SPMS Calculation Policy

Objective

The calculation policy is intended to ensure a consistent approach when teaching all children and eliminate any confusion that the children may experience if they are taught differing methods. This consistency is essential as the children progress with their learning and will also allow for the smooth movement of pupils between teaching groups within a year and between years. It is also designed to aid all members of staff with progression. The policy has drawn upon all best practices from the PNS and advice from RBWM advisors.

Scope

Although children do not enter SPMS until Year 5, the calculation policy looks at all aspects of progression within the key calculation areas (the 4 operations) as SPMS acknowledge the wide range of ability of children when they enter SPMS and throughout their time at SPMS. (NB: The word calculation should be used at all times – not SUM as this word applies to addition only)

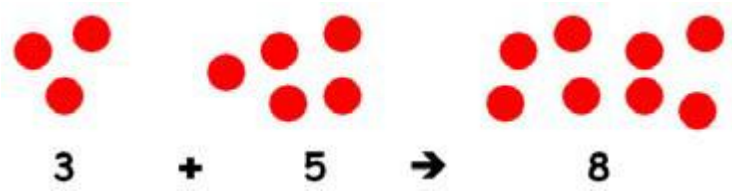
Written methods of calculation are based on mental strategies. Each of the four operations builds on mental skills which provide the foundation for jottings and informal written methods of recording. Skills need to be taught, practised and reviewed constantly. These skills lead on to more formal written methods of calculation.

Strategies for calculations need to be continually supported by familiar models and images to reinforce understanding in the context of real life situations. When teaching a new strategy it is important to start with numbers that the pupil can easily manipulate so that they can understand the concept. The transition between methods should not be hurried as not all children will be ready to move on to the next method at the same time. Previous methods may need to be revisited to consolidate understanding when introducing a new strategy.

Addition

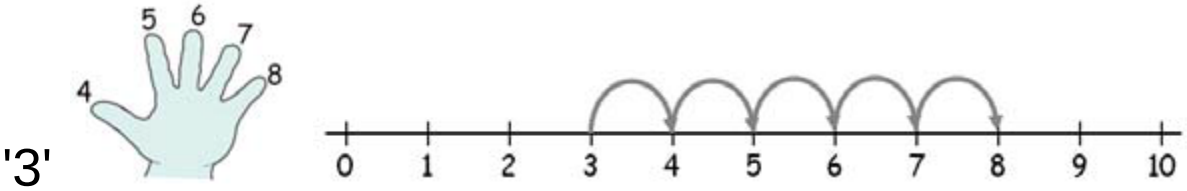
Count all

3 + 5 count out three counters and then five counters and then find the total by counting all the counters



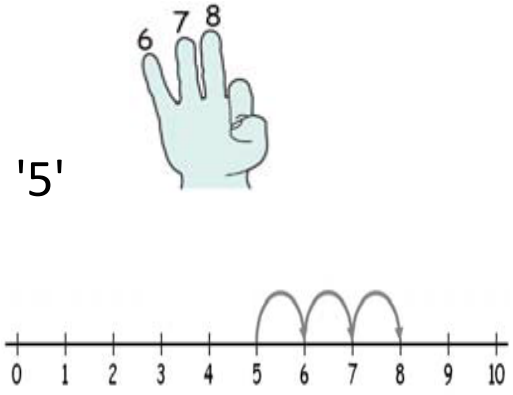
Count on from the first number

3 + 5 count on from the first number: *'four, five, six, seven, eight'*.



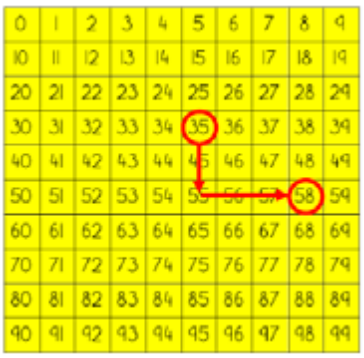
Count on from the larger number

3 + 5



Count on from the larger number

35 + 23



Count on 2 tens, then 3 ones

Partitioning

35 + 23 =

35 + 23

= 30 + 5 + 20 + 3

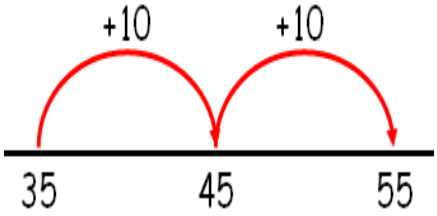
= 30 + 20 + 5 + 3

= 50 + 8

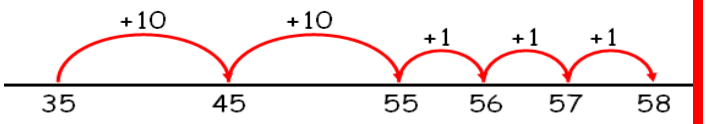
= 58

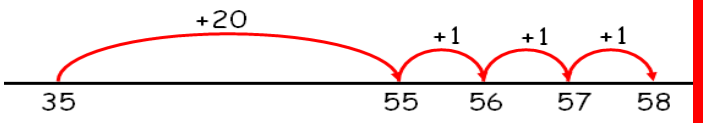
Counting on - number line

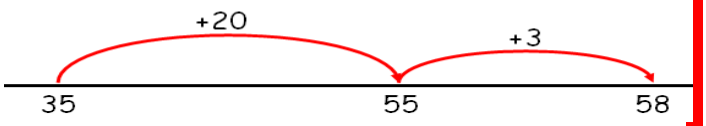
35 + 20 =



35 + 23 =







Number lines are also an excellent resource for negative number work and can use vertical number lines - thermometer

Expanded Addition

Add the most significant digits first

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

Add the least significant digits first

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

Compact Addition

$$\begin{array}{r} 3587 \\ +\ 675 \\ \hline 4262 \\ \hline 111 \end{array}$$

$$\begin{array}{r} 6584 \\ +\ 5848 \\ \hline 12432 \\ \hline 111 \end{array}$$

$$\begin{array}{r} 3.68 \\ +\ 4.23 \\ \hline 7.91 \\ \hline 1 \end{array}$$

Square for each digit and the decimal point

Decimal points line up in calculation and answer

'Carries' written under the line

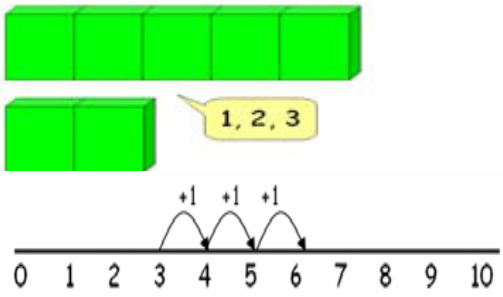
Subtraction

Counting Back (take away reduction)

4 less than 10

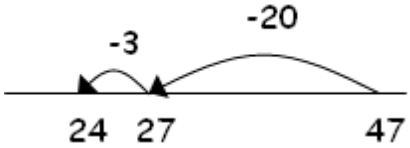
Counting On (difference)

'the difference between 3 and 6'

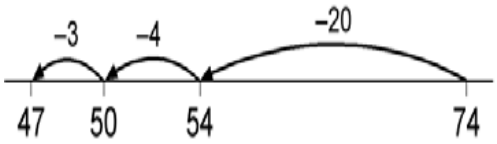


Counting Back

47 – 23

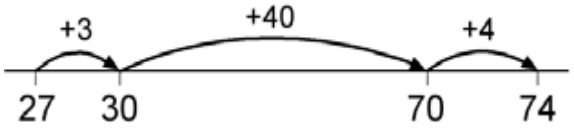


74 – 27

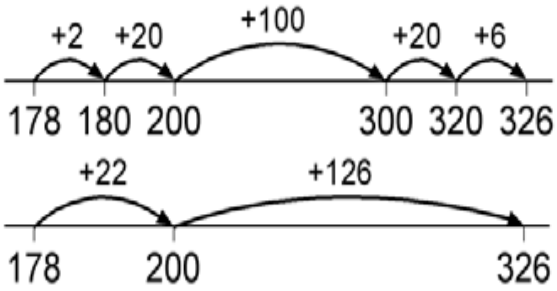


Counting On

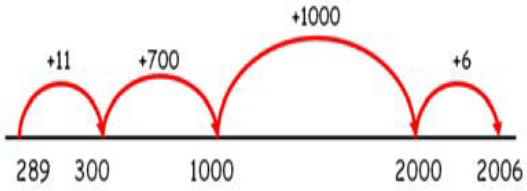
74 – 27



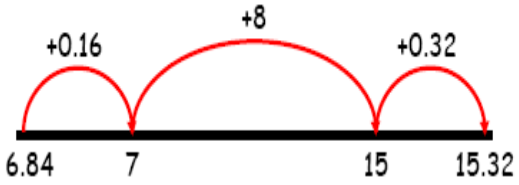
326 – 178



2006 – 289



15.32 - 6.84



Partitioning

58 – 23

= 58 – 20 – 3

= 38 – 3

= 35

74 – 27

= 74 – 20 – 7

= 54 – 7

= 47

Expanded Method

47 – 23

$$\begin{array}{r} 40 + 7 \\ -\ 20 + 3 \\ \hline 20 + 4 \end{array} = 24$$

81 – 57

$$\begin{array}{r} \overset{70}{\cancel{80}} + \overset{11}{1} \\ -\ 50 + 7 \\ \hline 20 + 4 \end{array} = 24$$

Compact Method

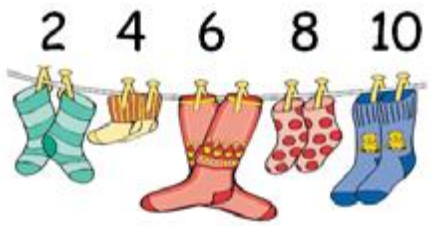
563 - 248

$$\begin{array}{r} \overset{50}{\cancel{60}} \quad \overset{13}{3} \\ 500 + \cancel{60} + \cancel{3} \\ -\ 200 + 40 + 8 \\ \hline 300 + 10 + 5 \end{array} = 315 \qquad \begin{array}{r} \overset{5}{\cancel{6}} \quad \overset{13}{\cancel{3}} \\ 5\ \cancel{6}\ \cancel{3} \\ -\ 2\ 4\ 8 \\ \hline 3\ 1\ 5 \end{array}$$

Exchange is the principal used. In the example above, one ‘ten’ is exchanged for ten ‘ones’

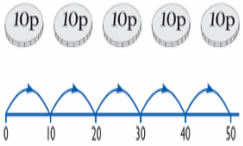
Multiplication

Counting in equal steps
(2s, 3s, 4s, 5s & 10s)



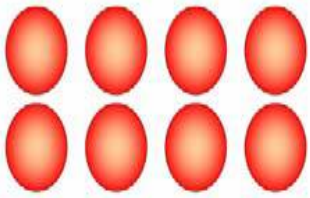
Repeated addition

2 + 2 + 2 + 2 + 2 = 10
2 x 5 = 10
2 multiplied by 5
5 pairs



10p + 10p + 10p + 10p + 10p = 50p
10p x 5 = 50p
5 jumps of 10

Describing an array



4 x 2 = 8

2 x 4 = 8

Partitioning

43 x 6 =

43

40 + 3

x6

240 + 18 = 258

40 x 6 = 240
3 x 6 = 18
240 + 18 = 258

Multiply by 10/100 etc

36 x 10

Digits move 1 place to the left and zero is used as a place holder

H T U
3 6 x 10

H T U
3 6 0

Grid Method

When children are confident at partitioning numbers into tens and units, they can progress to the grid method. As they become proficient with the grid method, they will be able to use it to complete calculations with larger numbers and decimals.

When teaching this method ensure that pupils understand, for example, 30 x 7

3 x 7 = 21 The question is 10 times bigger as 30 is 10 times bigger than 3 so multiply the answer by 10 **NOT JUST ADD ZERO OR DROP A ZERO DOWN**

38 x 7 =

x	30	8
7	2 1 0	5 6

284 x 3 =

x	200	80	4
3	600	240	12

NB: This method can also be used in KS3 algebra for multiplying out brackets

'Column' Method

Only when pupils are comfortable with this method, are able to use it efficiently in a range of contexts can they be introduced to alternative, more traditional methods and be shown how they relate to methods previously taught. As with every calculation, they should then be encouraged to select the most accurate, reliable and efficient method available to them for the problem faced.

Short Multiplication

38 x 7

38
x 7
56
210
266

Long Multiplication

56 x 27

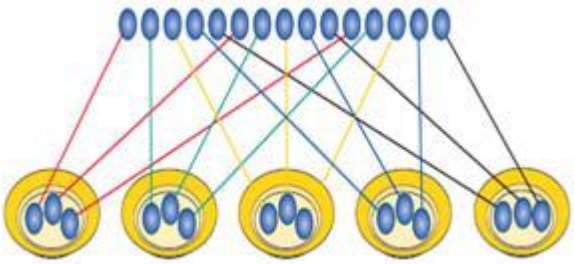
56
x 27
392 **56 x 7**
1120 **56 x 20**
1512
1

'Carries' below the line

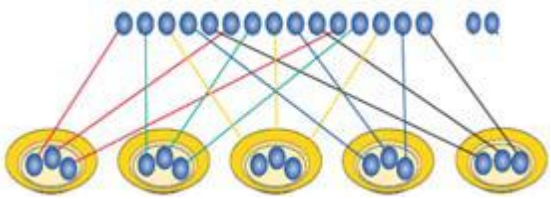
Division

Sharing

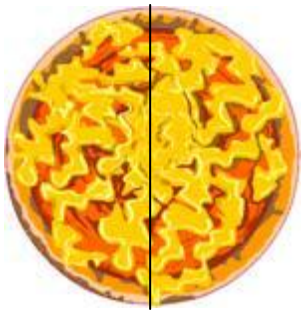
15 marbles are shared out equally among 5 children



17 ÷ 5 =

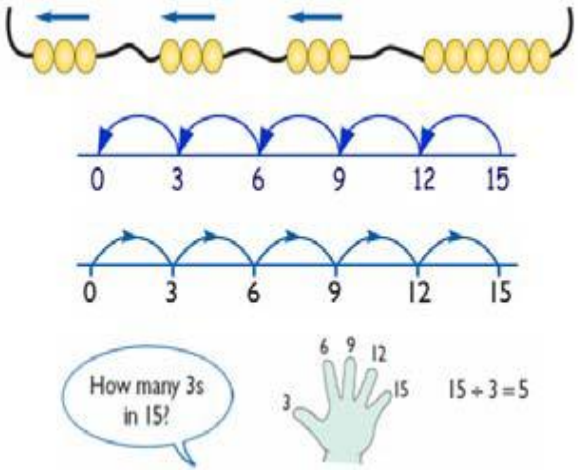


Cut the pizza in half. How many pieces are there?

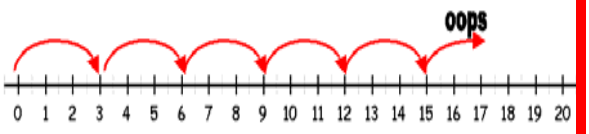


Grouping

15 marbles put into groups of 3

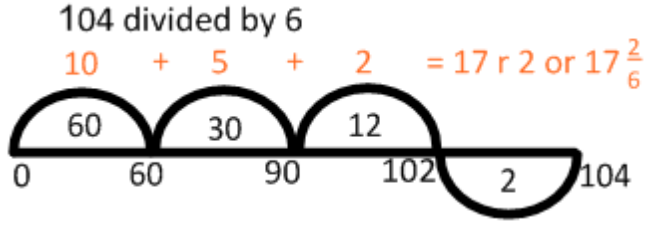


17 ÷ 3 =



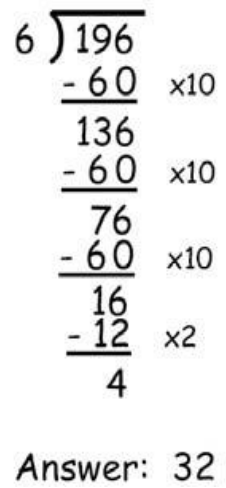
GROUPING/DIVIDING ON A NUMBER LINE

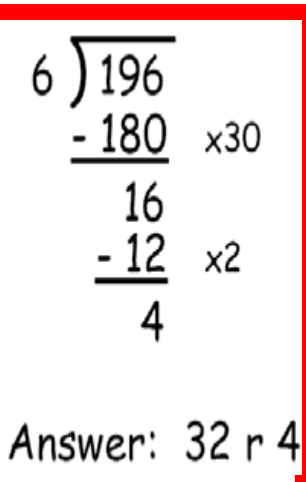
Remainders are shown as a jump under the line

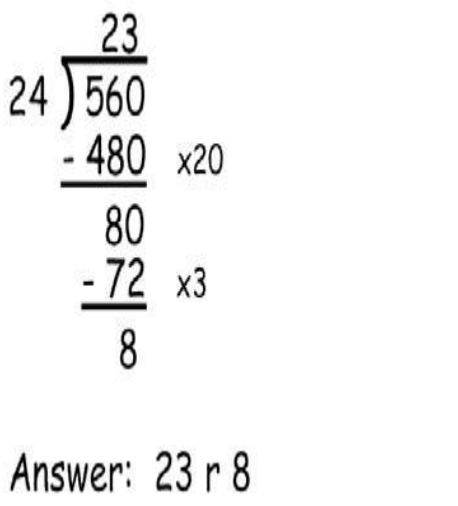


Children will calculate multiples of 10, 5, 2 and 1 before starting to count the number of jumps. When children are confident with this method, they will progress to the next stage where groups (chunks) to be subtracted will be shown vertically. As understanding develops, the size of each chunk they subtract will increase, as shown below.

CHUNKING







Leave remainders as whole numbers until children have secured fractions and decimals.

With decimals, for example, 234.5 divided by 7, the process is the same but ensure that the decimal point is placed in the calculation when it is written down. The most common use of this is in relation to questions about money. Like the other operations, it is essential to relate division to real life situations.

This is very important when looking at 'remainders in context' – whether to round up or down. Children need a lot of exposure to word problems to understand this concept.

For example, I have 57 children that I need to transport. The mini bus holds 10. How many trips?

I have 57 children. How many 10 a side football teams can I make?

'SHORT DIVISION'

212 r 2
3√638

This method should only be used when pupils fully understand place value and the value of the numbers involved. EG – in the example above, 600 ÷ 3 = 200

Divide by 10/100 etc

36 x 10

Digits move 1 place to the right and zero is used as a place holder

H T U
4 3 0 ÷ 10

H T U
4 3