VHPS Calculation Policy – Summer 2019

ADDITION: Key language: sum, total, parts and wholes, plus, add, altogether, more, 'is equal to' 'is the same as

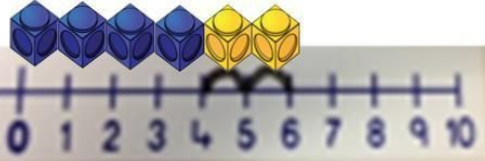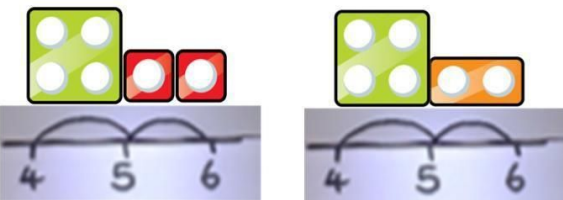| Concrete	Pictorial	Abstract
Combining two parts to make a whole (use other resources too e.g. eggs, shells, teddy bears, cars).	Children to represent the cubes using dots or crosses. They could put each part on a part whole model too.	$4 + 3 = 7$ Four is a part, 3 is a part and the whole is seven.
Counting on using number lines using cubes or Numicon.	A number line which encourages the children to count on, rather than count all.	The abstract number line: What is 2 more than 4? What is the sum of 2 and 4? What is the total of 4 and 2? $4 + 2$

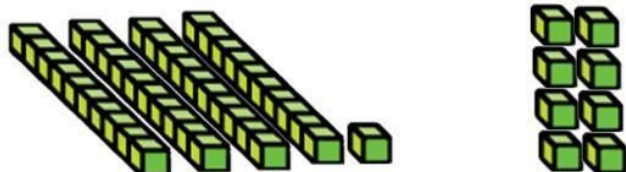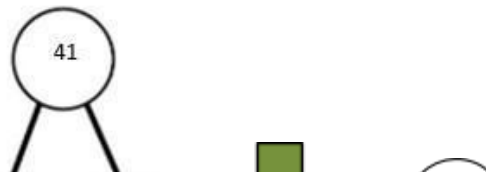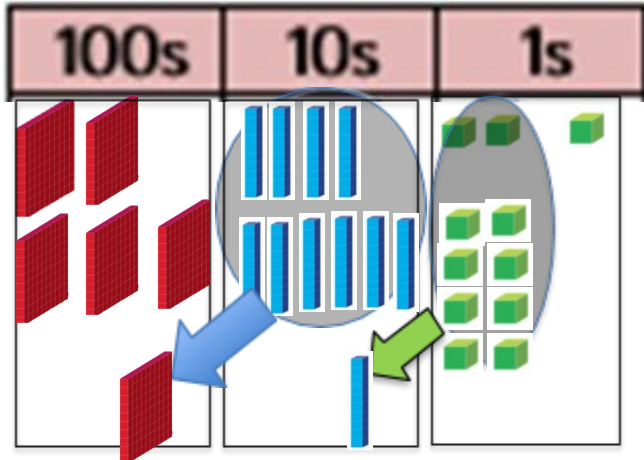|		
Regrouping to make 10; using ten frames and counters/cubes or using Numicon. 6 + 5	Children to draw the ten frame and counters/cubes. 	Children to develop an understanding of equality e.g. $6 + \square = 11$ $6 + 5 = 5 + \square$ $6 + 5 = \square + 4$
TO + O using base 10. Continue to develop understanding of partitioning and place value. 41 + 8 	Children to partition into tens and ones. 41 + 8 	41 + 8 $1 + 8 = 9$ $40 + 9 = 49$
TO + TO using base 10. Continue to develop understanding of partitioning and place value. 36 + 25 	Children to partition into tens and ones. 36 + 25 	Using the formal method. 36 + 25 36

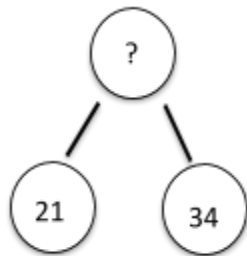| Use of place value counters to add HTO + TO, HTO + HTO etc. When there are 10 ones in the 1s column, exchange for 1 ten, when there are 10 tens in the 10s column- exchange for 1 hundred. (243 + 368)	Children to partition into hundreds, tens and ones. (243 + 368)	Formal method: (243 + 368)

Conceptual Variation; different ways to solve TO + TO

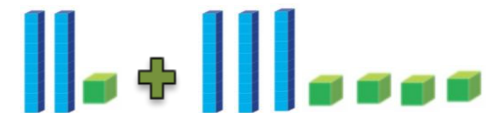|	Word problems (21+34)	21 +34	
	In year 3, there are 21 children, and in year 4, there are 34 children. How many children are there in total?	⬜ = 21 + 34	Missing digit problems
	21 + 34 = 55. Prove it.	Calculate the sum of twenty-one and thirty-four.	21 +3⬜ ⬜5
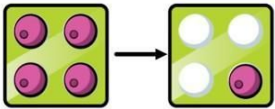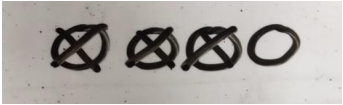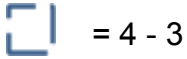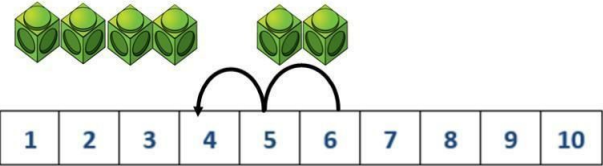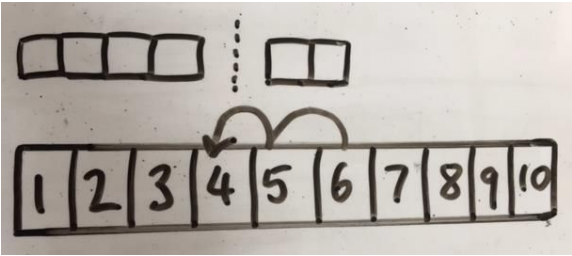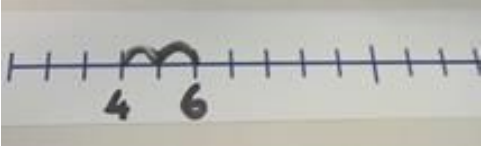
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SUBTRACTION: Take away, less than, the difference, subtract, minus, fewer, decrease

Concrete	Pictorial	Abstract
Physically taking away and removing objects from a whole (Numicon, cubes and other items such as beanbags could be used). 4 – 3 = 1 	Children to draw the concrete resources they are using and cross out the correct amount. 	4 – 3 = ☐☐ = 4 - 3
Counting back (using number lines or number tracks) children start with 6 and count back 2. 6 – 2 = 4 	Children to represent what they see pictorially e.g. Cubes can also be used.	Children to represent the calculation on a number line or number track and show their jumps. Encourage children to use an empty number line

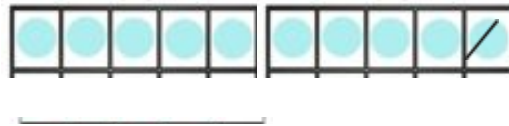|		
Finding the difference (using cubes, Numicon or Cuisenaire rods, other objects can also be used). Calculate the difference between 8 and 5. 	Children to draw the cubes/other concrete objects which they have used or use the bar model to illustrate what they need to calculate. ?	Find the difference between 8 and 5. 8 – 5, the difference is ☐ Children to explore why 9 - 6 = 8 – 5 = 7 – 4 have the same difference.
Making 10 using ten frames (and/or dienes) 14 –5	Children to present the ten frame pictorially (and or dienes) and discuss what they did to make 10. 	Children to show how they can make 10 by partitioning the subtrahend. 14 - 5 = 9 4 ∕ ＼ 1 14 – 4 = 10 10 – 1 = 9
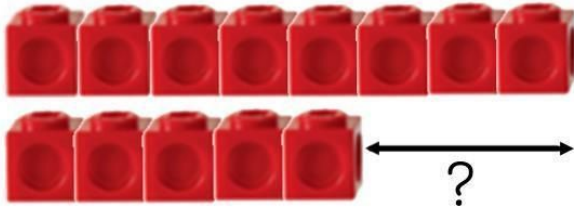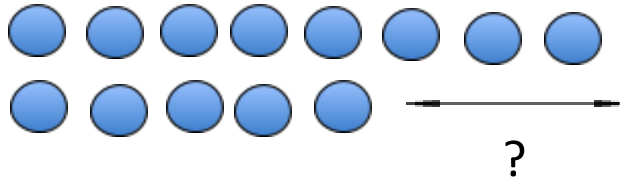
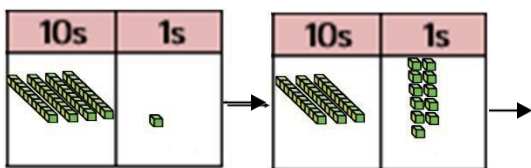| **Column method** using base 10. 48-7	Children to represent the base 10 pictorially.	Column method or children could count back 7.

Column method using base 10 and having to exchange. 41 – 26	Represent the base 10 pictorially, remembering to show the exchange.	Formal column method. Children must understand that when they have exchanged the 10 they still have 41 because 41 = 30 + 11.
	T / **O** 30/40 / 10 + 1 20 / 6	
Column method using dienes. 234 – 88	Represent the place value counters pictorially; remembering to show what has been exchanged.	Formal colum method. Children must understand what has happened when they have crossed out digits. 2 1
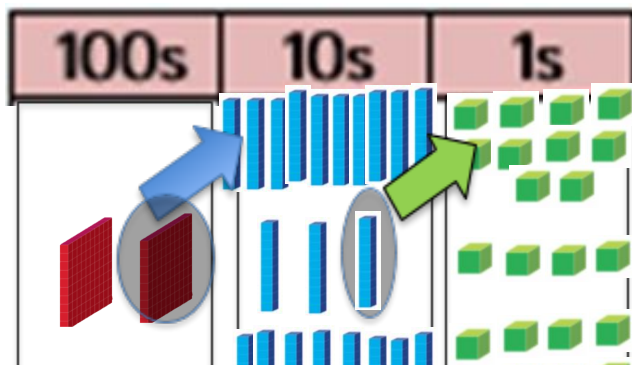
H	T	O
100 200	10 + 30 20	10 + 4
	80	8

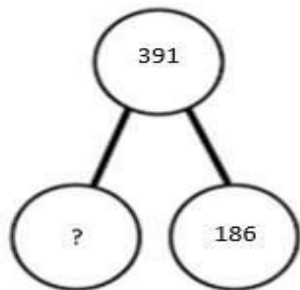# Conceptual Variation; different ways to ask children to solve 391-186

391

?   186

Raj spent £391, Timmy spent £186. How much more did Raj spend?

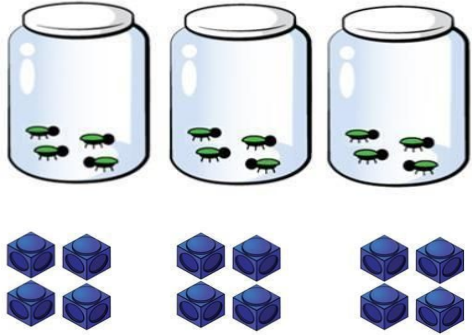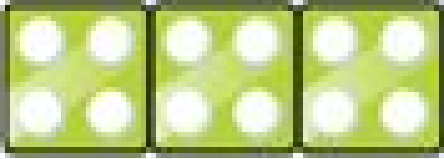Calculate the difference between 391 and 186.

☐ = 391 – 186

$$391$$
$$-186$$
____
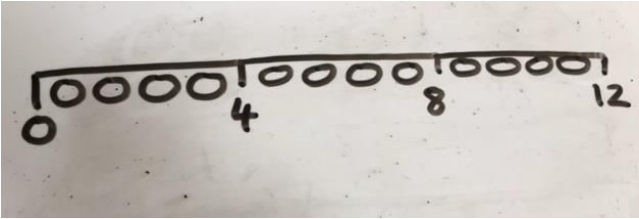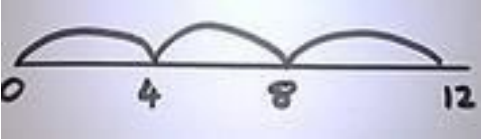
What is 186 less than 391?

Missing digit calculations

      3 9 ☐
-    ☐ ☐ 6
_____
   ☐ 0 5

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MULTIPLICATION: double, times, multiplied by, the product of, groups of, lots of equal groups.

Concrete	Pictorial	Abstract
Repeated grouping/repeated addition 3 × 4 4 + 4 + 4 There are 3 equal groups, with 4 in each group. 	Children to represent the practical resources in a picture. 	3 × 4 = 12 4 + 4 + 4 = 12
Number lines to show repeated groups- 3 × 4 	Represent this pictorially alongside a number line e.g.: 	Abstract number line showing three jumps of four. 3 × 4 = 12

Use arrays to illustrate commutativity counters and other objects can also be used. $2 \times 5 = 5 \times 2$ 2 lots of 5 5 lots of 2	Children to represent the arrays pictorially (e.g. theatre rows).	Children to be able to use an array to write a range of calculations e.g. $10 = 2 \times 5$ $5 \times 2 = 10$ $2 + 2 + 2 + 2 + 2 = 10$ $10 = 5 + 5$
Partition to multiply using base 10 (dienes) 15×4	Children to represent the concrete manipulatives pictorially.	Children to be encouraged to show the steps they have taken.

X	10	5
4	40	20

Then, $40 + 20 = 60$

Formal column method

go straight from grid method to column method 3×23 and 23×6

Children may need to record what it is they are doing to show understanding.

3×23 $3 \times 20 = 60$
$3 \times 3 = 9$
20   3 $60 + 9 = 69$

$$\begin{array}{r} 23 \\ \times\ \ 3 \\ \hline 69 \end{array}$$

$$\begin{array}{r} 23 \\ \times\ \ 6 \\ \hline 138 \\ \scriptstyle 1\ 1 \end{array}$$

When children start to multiply 3d × 3d and 4d × 2d etc., they should be confident with the abstract:

To get 744 children have solved 6 × 124.
To get 2480 they have solved 20 × 124.

```
      1 2 4
  ×     2 6
  ─────────
    . 7 4 4
      1   2
  2 ‾4 8 0
  ─────────
  3 2 2 4
  1   1
```

Answer: 3224

Conceptual Variation; different ways to solve 6 x 23

Mai had to swim 23 lengths, 6 times a week.
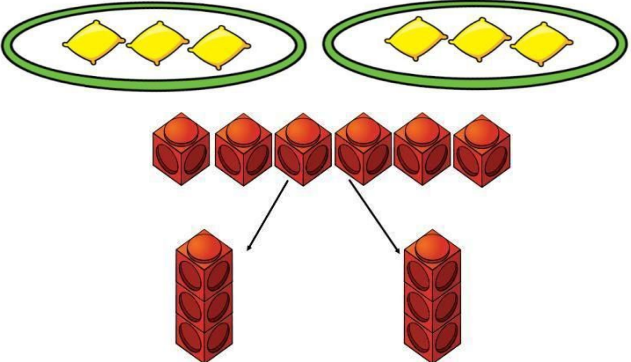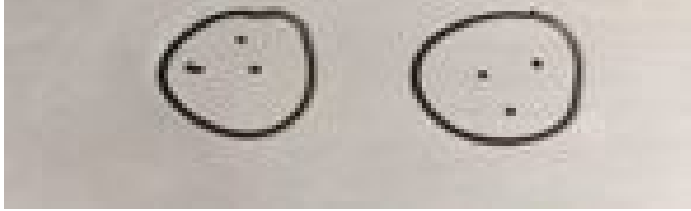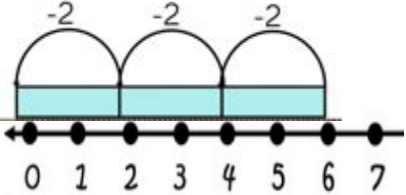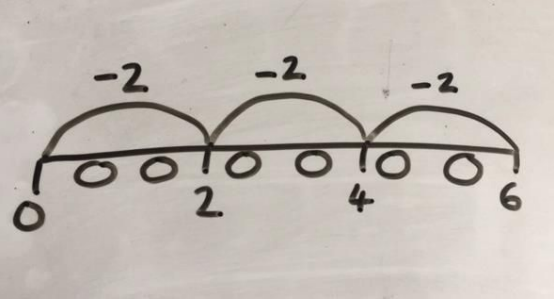How many lengths did she swim in one week?
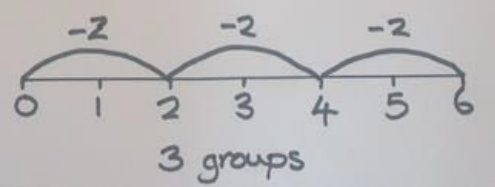
Find the product of 6 and 23 6 × 23 =

= 6 × 23

```
    6          23
×  23        ×  6
───          ───
```

VHPS Calculation Policy – Summer 2019

DIVISION: Share, group, divide, divided by, half.

Concrete	Pictorial	Abstract
Sharing using a range of objects. 6 ÷ 2	Represent the sharing pictorially.	6 ÷ 2 = 3 Children should also be encouraged to use their 2 times tables facts.
Repeated subtraction using number line above a ruler. 6 ÷ 2	Children to represent repeated subtraction pictorially.	Abstract number line to represent the equal groups that have been subtracted.

2d ÷ 1d with remainders using sharing. 13 ÷ 3 	Children to represent the sharing pictorially. There are 3 groups, with 1 left over.	13 ÷ 4 – 3 remainder 1 Children should be encouraged to use their times table facts; they could also represent repeated addition on a number line. '3 groups of 4, with 1 left over'
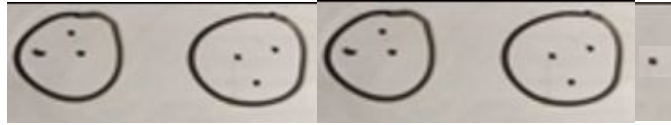
Division using chunking method
 	
42 ÷ 3
		Children need to be able to use chunking method to make sense of place value when sharing.
		
		<pre> 1 4 3 x 10
		3 │ 4 2
		- 3 0
		    1 2
		- 1 2
		       0</pre>
		14

Short division 615 ÷ 5		Children calculate using the short division scaffold.

Long division

615 ÷ **5**

$$
\begin{array}{r}
0\,2\,. \\
12\,\overline{)2544} \\
24 \\
\hline
1
\end{array}
$$

$$
\begin{array}{r}
0\,2\,1 \\
12\,\overline{)2544} \\
24 \\
\hline
14 \\
12 \\
\hline
2
\end{array}
$$

$$
\begin{array}{r}
0\,2\,1\,2 \\
12\,\overline{)2544} \\
24 \\
\hline
\end{array}
$$

After exchanging the 2 tens, we have 24 ones. We can group 24 ones into 2 group of 12, which leaves no remainder.

```
        0 2 1 2
12 | 2544
       24
       14
       12
       24
       24
        0
```

I have £615 and share it equally between 5 bank accounts. How much will be in each account?

615 pupils need to be put into 5 groups. How many will be in each group?

```
5 | 615
```

$615 \div 5 =$

$\lceil\ \rceil 15 \div 5$