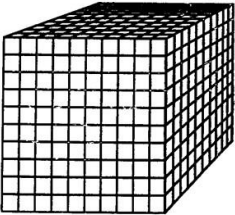
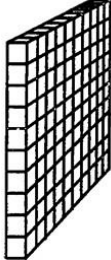




Written Methods Calculation Policy

<u>Thousands</u>	<u>Hundreds</u>	<u>Tens</u>	<u>Ones</u>	.	<u>Tenths</u>	<u>Hundredths</u>	<u>Thousandths</u>
1000s	100s	10s	1s	.	1/10s	1/100s	1/1000s
				.			

Number Lines: regardless of which operation is being used, smallest & largest numbers must be at the 'correct' end (place value needed so children know which is the smallest & largest number).

Smallest
Number

Largest
Number

Formal Written Methods Must:

- show operation symbol
- carry **underneath**
- exchange by crossing through and rewriting **above**
-

Year 1:

Objects (concrete), number tracks (visual), written equations (abstract).

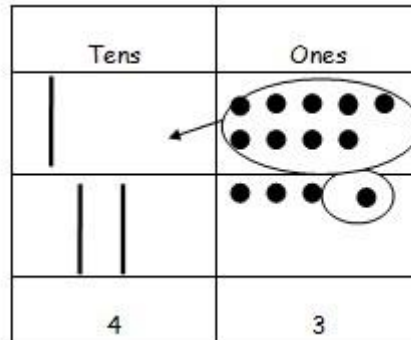
Maths Mastery big picture. Show addition can be done in any order.



Jane had 3 bears. She was given 2 more. How many does she have now?

$$19 + 24 = 43$$

$$\begin{array}{r} 10 \\ + \\ 10 \\ + \\ 20 \\ = \end{array}$$



No. of ones =

Exchange Game (to prepare for formal written addition): e.g.

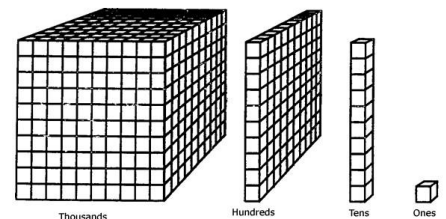
using dienes blocks or other objects:

roll a dice & take 1-6 'ones'.

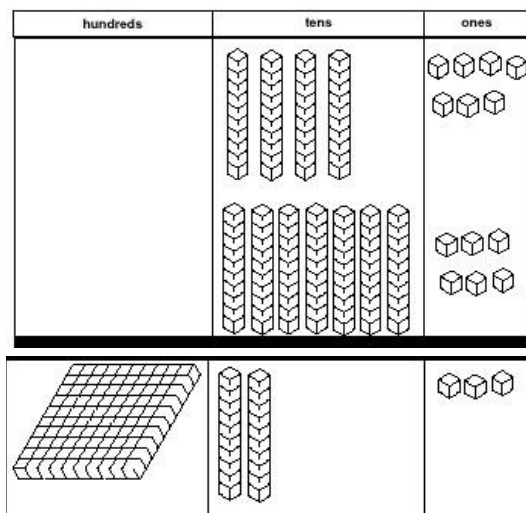
When have ten, 'swap' for a 'ten'.

When have ten 'tens', swap for a 'hundreds'.

When have ten 'hundreds', swap for a 'thousand'.



Year 2:



Partitioning & recombining when exchanging - using concrete objects to support.

$$47 + 76 =$$

Use dienes blocks to represent the numbers in correct columns.

Add together, starting from the ones and exchange where necessary - carry over into the new column. Then recombine.

Partitioning and recombining.

$$42 \rightarrow 40 + 2$$

$$+36 \rightarrow \underline{30} + 6$$

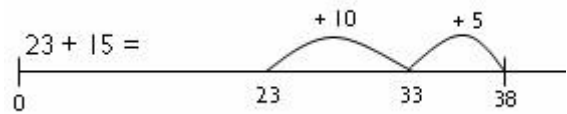
$$\underline{70} + 8 \rightarrow 78$$

$$37 \rightarrow 30 + 7$$

$$+ 85 \rightarrow \underline{80} + 5$$

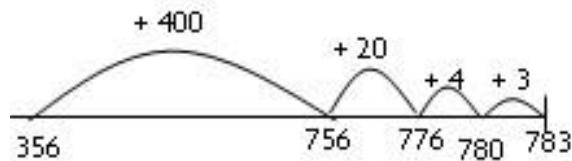
$$\underline{110} + 12 \rightarrow 122$$

Number line - adding multiples of ten, using numbers bonds to 10.



Year 3:

Number line addition - partitioning one number.



Column Addition - adding ones first, then tens and recombining.

$$\begin{array}{r} 43 \\ + 54 \\ \hline 7 \\ \hline 90 \\ \hline 97 \end{array}$$

Year 4:

Column Addition - adding ones first, then tens, then 100s and recombining.

$$\begin{array}{r} 43 \\ + 54 \\ \hline 7 \\ \hline 90 \\ \hline 97 \end{array} \qquad \begin{array}{r} 358 \\ + 33 \\ \hline 11 \\ \hline 80 \\ \hline 300 \\ \hline 391 \end{array}$$

Compact Column Method - adding from ones and carrying underneath.

$$\begin{array}{r} 358 \\ + 33 \\ \hline 391 \\ 1 \end{array}$$

$8 + 3 = 11$. So place the one and carry ten.

$$50 + 30 + 10 = 90$$

$$300 + \text{no hundreds} = 300$$

Year 5 & 6:

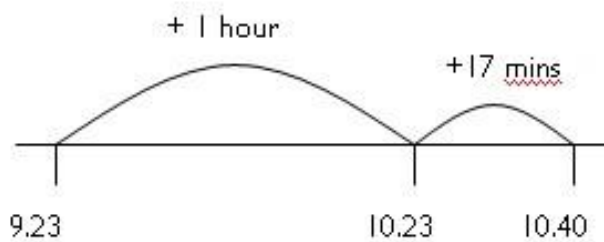
Compact Column Method, extending to 4 digit numbers; 2 decimal places; different number of decimal places and adding more than 2 numbers.

$$\begin{array}{r}
 72.5 \\
 +54.6 \\
 \hline
 127.1
 \end{array}$$

$$\begin{array}{r}
 3481.9 \\
 26.85 \\
 + 0.71 \\
 \hline
 3509.46
 \end{array}$$

$$\begin{array}{r}
 \text{£ } 73.42 \\
 + \text{£ } 84.73 \\
 \hline
 \text{£ } 158.15
 \end{array}$$

Number line method to add time, in minutes and hours (as time is measured in 60 minutes, not hundreds).



Subtraction:

Year 1

Objects (concrete), number tracks/drawings (visual), written equations (abstract).

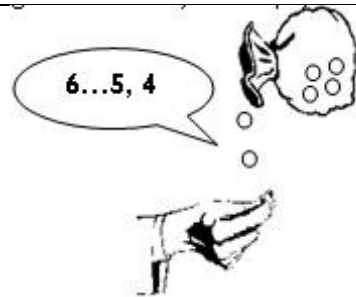
Subtract/take away:

Using moveable objects to physically take away and pictures.

Write equations using symbols

e.g. $5 - 2 = 3$

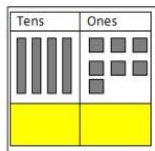
6 in a bag. Take away 2 and there are 4 left in the bag $\rightarrow 6 - 2 = 4$



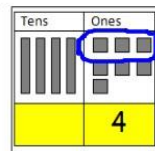
As with addition, concrete objects to shows tens and ones. Taking away objects and circle $47 - 13 =$ then starting to drawings for the representation.

objects and pictorial

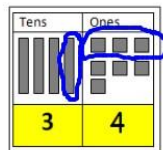
First make the largest number in tens and ones
e.g. 47



Then circle the ones of the smaller number and write how many ones have been left
e.g. 13 - 3 ones which



Finally circle the tens of the smaller number and write how many tens have been left
e.g. 13 - 1 ten which leaves 3 tens



$47 - 13 = 34$

Find the difference:

Using moveable objects and drawings e.g. bead string, coins, cubes

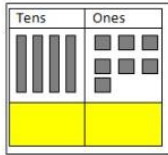
Year 2

Use of concrete to consolidate but moving towards number lines and column methods.

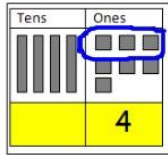
Subtract/Take away:

47 - 13 =

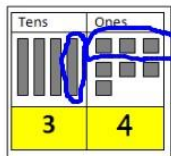
First make the largest number in tens and ones
e.g. 47



Then circle the ones of the smaller number and write how many ones have been left
e.g. 13 - 3 ones which



Finally circle the tens of the smaller number and write how many tens have been left
e.g. 13 - 1 ten which leaves 3 tens



47 - 13 = 34

Use partitioning and column method (supported with **dienes blocks**) when not crossing the tens boundary.

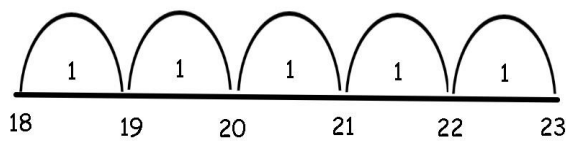
$$\begin{array}{r} 67 \rightarrow 60 + 7 \\ - 35 \rightarrow \underline{30 + 5} \\ \hline \underline{30 + 2} \rightarrow 32 \end{array}$$

$$\begin{array}{r} 82 \rightarrow 80 + 2 \\ - 21 \rightarrow \underline{60 + 1} \\ \hline \underline{20 + 1} \rightarrow 21 \end{array}$$

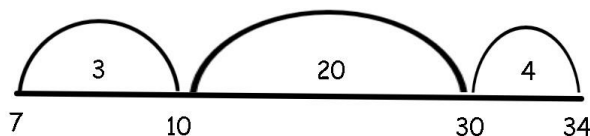
Find the difference:

Use place value knowledge to add to the nearest ten, add in tens and then ones.

e.g. What is the difference between 23 and 18? (Counting on)



e.a. what is the difference between 7 and 34?

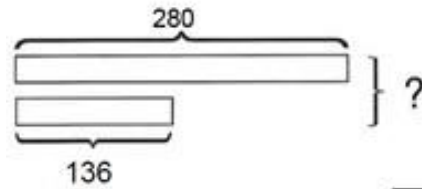


Add the ones, then add the tens
 $3 + 4 = 7$
 $20 + 7 = 27$

Bar modelling:

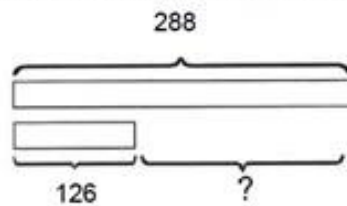
Use pictorial bars to represent numbers to find missing numbers.

What is the sum of 280 and 136?



The sum of 280 and 136 is

Find the difference between 288 and 126?

**Year 3**

Continue pictorial methods (see above) moving onto the abstract formal written column methods, including HT1s - HT1s, with concrete objects to support (e.g. dienes blocks)

3 digit subtract 3 digits
(using dienes blocks to consolidate from Yr 2)

$$\begin{array}{r} 874 \rightarrow 800 + 70 + 4 \\ - 523 \rightarrow \underline{500 + 20 + 3} \\ \underline{300 + 50 + 1} \rightarrow 351 \end{array}$$

Including **exchanging**:

$$\begin{array}{r} 200 \quad 120 \\ 326 \rightarrow \cancel{300} + \cancel{20} + 6 \\ - 152 \rightarrow \underline{100 + 50 + 2} \\ \underline{100 + 70 + 4} = 174 \end{array}$$

Year 4

Consolidate column method with partitioning, then move to compact method.

Always beginning with the 'ones' column,

$$\begin{array}{r} 874 \\ - 523 \\ \hline 351 \end{array}$$

$$\begin{array}{r} 367 \\ - 25 \\ \hline 342 \end{array}$$

Including **single exchange**:

(children must be confident in the value of each digit e.g. 2 = 20 - two tens)

$$\begin{array}{r} 2 \quad 12 \\ \cancel{8} \cancel{7} 6 \\ - 152 \\ \hline 174 \end{array}$$

Year 5 & 6: Use column compact method for a wider range of applications.

Different numbers of digits:

$$\begin{array}{r} 1 \\ \cancel{2}^1 567 \\ - 734 \\ \hline 1833 \end{array}$$

Decimals, including money & measures

$$\begin{array}{r} 3 \quad 1 \\ \text{£} 1 \cancel{4}^3 \text{ }^1 47 \\ - \text{£} 4.83 \\ \hline \text{£} 9.64 \end{array}$$

Double exchanging:

$$\begin{array}{r} 4 \quad 1 \quad 5 \\ 3 \cancel{5}^4 \cancel{6}^1 7 \\ - 1369 \\ \hline 2198 \end{array}$$

Numbers with different numbers of decimal places
- use of a place holder.

$$\begin{array}{r} 37.4 - 15.25 \\ 37. \quad 3 \quad 1 \\ \quad \cancel{4}^3 \text{ }^1 0 \\ - 15.25 \\ \hline 22.15 \end{array}$$

Multiplication:

X10 and x100

Years 2 and 3: move digits written method

Years 4 - 6: mental calculations (including decimals)


100s	10s	1s	$\frac{1}{10}$
3	3 4	4 0	
	3	3 7	7

Year 1

Use of concrete objects and pictorial representation.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40

Countina in 5s and 10s usina money:



“10, 20, 30, 40, 50

Countina in twos with pairs of objects:

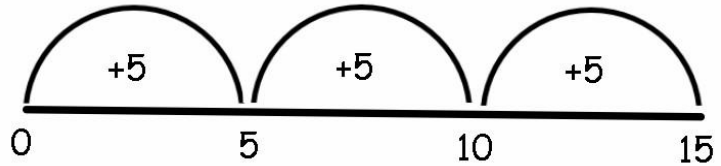


Find patterns on 100s squares for x2, x5, x10:

Year 2: (times tables- $\times 2$, $\times 5$, $\times 10$)

Building on skills of counting in 2s, 5s and 10s.

Repeated addition:

 3×5 (3 lots of 5) 5×10 (5 lots of 10)

$$10p + 10p + 10p + 10p + 10p = 50p$$

$$10p \times 5 = 50p$$

5 hops of 10

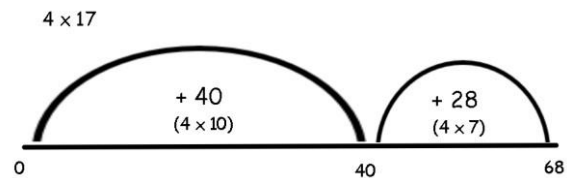
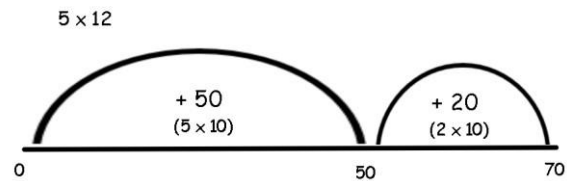
Arrays:

Support understanding that the multiplication of 2 numbers can be done in any order.

 3×4 (3 rows of 4) 4×3 (4 rows of 3)

Year 3

Consolidate repeated addition, including larger jumps



Introduce multiplying with formal vertical method.
Begin by multiplying with the 'ones' digits. Introduce exchanging underneath.

$$\begin{array}{r} 24 \\ \times 6 \\ \hline 24 \quad (6 \times 4) \\ 120 \quad (6 \times 20) \\ \hline 144 \end{array}$$

$$\begin{array}{r} 24 \\ \times 6 \\ \hline 144 \\ 2 \end{array}$$

Year 4

Consolidate column method from Yr 3 including carrying underneath (as in addition).

$$\begin{array}{r} 24 \\ \times 6 \\ \hline 144 \\ 2 \end{array}$$

$$\begin{array}{r} 354 \\ \times 4 \\ \hline 1416 \\ 21 \end{array}$$

Year 5 & 6

Vertical Multiplication, including 4 digits x 2 digit numbers and decimals.

$$\begin{array}{r}
 246 \\
 \times 32 \\
 \hline
 492 \\
 7380 \\
 \hline
 7872
 \end{array}$$

place holder

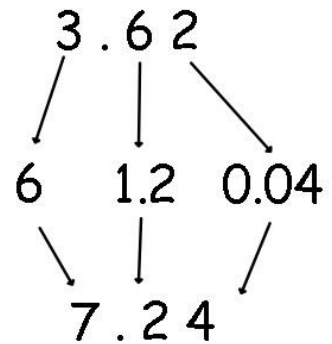
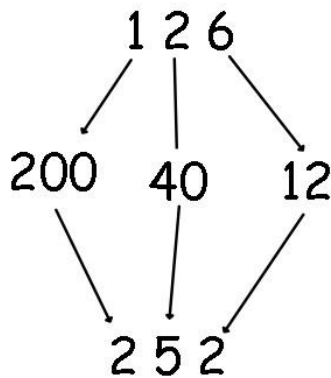
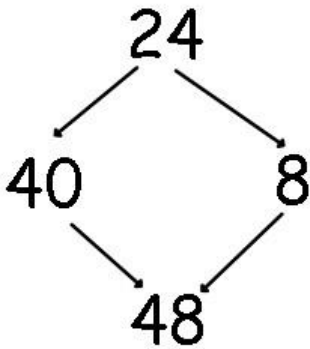
$$\begin{array}{r}
 36.4 \\
 \times 7 \\
 \hline
 254 \\
 42
 \end{array}$$

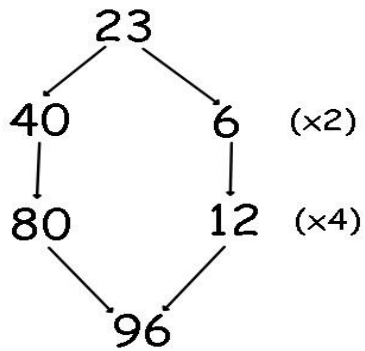
$$\begin{array}{r}
 5246 \\
 \times 26 \\
 \hline
 31476 \\
 104920 \\
 \hline
 136396
 \end{array}$$

place holder

Doubling and x 4

Partition, x2 and then recombine:



X4 → double and double again**Division:****Year 1**

Consolidate counting to prepare for formal division.

Using concrete objects (bead string, cubes, Numicon) and pictorial representations.

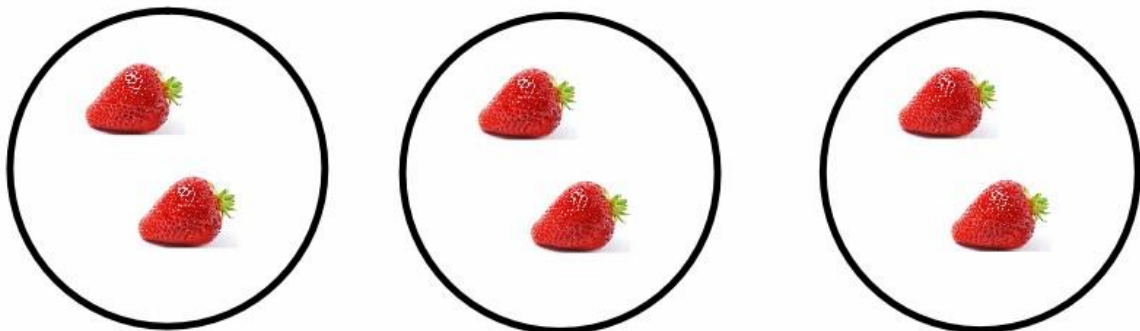
Halving - sharing concrete objects into two groups.

Year 2

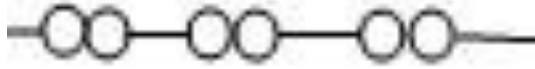
Introduce the language 'division' and the symbol ' \div '

Sharing equally - into 2s, 5s and 10s → moving objects

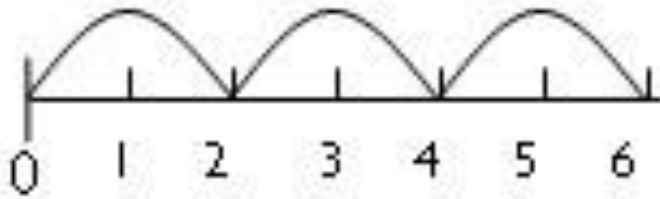
e.a. $6 \div 3 = 2$



Grouping - into 2s, 5s and 10s → Cubes, bead strings, pictorially
 e.g. $6 \div 2 = 3$

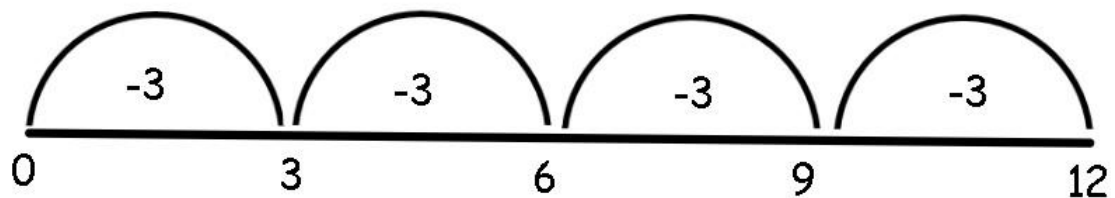


Represent using equal jumps on a number line:
 3 jumps of 2. So 6 divided by 2 = 3



Year 3

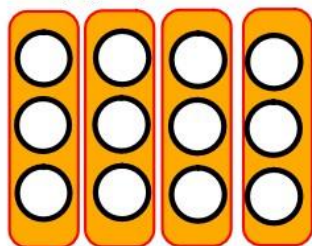
Repeated Subtraction:
 e.g. 4 groups of 3. So $12 \div 3 = 4$



Arrays to show inverse:

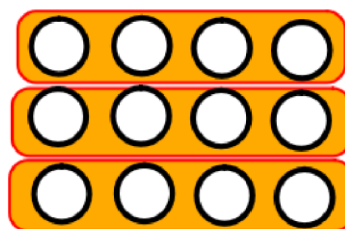
$12 \div 4 = 3$

How many groups of 4 are there?



$12 \div 3 = 4$

How many groups of 3 are there?



Sharing using concrete objects, introduce remainder:

$$11 \div 2 = 5 \text{ r}1$$



$$93 \div 3 = 31$$



Year 4

Short division using times tables and remainder:

$$\begin{array}{r} 32 \\ 3 \overline{) 96} \end{array}$$

$$\begin{array}{r} 14 \\ 7 \overline{) 98} \end{array}$$

$$\begin{array}{r} 086 \text{ r}2 \\ 5 \overline{) 432} \end{array}$$

Year 5

Short division, including remainder as fractions and decimals:

$$\begin{array}{r} 05 \text{ r} 2 \\ 5 \overline{) 27} \end{array}$$

$5 \text{ r} 2,$ $\frac{5 \underline{2}}{5}$ $\frac{5 \underline{4}}{10}$ 5.4
 ↗ ↖
 remainder equivalent
 over divisor fraction

$$\begin{array}{r} 28 \\ 15 \overline{) 432} \\ \underline{300} \quad 15 \times 20 \\ 32 \\ \underline{120} \quad 15 \times 8 \\ \text{r} 12 \end{array}$$

$28 \text{ r} 12$ $28 \frac{12}{15}$ $28 \frac{4}{5}$ $28 \frac{8}{10}$ 28.8
 ↗ ↖ ↗ ↖
 simplest or /10 to
 form convert to
 decimal

Year 6

Long division to give remainder as decimals.

Only look at the first 2 digits of 432 to start.

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

15s into 43:
 $15 \times 2 = 30$ r13

15s into 132:
 $15 \times 8 = 120$ r12

15s into 120:
 $15 \times 8 = 120$

$$\begin{array}{r}
 31 \\
 22 \overline{) 682} \\
 \underline{66} \\
 22 \\
 \underline{22} \\
 0
 \end{array}$$

$$\begin{array}{r}
 17.4 \\
 25 \overline{) 435.0} \\
 \underline{25} \\
 185 \\
 \underline{175} \\
 100 \\
 \underline{100} \\
 0
 \end{array}$$

Halving

