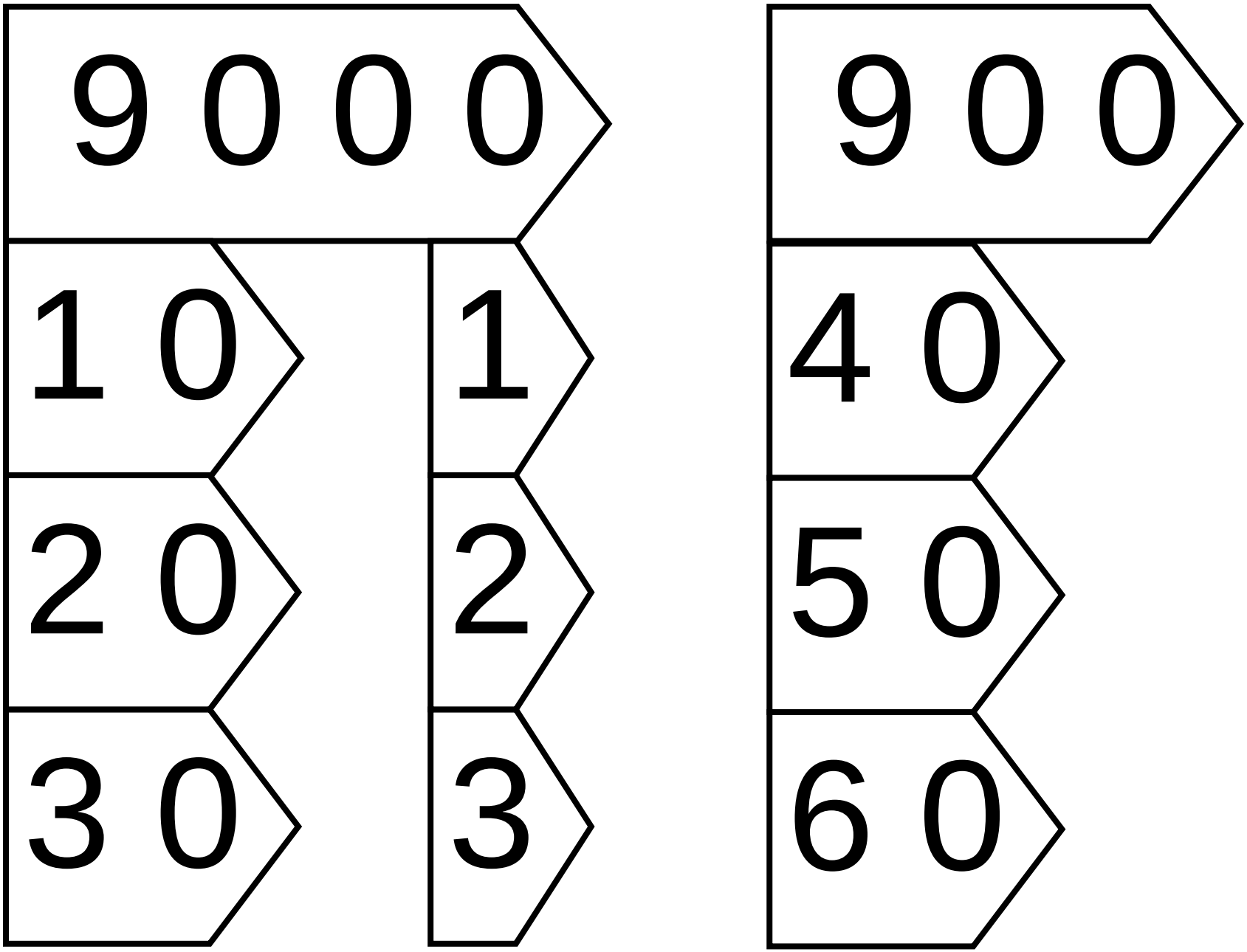
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