Mathematics Mental calculation Policy

May 2014

Key Principles of the Policy

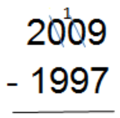
This policy is to be read in conjunction with our written calculation policy. It is based on 5 key principles which are:

1. For students to be able to select an efficient method of their choice (whether this be mental, written or using a calculator) that is appropriate for a given task. They will do this by always asking themselves:
   ‘Can I do this in my head?’
   ‘Can I do this in my head using drawings or jottings?’
   ‘Do I need to use a pencil and paper procedure?’
   ‘Do I need a calculator?’
2. Calculating mentally should be the first choice when presented with any question.
3. Mental calculation is much more than just mental arithmetic.
4. All calculation questions should be presented horizontally, so that pupils can make appropriate choices based on efficiency and accuracy.
5. Jottings should be encouraged and modelled for pupils so as to support them in the required steps, overcome any ‘working memory’ issues, and to provide visual representation of steps:

   e.g.
   2009 – 1997

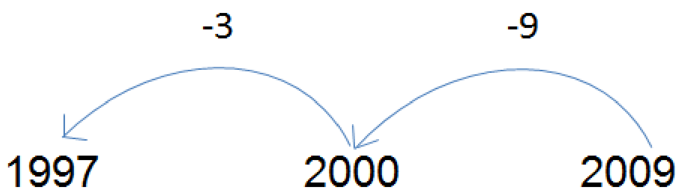
   If a pupil attempts to complete this vertically, many pupils will make mistakes exchanging the zeros.

   e.g.



   However, if tackled mentally (with or without jottings) there is less room for error

   e.g.



   3 + 9 = 12

To be secure in mental calculations, pupils need to be ‘taught’;

1. Key facts that they can rapidly recall.

2. How to use (apply those facts-see appendix 1) to solve other questions. E.g.
   a) ‘3 for free-use the fact family triangles’ – if I know 3 + 4 = 7,
   then I also know: 4 + 3 = 7
   7 – 3 = 4
   7 – 4 = 3
   And if I know 3 x 4 = 12, then I also know: 4 x 3 = 12
   12 ÷ 4 = 3
   12 ÷ 3 = 4

   b) Place value rules. ‘Use what you know.’
   E.g. If I know 4 + 3 = 7, then I also know 40 + 30 = 70
   400 + 300 = 700
   0.4 + 0.3 = 0.7 etc.

3. The 7 key addition and subtraction mental strategies, which are:
   i) counting forwards and backwards
   ii) re-ordering
   iii) partitioning - using multiples of 10 and 100
   iv) partitioning - bridging through multiples of 10
   v) partitioning – compensating
   vi) partitioning – using near doubles
   vii) partitioning – bridging through numbers other than 10

4. The 5 key multiplication and division strategies, which are:
   i) knowing multiplication and division facts to 12
   ii) multiplying and dividing by multiples of 10
   iii) multiplying and dividing by single digit numbers and multiplying by 2 digit numbers
   iv) doubling and halving
   v) fractions, decimals and percentages (FDP)

What’s Special about Mental Calculations?

Carrying out a calculation mentally is not the same as doing a traditional paper and pencil algorithm while mentally picturing it in your head rather than putting it on paper.

Example:

Students in a class are carrying out mental addition of two-digit numbers:

- Charlotte explains that 36 + 35 must be 71 (double 35 plus 1) (near doubles).
- Abtahir explains that 36 + 45 is 36 plus 40 (76) plus 4 (80) plus 1, giving 81 (partitioning the smaller number and then bridging to 10).
- Deimantas explains that 38 + 37 is 60 (30 plus 30) plus15 (known fact: 8 + 7 = 15), giving 75.

How do I Help Students Develop a Range of Mental Strategies?

Individual pupils will be at different stages in terms of the number facts that they have committed to memory and the strategies available to them for figuring out other facts. This policy is designed so that teachers can be clear and *teach* the main calculation strategies that *all* pupils need to learn. It is essential that the teacher draws attention to and models a variety of strategies.

There are three aspects to developing a range of mental strategies and ensuring that pupils become effective in deploying these strategies:

- raising pupil’s awareness that there is a range of strategies;
- working on pupil’s confidence and fluency with the full range of strategies;
- developing efficient methods.

What might a session on mental calculation look like?

As most sessions on mental calculation involve class discussion, they need to be managed in a similar way to discussion sessions in, for example, science or geography lessons. The traditional method of asking a question and inviting a volley of hands to go up has several drawbacks:

- it emphasises the rapid, the known, over the derived – pupils who ‘know’ the answer beat those figuring it out;
- it is unhelpful to those figuring out – students collecting their thoughts are distracted by others straining to raise hands high and muttering ‘Miss/Sir’.

Sessions on mental calculation therefore need to be managed in a way that enables all pupils to take part. Lessons need to be organised to provide some thinking time that enables rapid rather than instant responses and supports those children who need a bit longer to figure things out. Successful strategies include:

- insisting that *nobody* puts a hand up until the signal and silently counting to five or so before giving the signal;
- using digit cards, or mini whiteboards for all children to show their answer at the same time;
- children simply raising a thumb to indicate that they are ready to answer/the teacher using the magic wave to get an answer from all and then ask for a particular student to explain in depth.

Whatever activity is used, it is important to spend time discussing the various ways that pupils reached the answer, to point out the range of possible strategies and to highlight the most efficient and appropriate strategies.

All of the mental calculation strategies in this policy will need to be taught by teachers and discussed with the pupils in a whole class group. Students will learn by comparing their strategies and discussing which strategies appear more effective for particular problems with particular types of number.

Teaching and learning of mental calculation strategies should be taught in whole class lessons and be reinforced during mental/oral starters or other mental calculation times.

Teaching the 7 Addition and Subtraction Strategies

i) counting forwards and backwards

Pupils first encounter the act of counting by beginning at one and counting on in ones. Their sense of number is extended by beginning at different numbers and counting forwards and backwards in steps, not only of ones, but also of twos, tens, hundreds and so on. The image of a number line helps them to appreciate the idea of counting forwards and backwards. They will also learn that, when adding two numbers together, it is generally easier to count on from the larger number rather than the smaller. Eventually 'counting-on' will be replaced by more efficient methods.

Progression:

Step 1	4 + 8 7 –3 13 + 4 15 – 3 18 – 6	count on in ones from 4 or count on in ones from 8 count back in ones from 7 count on from 13 count back in ones from 15 count back in twos
Step 2	14 + 3 27 – 4 18 – 4 30 + 3	count on in ones from 14 count on or back in ones from any two-digit number count back in twos from 18 count on in ones from 30
Step 3	40 + 30 90 – 40 35 – 15	count on in tens from 40 count back in tens from 90 or count on in tens from 40 count on in steps of 3, 4, or 5 to at least 50
Step 4	73 – 68 86 – 30 570 + 300 960 – 500	count on 2 to 70 then 3 to 73 count back in tens from 86 or count on in tens from 30 count on in hundreds from 300 count back in hundreds from 960 or count on in hundreds from 500
Step 5	1 ½ + ¾	count on in quarters
Step 6	1.7 + 0.5	count on in tenths

St Hugh's

ii) reordering

Sometimes a calculation can be more easily worked out by changing the order of the numbers. The way in which students rearrange numbers in a particular calculation will depend on which number facts they have instantly available to them.

It is important for pupils to know when numbers can be reordered (eg 2 + 5 + 8 = 8 + 2 + 5 or 15 + 8 – 5 = 15 – 5 + 8 or 23 – 9 – 3 = 23 – 3 – 9) and when they cannot (eg 8 – 5 ≠ 5 – 8).

The strategy of changing the order of numbers only really applies when the question is written down. It is difficult to reorder numbers if the question is presented orally.

Progression:

Step 1	2 + 7 = 7 + 2 5 + 13 = 13 + 5 3 + 4 + 7 = 3 + 7 + 4
Step 2	2 + 36 = 36 + 2 ('the switcher'-commutative law) 5 + 7 + 5 = 5 + 5 + 7
Step 3	23 + 54 = 54 + 23 ('the switcher'-commutative law) 12 – 7 – 2 = 12 – 2 – 7 13 + 21 + 13 = 13 + 13 + 21 (using double 13)
Step 4	6 + 13 + 4 + 3 = 6 + 4 + 13 + 3 17 + 9 – 7 = 17 – 7 + 9 28 + 75 = 75 + 28 (thinking of 28 as 25 + 3)
Step 5	3 + 8 + 7 + 6 + 2 = 3 + 7 + 8 + 2 + 6 25 + 36 + 75 = 25 + 75 + 36 58 + 47 – 38 = 58 – 38 + 47 200 + 567 = 567 + 200 1.7 + 2.8 + 0.3 = 1.7 + 0.3 + 2.8
Step 6	34 + 27 + 46 = 34 + 46 + 27 180 + 650 = 650 + 180 (thinking of 180 as 150 + 30) 4.6 + 3.8 + 2.4 = 4.6 + 2.4 + 3.8 8.7 + 5.6 – 6.7 = 8.7 – 6.7 + 5.6 4.8+ 2.5 – 1.8 = 4.8 – 1.8 + 2.5

iii) Partitioning – using multiples of 10 and 100

It is important for pupils to know that numbers can be partitioned into, for example, hundreds, tens and ones, so that 326 = 300 + 20 + 6. In this way, numbers are seen as wholes, rather than as a collection of single-digits in columns. This way of partitioning numbers can be a useful strategy for addition and subtraction. Both numbers involved can be partitioned in this way, although it is often helpful to keep the first number as it is and to partition just the second number.

Progression:

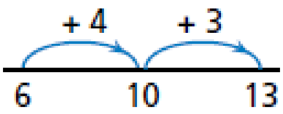
Step 1	30 + 47 78 –40 25 + 14	= 30 + 40 + 7 = 70 –40 + 8 = 20 + 5 + 10 + 4 = 20 + 10 + 5 + 4
Step 2	23 + 45 68 –32	= 40 + 5 + 20 + 3 = 40 + 20 + 5 + 3 = 60 + 8 –30 –2 = 60 – 30 + 8 – 2
Step 3	55 + 37 365 –40	= 55 + 30 + 7 = 85 + 7 = 300 + 60 + 5 –40 = 300 + 60 – 40 + 5
Step 4	43 + 28 + 51 5.6 + 3.7 4.7 –3.5	= 40 + 3 + 20 + 8 + 50 + 1 = 40 + 20 + 50 + 3 + 8 + 1 = 5.6 + 3 + 0.7 = 8.6 + 0.7 = 4.7 –3 –0.5
Step 5	540 + 280 276 –153	= 540 + 200 + 80 = 276 –100 –50 –3

iv) Partitioning – Bridging through multiples of 10

An important aspect of having an appreciation of number is to know when a number is close to 10 or a multiple of 10: to recognise, for example, that 47 is 3 away from 50, or that 96 is 4 away from 100. When adding or subtracting mentally, it is often useful to make use of the fact that one of the numbers is close to 10 or a multiple of 10 by partitioning another number to provide the difference. The use of an empty number line where the multiples of 10 are seen as ‘landmarks’ is helpful and enables pupils to have an image of jumping forwards or backwards to these ‘landmarks’.

For example,

6 + 7 = 6 + 4 + 3



Progression:

Step 1	6 + 7 = 6 + 4 + 3 23 – 9 = 23 – 3 – 6 15 + 7 = 15 + 5 + 2
Step 2	49 + 32 = 49 + 1 + 31
Step 3	57 + 14 = 57 + 3 + 11 or 57 + 13 + 1
Step 4	3.8 + 2.6 = 3.8 + 0.2 + 2.4
Step 5	296 + 134 = 296 + 4 + 130 584 – 176 = 584 – 184 + 8 0.8+ 0.35 = 0.8 + 0.2 + 0.15

v) Partitioning – Compensating (sometimes known as rounding and adjusting)

This strategy is useful for adding numbers that are close to a multiple of 10, for adding numbers that end in 1 or 2, or 8 or 9. The number to be added is rounded to a multiple of 10 plus a small number or a multiple of 10 minus a small number. For example, adding 9 is carried out by adding 10 and then subtracting 1, and subtracting 18 is carried out by subtracting 20 and adding 2. A similar strategy works for decimals, where numbers are close to whole numbers or a whole number of tenths. For example, 1.4 + 2.9 = 1.4 + 3 – 0.1 or 2.45 – 1.9 = 2.45 – 2 + 0.1

Progression:

Step 1	5 + 9 = 5 + 10 –1
Step 2	34 + 9 = 34 + 10 –1 52 + 21 = 52 + 20 + 1 70 – 9 = 70 – 10 + 1
Step 3	53 + 11 = 53 + 10 + 1 58 + 71 = 58 + 70 + 1 84 – 19 = 84 – 20 + 1
Step 4	38 + 69 = 38 + 70 – 1 53 + 29 = 53 + 30 –1 64 – 19 = 64 – 20 + 1
Step 5	138 + 69 = 138 + 70 – 1 405 – 399 = 405 – 400 + 1 2 ½ + 1¾ = 2 ½ + 2 – ¼
Step 6	5.7+ 3.9 = 5.7 + 4.0 –0.1

vi) Partitioning – Using near doubles

If children have instant recall of doubles, they can use this information when adding two numbers that are very close to each other. So, knowing that 6 + 6 = 12, they can be encouraged to use this to help them find 7 + 6, rather than use a 'counting on' strategy or 'building up to 10'. Children need to be secure in doubling and halving in order to use this near doubles strategy (see appendix 4 for support). See multiplication and division strategies (iv).

Progression:

Step 1	5 + 6	is double 5 and add 1 or double 6 and subtract 1
Step 2	13 + 14 40 + 39	is double 14 and subtract 1 or double 13 and add 1 is double 40 and subtract 1
Step 3	18 + 16 36 + 35 60 + 70	is double 18 and subtract 2 or double 16 and add 2 is double 36 and subtract 1 or double 35 and add 1 is double 60 and add 10 or double 70 and subtract 10
Step 4	38 + 35 160 + 170 380 + 380	is double 35 and add 3 is double 150 and add 10 then add 20, or double 160 and add 10, or double 170 and subtract 10 is double 400 and subtract 20 twice
Step 5	1.5 + 1.6	is double 1.5 and add 0.1 or double 1.6 and subtract 0.1
Step 6	421 + 387	is double 400 add 21 and then subtract 13

vii) Partitioning – Bridging through numbers other than 10

Time is a universal measure that is non-metric, so pupils need to learn that bridging through 10 or 100 is not always appropriate. A digital clock displaying 9.59 will, in two minutes time, read 10.01 not 9.61. When working with minutes and hours, it is necessary to bridge through 60 and with hours and days through 24. So to find the time 20 minutes after 8.50, for example, students might say 8.50 + 10 minutes takes us to 9.00, then add another 10 minutes.

Progression:

Step 1	1 week = 7 days What time will it be in one hour's time? How long is it from 2 o'clock to 6 o'clock? It is half past seven. What time was it 3 hours ago? It is 7 o'clock in the morning. How many hours to mid-day?
Step 2	1 year = 12 months 1 week = 7 days (Could extend to 2 weeks = 14 days) 1 day = 24 hours 1 hour = 60 minutes What time will it be 1 hour after 9 o'clock? 10.30 to 10.45 9.45 to 10.15
Step 3	40 minutes after 3.30 50 minutes before 1.00 pm It is 10.40. How many minutes to 11.00? It is 9.45. How many minutes to 10.00?
Step 4	It is 8.35. How many minutes to 9.15?
Step 5	It is 11.30. How many minutes to 15.40?
Step 6	It is 10.45. How many minutes to 13.20?

Teaching the 5 Multiplication and Division Strategies

i) Knowing multiplication and division facts to 12 (Use appendix 1 & 3)

Instant recall of multiplication and division facts is a key objective in developing pupil's numeracy skills. Learning these facts and being fluent at recalling them quickly is a gradual process which takes place over time and which relies on regular opportunities for practice in a variety of situations.

Progression:

Step 1	Count in twos – 2, 4, 6, 8, … to 20 Count in tens – 10, 20, 30 … to 50 Count in fives – 5, 10, 15, 20, … to 20 or more
Step 2	Count in fives – 5, 10, 15, 20, … to at least 30 Recall the 2 times table up to 2 x 10 Recall the 10 times table up to 10 x 10 Recall division facts for the 2 and 10 times tables
Step 3	Count in threes – 3, 6, 9, 12, … to 30 Count in fours – 4, 8, 12, 16, … to 40 Recall the 5 times table up to 5 x 10 Recall the corresponding division facts
Step 4	Count in sixes, sevens, eights and nines Recall the 3 times table up to 3 x 10 Recall the 4 times table up to 4 x 10 Recall the corresponding division facts
Step 5	Know the square numbers (eg 2 x 2, 3 x 3, 4 x 4, etc) up to 10 x 10 Recall the 6 times table up to 6 x 10 Recall the 8 times table up to 8 x 10 Recall the 9 times table up to 9 x 10 Recall the 7 times table up to 7 x 10 Recall the corresponding division facts (N.B – this order recognises that children can use their knowledge of the 3 and 4 tables to help them with their 6 and 8 times tables, before moving on to 9 and 7 times tables)
Step 6	Recall the 11 times table up to 11 x 10 Recall the 12 times table up to 12 x 10 Recall the corresponding division facts Know the squares of 11 and 12 (ie 11 x 11 and 12 x 12)

ii) Multiplying and dividing by multiples of 10

Being able to multiply by 10 and multiples of 10 depends on an understanding of place value and is fundamental to being able to multiply and divide larger numbers.

Progression:

Step 1	7 x 10 60 ÷ 10
Step 2	6 x 100 26 x 10 700 ÷ 100
Step 3	4 x 60 (Appendix 2 will support) 3 x 80 351 x 10 79 x 100 976 x 10 580 ÷ 10
Step 4	9357 x 100 9900 ÷ 10 737 ÷ 10 2060 ÷ 100
Step 5	23 x 50 637.6 x 10 135.4 ÷ 100

iii) Multiplying and dividing by single digit numbers and multiplying by two digit numbers

Progression:

Step 1	9 x 2 5 x 4 18 ÷ 2 16 ÷ 4
Step 2	7 x 3 4 x 8 35 ÷ 5 24 ÷ 3 23 x 2 46 ÷ 2
Step 3	13 x 9 32 x 3 36 ÷ 4 93 ÷ 3
Step 4	428 x 2 154 ÷ 2 47 x 5 3.1 x 7
Step 5	13 x 50 14 x 15 153 ÷ 51 8.6 x 6 2.9 x 9 45.9 ÷ 9

iv) Doubling and halving

The ability to double numbers (seek appendix 4 for support) is a fundamental tool for multiplication. Historically, all multiplication was calculated by a process of doubling and adding. Most people find doubles the easiest multiplication facts to remember, and they can be used to simplify other calculations. Sometimes it can be helpful to halve one of the numbers in a product and double the other.

Progression:

Step 1	7 + 7 is double 7
Step 2	7 + 7 = 7 x 2 Half of 14 is 7 Half of 30 is 15
Step 3	18 + 18 is double 18 Half of 18 is 9 60 x 2 is double 60 Half of 120 is 60 Half of 900 is 450 Half of 36 is 18
Step 4	14 x 5 = 14 x 10 ÷ 2 12 x 20 = 12 x 2 x 10 60 x 4 = 60 x 2 x 2
Step 5	36 x 50 = 36 x 100 ÷ 2 Half of 960 = 480 Quarter of 64 = Half of half of 64 15 x 6 = 30 x 3
Step 6	34 x 4 = 34 x 2 x 2 26 x 8 = 26 x 2 x 2 x 2 20% of £15 = 10% of £15 x 2 36 x 25 = 36 x 100 ÷ 4 = (36 ÷ 4) x 100 1.6÷ 2 = 0.8

v) Fractions, decimals and percentages

Children need an understanding of how fractions, decimals and percentages relate to each other. For example, if they know that 1/2 , 0.5 and 50% are all ways of representing the same part of a whole, then the calculations

½ x 40
40 x 0.5
50% of £40 can be seen as different versions of the same calculation.

Sometimes it might be easier to work with fractions, sometimes with decimals and sometimes with percentages. There are strong links between this section and the earlier section 'Multiplying and dividing by multiples of 10'.

Progression:

Step 1	Find half of 8 Find half of 30
Step 2	Find one third of 18 Find one tenth of 20 Find one fifth of 15
Step 3	Find half of 9, giving the answer as 4 ½ Know that 0.7 is 7/10 Know that 0.5 is ½ Know that 6.25 is 6 /4 Find 1/2 of 36 Find 1/2 of 150 Find 1/2 of £21.60
Step 4	Know that 27/100 = 0.27 Know that 75/100 is 3/4 or 0.75 Know that 3 hundredths is 3/100 or 0.03 Find 1 /7 of 35 Find 1/2 of 920 Find 1/2 of £71.30 Know that 10% = 0.1 = 1/10 Know 25% = 0.25 = 1/4 Find 25% of £100 Find 70% of 100cm
Step 5	Know that 0.007 is 7/1000 Know that 0.27 is 27/100 0.1 x 26 0.01 x 17 7 x 8.6 Know that 43% is 0.43 or 43/100 Find 25% of £360 Find 17 ½ % of £5250

Rapid recall facts

Children should be able to rapidly recall the following:

Step 1	all pairs of numbers with a total of 10, eg 3 + 7; addition and subtraction facts for all numbers to at least 5; addition doubles of all numbers to at least 5, eg 4 + 4.
Step 2	addition and subtraction facts for all numbers to at least 10; all pairs of numbers with a total of 20, eg 13 + 7; all pairs of multiples of 10 with a total of 100, eg 30 + 70; multiplication facts for the 2 and 10 times-tables and corresponding division facts; doubles of all numbers to ten and the corresponding halves; multiplication facts up to 5 x 5, eg 4 x 3.
Step 3	addition and subtraction facts for all numbers to 20; all pairs of multiples of 100 with a total of 1000; all pairs of multiples of 5 with a total of 100; multiplication facts for the 2, 5 and 10 times-tables and corresponding division facts.
Step 4	multiplication facts for 2, 3, 4, 5 and 10 times-tables; division facts corresponding to tables of 2, 3, 4, 5 and 10.
Step 5	multiplication facts to 12 x 12; division facts corresponding to tables up to 12 x 12.
Step 6	squares of all integers from 1 to 12.

There are 25 essential addition recall facts. From knowledge of these facts, children can be taught to work out a wide range of other number facts. For example through use of '3 for free' and place value.

Step 1	Facts of all numbers up to 5	2	1 + 1
		3	2 + 1
		4	3 + 1 2 + 2
		5	4 + 1 3 + 2
Step 2	All pairs of numbers totalling 10		9 +1 8 + 2 7 + 3 6 + 4 5 + 5
Step 3	All facts to 10	6	5 + 1 4 + 2 3 + 3
		7	6 + 1 5 + 2 4 + 3
		8	7 + 1 6 + 2 5 + 3 4 + 4
		9	8 + 1 7 + 2 6 + 3 5 + 5

The ability to recall and use times tables is also vital. However it can be a daunting task. This system is intended to simplify the process and break it into more progressive and manageable steps. It is called the Bronze, Silver, Gold and Platinum approach. Time on a weekly basis should be provided for students to practise. (Appendix 3 displayed on class working wall to be accessed by a QR code reader will support learning, along with use of fact family triangles) Practise as a home-study task should also be regularly encouraged. Achievement of bronze, silver, gold or platinum should be recorded on the student's target sheet in the front of their book.

Bronze	To be able to count forwards and backwards in a times table. e.g. 0, 5, 10, 15 …. 30, 27, 24, 21 …. 18, 24, 30, 36 ….	In counting forwards and backwards it is important to start and stop at numbers other than 0. E.g. start counting in 3s from 18 and stop at 27. Likewise, although not part of times tables, it's important that children count forwards and back in steps of 3, 4 etc. on numbers that are not multiples, e.g. count back in 3s starting on 23.
Silver	To know by heart and be able to recall multiplication facts. Step 1: Counting in 10s, 5s and 2s Step 2: x 10, x5, x2 Step 3: x 3, x4, x9 Step 4: x6, x7, x8 Step 5: x11, x12	The use of inverses and doubling/halving are very effective ways of reducing the number of facts needed to learn by heart. For example the '3 for free' approach tells us that if we know 1 fact e.g. 5 x 4 = 20, then we also know 3 other facts, 4 x 5 = 20, 20 ÷ 4 = 5, and 20 ÷ 5 = 4.
Gold	To be able to derive and recall division facts. e.g. How many 4s in 24? How many 9s in 63? (Where's Mully?'-see appendix 5)	
Platinum	To be able to use times tables to calculate other facts. e.g. if it is known that 3 x 5 = 15, there must be an ability to also know that 3 x 50 = 150, 3 x 0.5 = 1.5 etc.	Once the gold has been achieved, this needs to continue to be practiced in subsequent years and extended to platinum. The platinum level is the ability to use and apply this knowledge. e.g. if you know 6 x 7 = 42, then you can also work out many other facts using knowledge of place value.

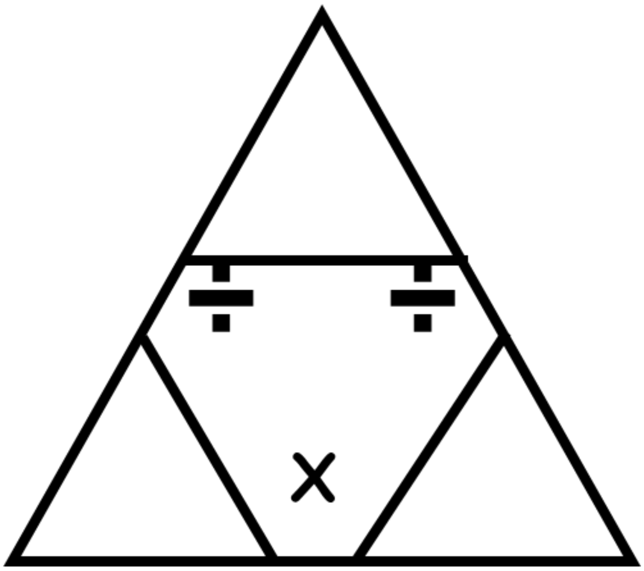
Review

This policy is monitored by the maths subject leader and the Senior Leadership Team through:

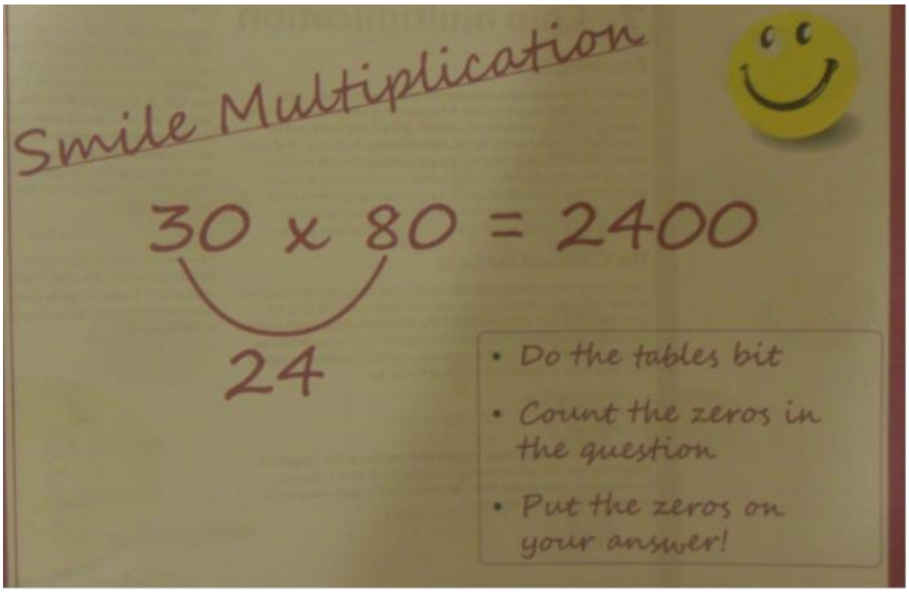
- Regular scrutiny of student's books
- Regular monitoring of teaching plans
- Evaluation and review of assessment data
- Lesson observations to monitor the quality of teaching and implementation of teaching plans
- Pupil interviews

This policy is reviewed by staff and governors at least once every two years, and reviewed whenever Government policy changes. The next review is due May 2015. Parents are most welcome to request copies of this document and comments are invited from anyone involved in the life of the school.

Appendix 1 (Fact family triangles)

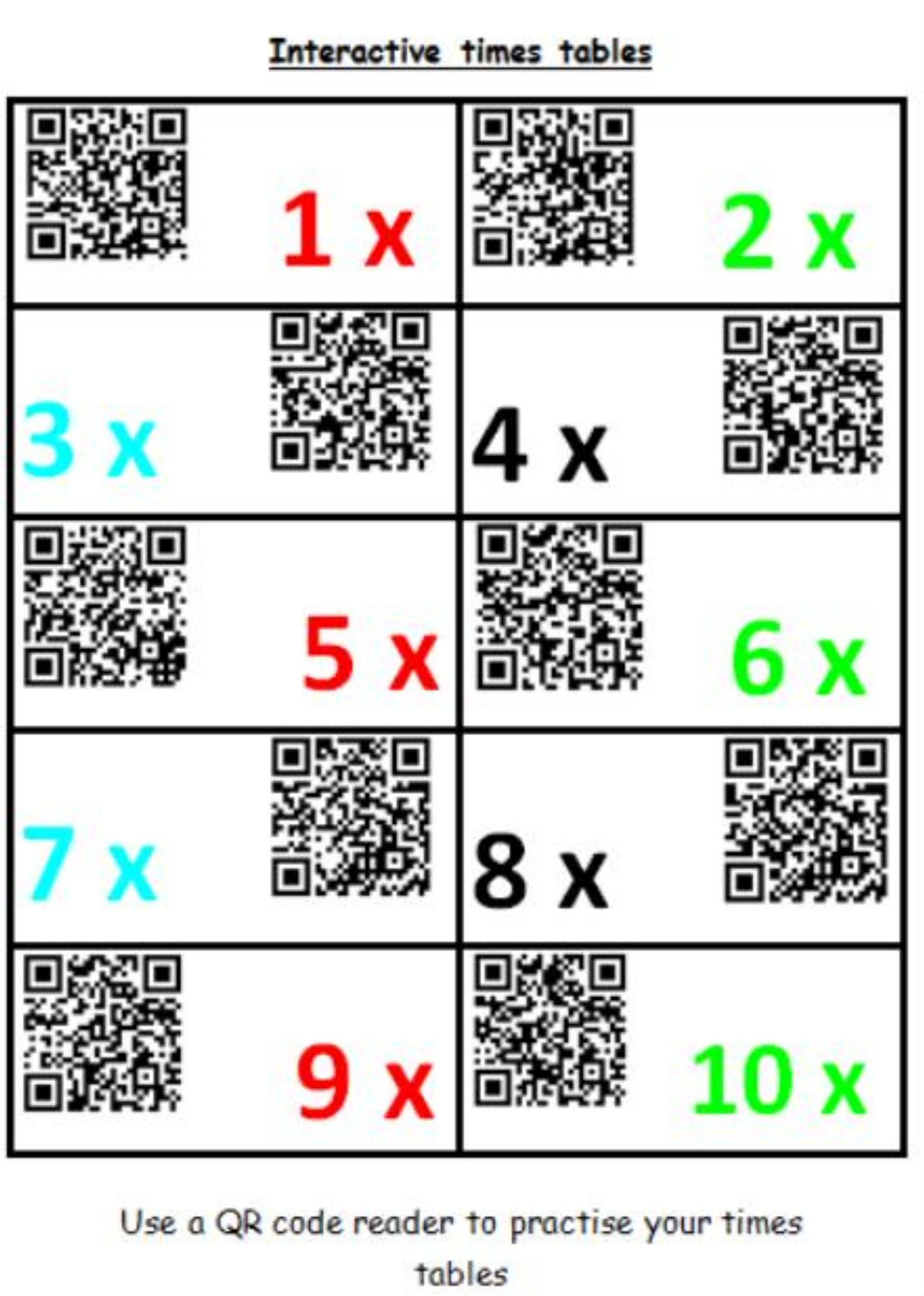


Appendix 2



Smile Multiplication
30 x 80 = 2400
24
• Do the tables bit
• Count the zeros in the question
• Put the zeros on your answer!

Appendix 3



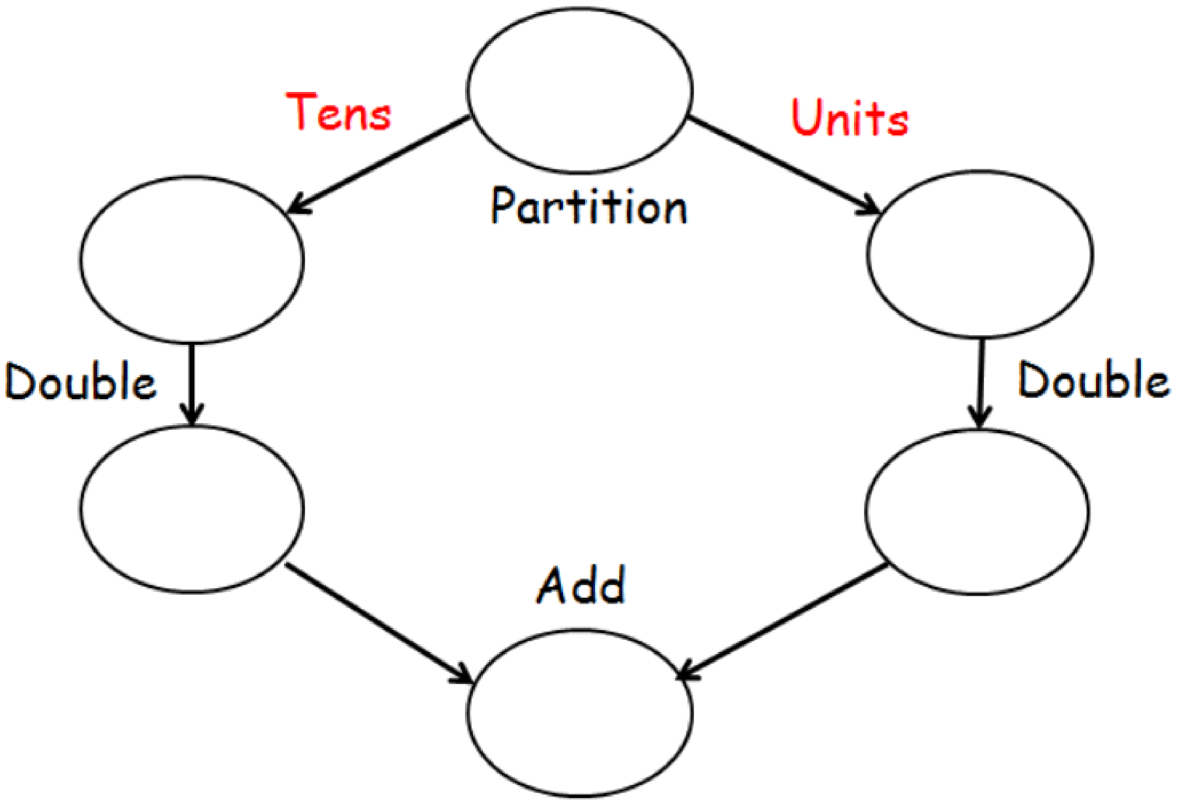
Interactive times tables

1 x	2 x
3 x	4 x
5 x	6 x
7 x	8 x
9 x	10 x

Use a QR code reader to practise your times tables

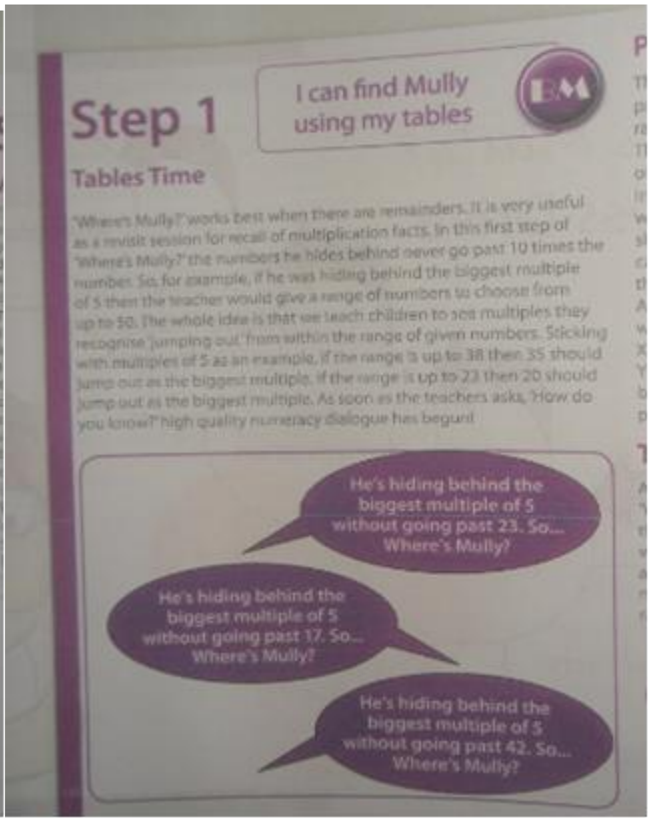
Appendix 4

Doubling 2 digit numbers



Appendix 5


Where's Mully?
Big Maths
?
He's hiding behind the biggest multiple of...
...without going past...


Step 1
I can find Mully using my tables
BM
Tables Time
'Where's Mully?' works best when there are remainders. It is very useful as a revisit session for recall of multiplication facts. In this first step of 'Where's Mully?' the numbers he hides behind never go past 10 times the number. So, for example, if he was hiding behind the biggest multiple of 5 then the teacher would give a range of numbers to choose from up to 50. The whole idea is that we teach children to see multiples they recognise 'jumping out' from within the range of given numbers. Sticking with multiples of 5 as an example, if the range is up to 38 then 35 should jump out as the biggest multiple. If the range is up to 23 then 20 should jump out as the biggest multiple. As soon as the teachers asks, 'How do you know?' high quality numeracy dialogue has begun!
He's hiding behind the biggest multiple of 5 without going past 23. So... Where's Mully?
He's hiding behind the biggest multiple of 5 without going past 17. So... Where's Mully?
He's hiding behind the biggest multiple of 5 without going past 42. So... Where's Mully?