Maths Workshop

November 2019

KS1 Year 2

What we will cover

Explanation of:

- Different methods and strategies used
- Concrete-Pictorial-Abstract approach
- Bar modelling
- Calculation & problem solving examples

Levels of learning

Shallow learning: surface, temporary, often lost
Deep learning: it sticks, can be recalled and used

Deepest learning: can be transferred and applied in different context

What is mastery?

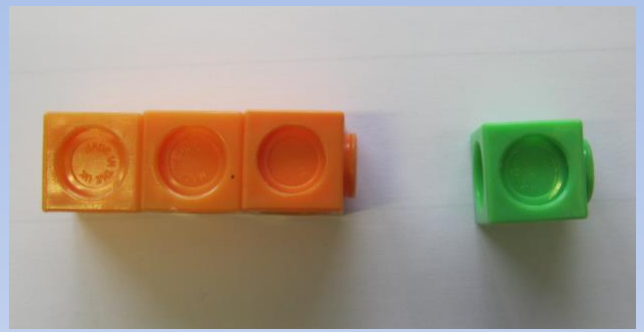
- The essential idea behind the mastery teaching approach is that ***all pupils*** gain a deep understanding of the mathematics. This ensures that:

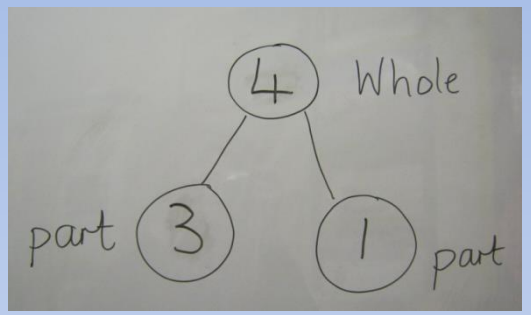
- *Future* mathematical learning is built on *solid foundations* which do not need to be re-taught (less breadth but greater depth)

- Increasingly, there will be less *need* for separate catch-up programmes due to some children falling behind;

- Pupils who, under other teaching approaches, can often fall a long way behind, are better able to keep up with their peers, so that gaps in attainment are narrowed whilst the attainment of all is raised.

Concrete Pictorial Abstract



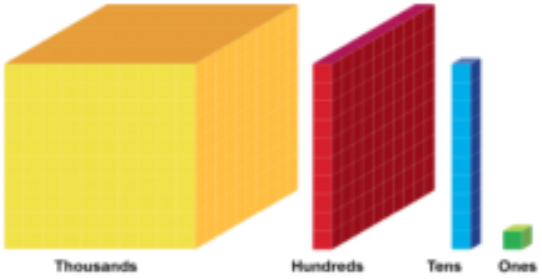


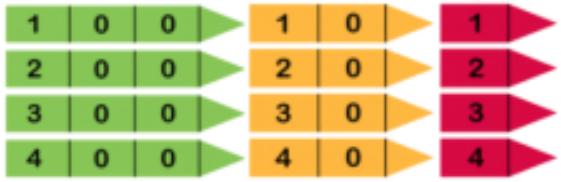
3 + 1 = 4

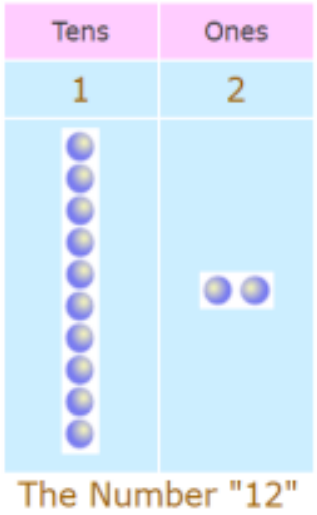
Concrete or pictorial representations support students to understand abstract concepts

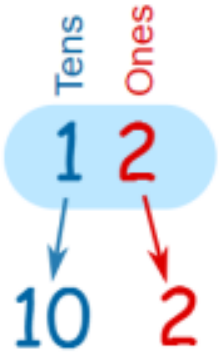
Place Value...

Place value is the value of each digit in a number.
It means understanding that 82 is made 80 and 2,
rather than 8 and 2.





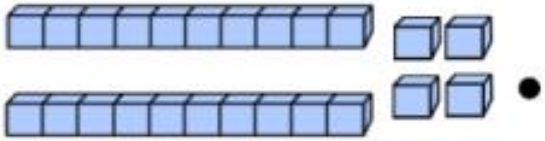


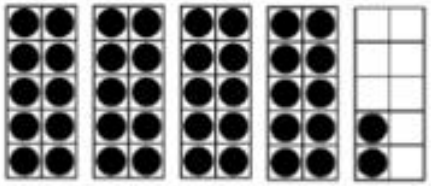


Place Value…

Place Value...

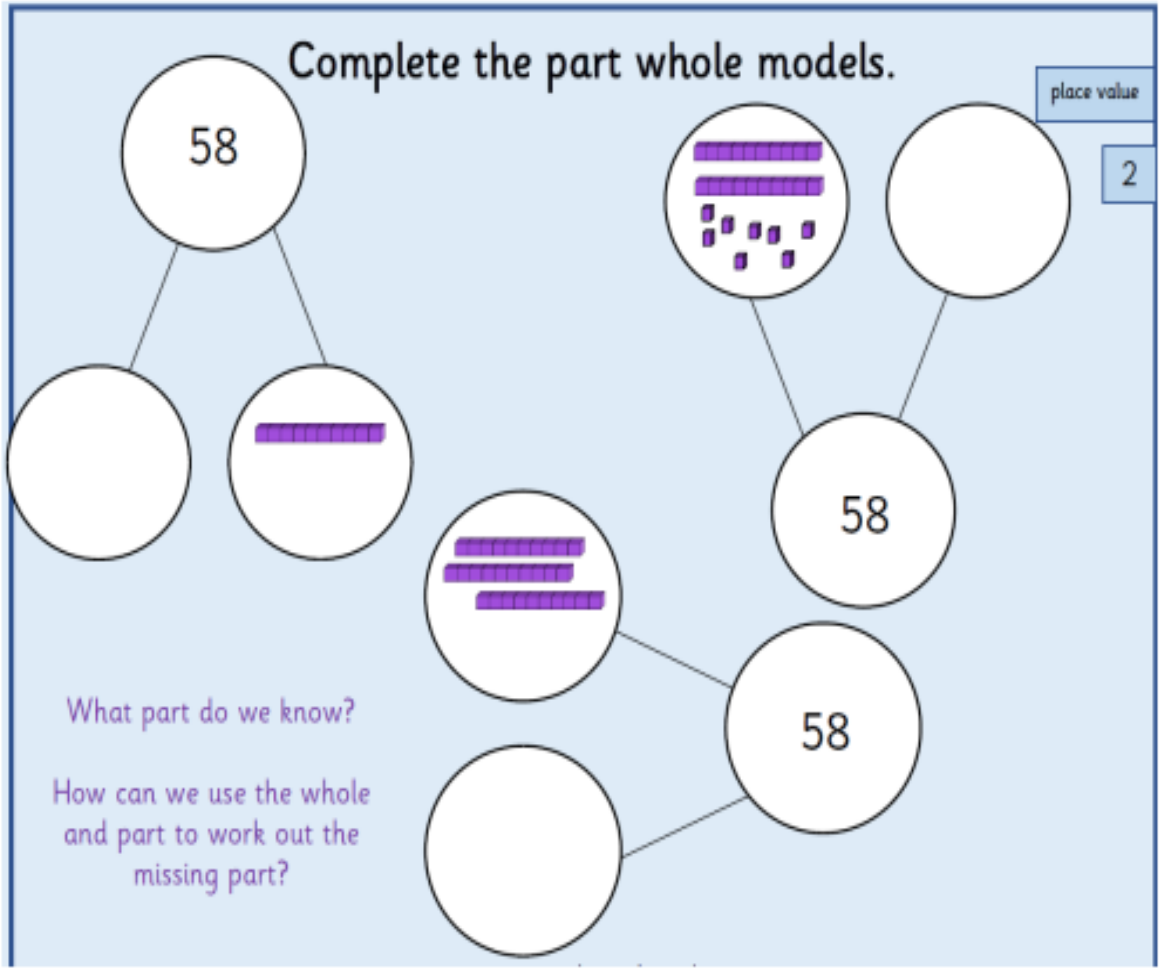
Match the representation to the correct number.





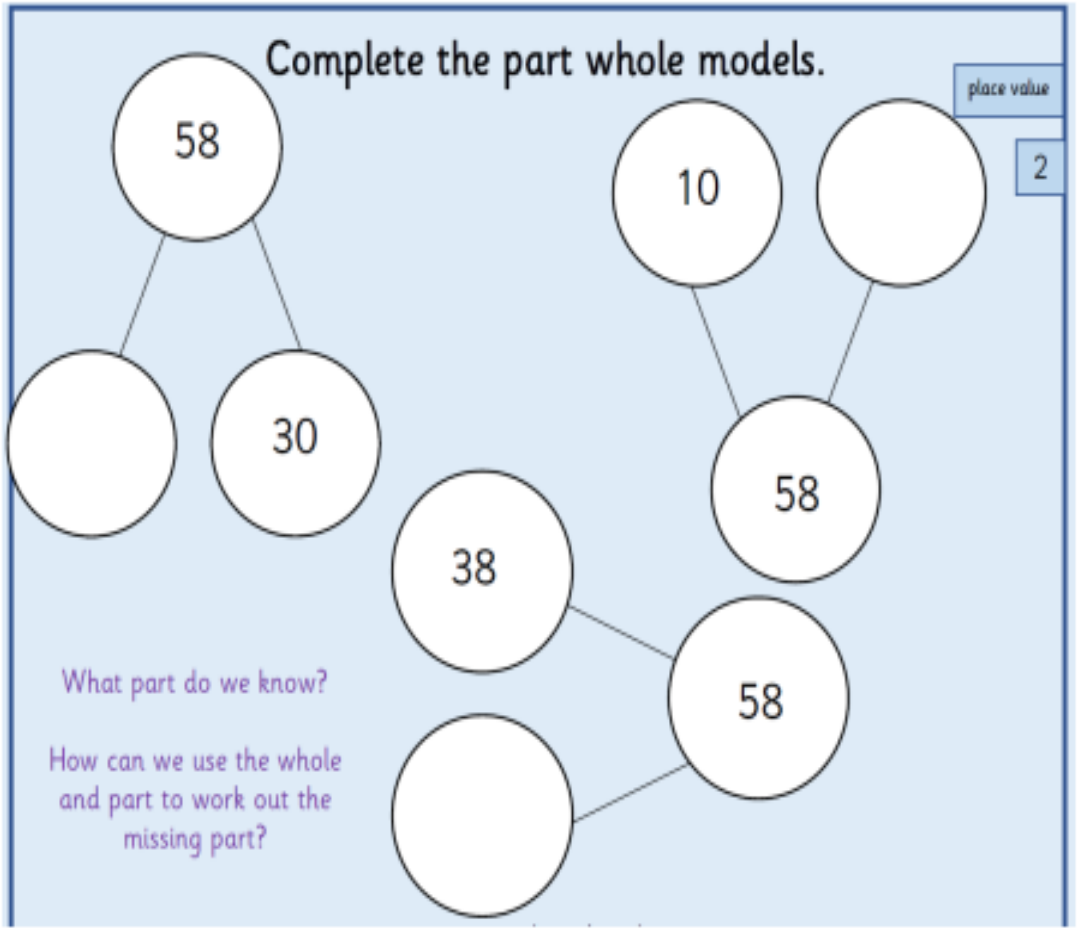
- forty-one
- 24
- 4 tens and 2 ones

Place Value...


Complete the part whole models.
place value
2
58
58
58
What part do we know?
How can we use the whole and part to work out the missing part?

Place Value...

It is important that children can partition numbers in a variety of ways, not just as tens and ones. For example, 58 is made up of 5 tens and 8 ones or 4 tens and 18 ones, or 20 and 38, etc.



Place Value...

How many two-digit numbers can you make using the digit cards only once?

I can make _____ two-digit numbers.

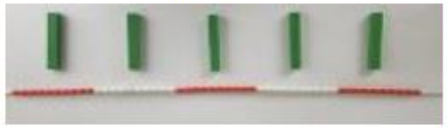
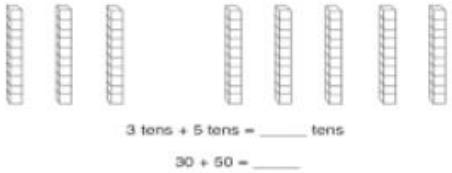
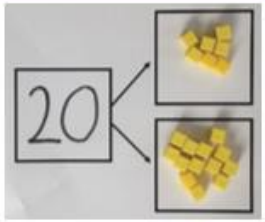
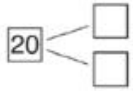
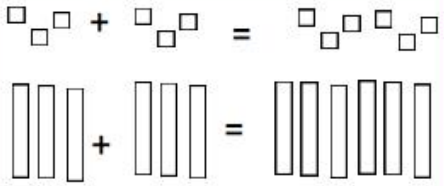
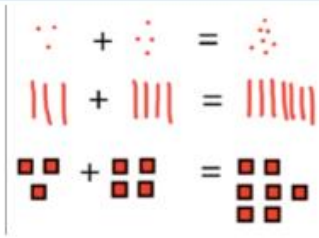
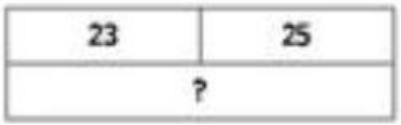
They are _____

Your turn!

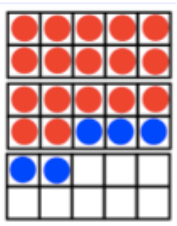
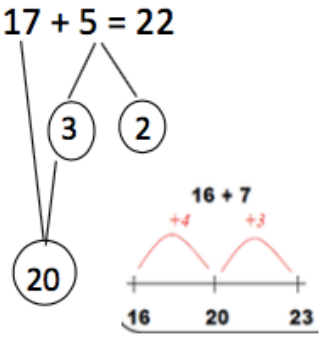
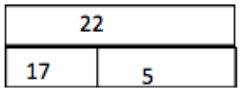
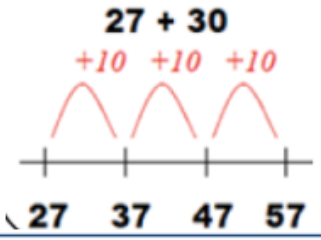
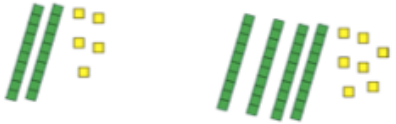
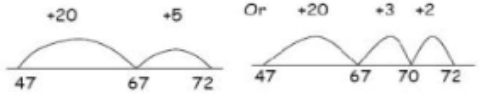
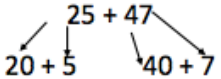
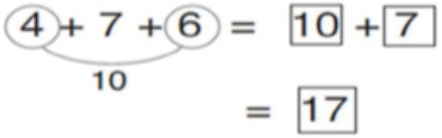
Numeracy key words

Addition +	Subtraction -	Multiplication X	Division ÷
More than	Subtract	Multiply	Divide by
Total	Minus	Lots of	Share
Altogether	Less than	Times	Groups of
Plus	Take away	Multiplied by	
Add	Difference between	Multiples of	

Y2 ADDITION +

Objective & Strategy	Concrete	Pictorial	Abstract
Adding multiples of ten	50= 30 = 20  Model using dienes and bead strings	 Use representations for base ten.	20 + 30 = 50 70 = 50 + 20 40 + □ = 60
Use known number facts Part part whole	 Children explore ways of making numbers within 20	 □ + □ = 20 20 − □ = □ □ + □ = 20 20 − □ = □	□ + 1 = 16 16 − 1 = □ 1 + □ = 16 16 − □ = 1
Using known facts		 Children draw representations of H,T and O	3 + 4 = 7 *leads to* 30 + 40 = 70 *leads to* 300 + 400 = 700
Bar model	 3 + 4 = 7	 7 + 3 = 10	 23 + 25 = 48

Y2 ADDITION +

Objective & Strategy	Concrete	Pictorial	Abstract
Add a two digit number and ones	 17 + 5 = 22 Use ten frame to make 'magic ten Children explore the pattern. 17 + 5 = 22 27 + 5 = 32	Use part part whole and number line to model. 	17 + 5 = 22 Explore related facts 17 + 5 = 22 5 + 17 = 22 22—17 = 5 22—5 = 17 
Add a 2 digit number and tens	 25 + 10 = 35 Explore that the ones digit does not change		27 + 10 = 37 27 + 20 = 47 27 + □ = 57
Add two 2-digit numbers	 Model using dienes , place value counters and numicon	 Use number line and bridge ten using part whole if necessary.	 20 + 40 = 60 5+ 7 =12 60 + 12 = 72
Add three 1-digit numbers	 Combine to make 10 first if possible, or bridge 1o then add third digit	 Regroup and draw representation. 	 Combine the two numbers that make/ bridge ten then add on the third.

Addition

23+12 =

Using a number line...

Addition Using partitioning... +

Partitioning both numbers into tens and ones mirrors the column method where ones are placed under ones and tens under tens. This also links to mental methods.

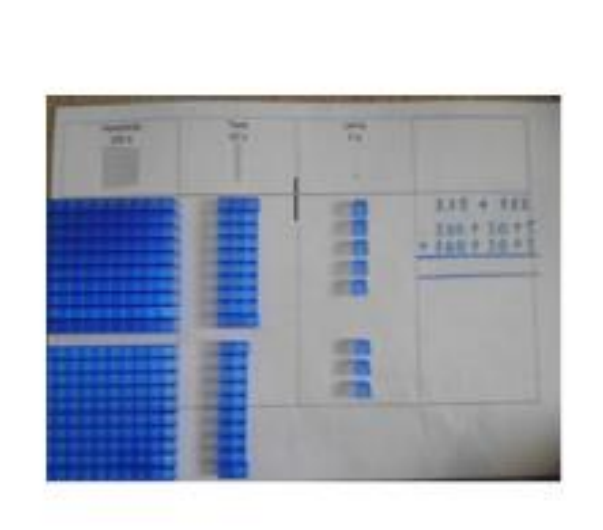
The expanded method **leads** children to the more compact method so that they understand its structure and efficiency. The amount of time that should be spent teaching and practising the expanded method will depend on how secure the children are in their recall of number facts and in their understanding of place value.

76 + 47

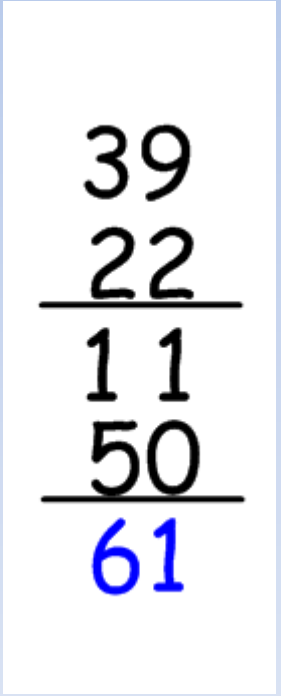
70 + 40 = 110

6 + 7 = 13

110 + 13 = 123

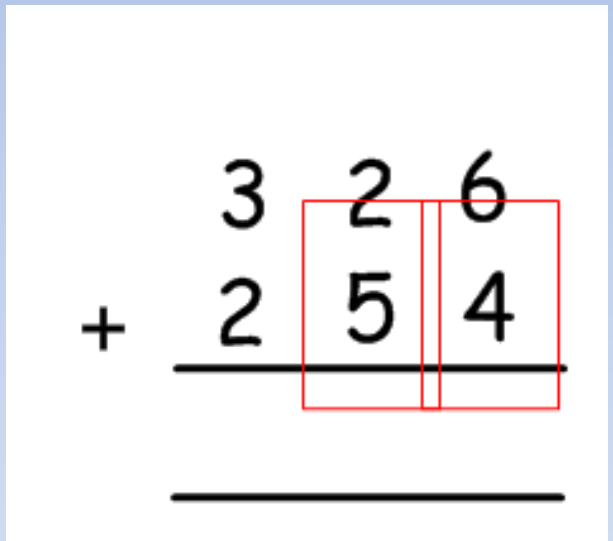


+



Addition Using columns... +

In this method, recording is reduced further. Carry digits are recorded **below** the line, **using the words 'carry ten' or 'carry one hundred', not 'carry one'.**

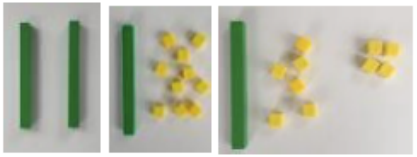
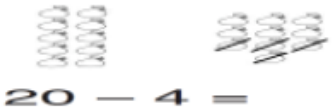
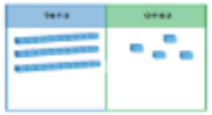
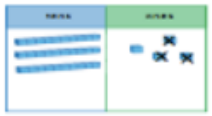
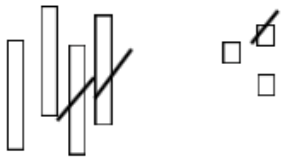
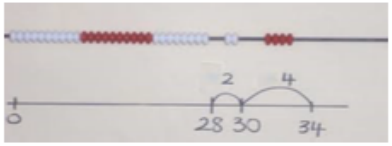
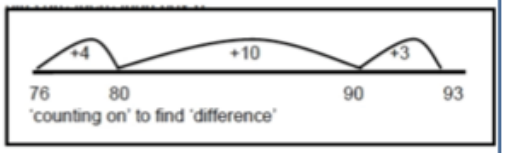


The bar model is a really good way of helping children to understand the relative sizes of numbers and to link three numbers together in different ways, showing addition and subtraction are closely related (inverse).

<table>
<tr><td colspan="2">There are 20 sweets in my bag and 13 sweets in my friend's bag. How many sweets have we got altogether?</td></tr>
<tr><td colspan="2"></td></tr>
<tr><td>20</td><td>13</td></tr>
</table>

Number families...

Y2 SUBTRACTION

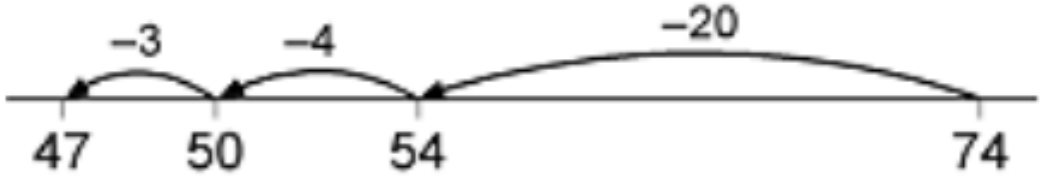
Objective & Strategy	Concrete	Pictorial	Abstract
Regroup a ten into ten ones	 Use a PV chart to show how to change a ten into ten ones, use the term 'take and make'		20—4 = 16
Partitioning to subtract without re-grouping. *'Friendly numbers'*	34—13 = 21   Use Dienes to show how to partition the number when subtracting without regrouping. 	Children draw representations of Dienes and cross off.  43—21 = 22	43—21 = 22
Make ten strategy *Progression should be crossing one ten, crossing more than one ten, crossing the hundreds.*	 34—28 Use a bead bar or bead strings to model counting to next ten and the rest.	 Use a number line to count on to next ten and then the rest.	93—76 = 17

Subtraction

Steps in subtraction can be recorded on a number line. The steps often bridge through a multiple of 10.

15 - 7 = 8

74 - 27 = 47 worked by counting back:



Subtraction

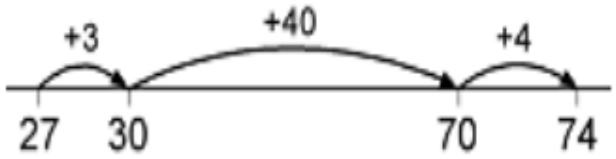
Using a number line...

28 - 13 =

Subtraction

Finding an answer by counting up - The steps can also be recorded by counting up from the smaller to the larger number to find the difference, for example by counting up from 27 to 74 in steps totaling 47. Pupils should be comfortable that either way we get the same answer (and that the three numbers involved therefore hold an inverse relationship).

74 - 27 =



Subtraction

Expanded layout, leading to column method

- Partitioning the numbers into tens and ones and writing one under the other mirrors the column method, where ones are placed under ones and tens under tens.
- The expanded method leads children to the more compact method so that they understand its structure and efficiency.

Example: 63 – 41 =

$$\begin{array}{r} 60 + 3 \\ -\ 40 + 1 \\ \hline + \\ \hline \end{array}$$

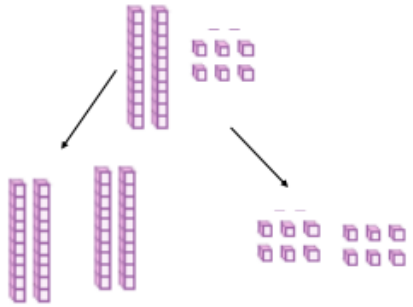
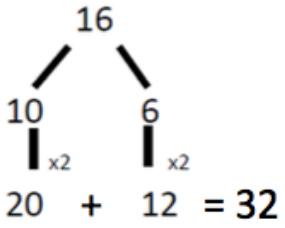
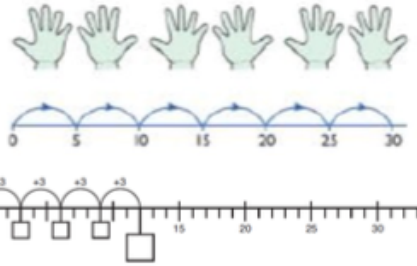
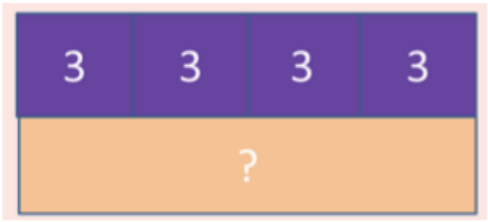
Start by subtracting the ones, then the tens. Refer to subtracting the tens, for example, by saying 'sixty take away forty', not 'six take away four'.

Subtraction

The concept of transfer / exchange

$$\begin{array}{r} 72 \\ -\ 47 \\ \hline \\ \hline \end{array}$$

Y2 MULTIPLICATION

Objective & Strategy	Concrete	Pictorial	Abstract
Doubling	Model doubling using dienes and PV counters.  40 + 12 = 52	Draw pictures and representations to show how to double numbers	Partition a number and then double each part before recombining it back together. 
Counting in multiples of 2, 3, 4, 5, 10 from 0 (repeated addition)	Count the groups as children are skip counting, children may use their fingers as they are skip counting. Use bar models.  5 + 5 + 5 + 5 + 5 + 5 + 5 + 5 = 40   	Number lines, counting sticks and bar models should be used to show representation of counting in multiples.   	Count in multiples of a number aloud. Write sequences with multiples of numbers. 0, 2, 4, 6, 8, 10 0, 3, 6, 9, 12, 15 0, 5, 10, 15, 20, 25 , 30 $4 \times 3 = \square$

Multiplication

We started with step counting in Year 1 and still do this but we also look for patterns and start to know that 1 x 2 = 2 and 2 x 2 = 4 etc.

Which times table has been highlighted on the number square?

How do you know?

Which of these numbers would you find in the 5 times table?

134 **67** **205** **502**

How do you know?

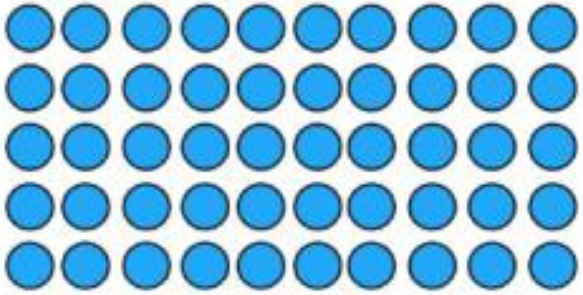
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Multiplication

Arrays

2x10

5x10

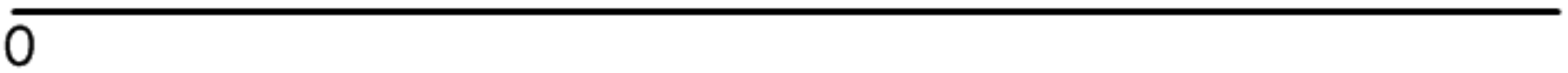


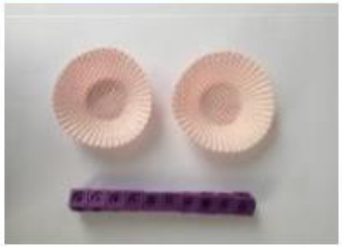
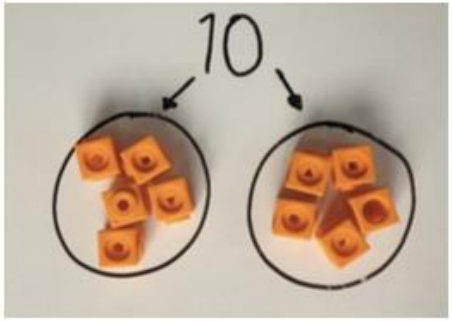
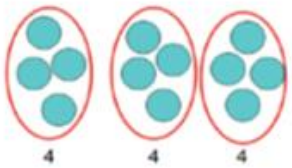
Multiplication

Using a number line

3 x 3 =

3+3+3=

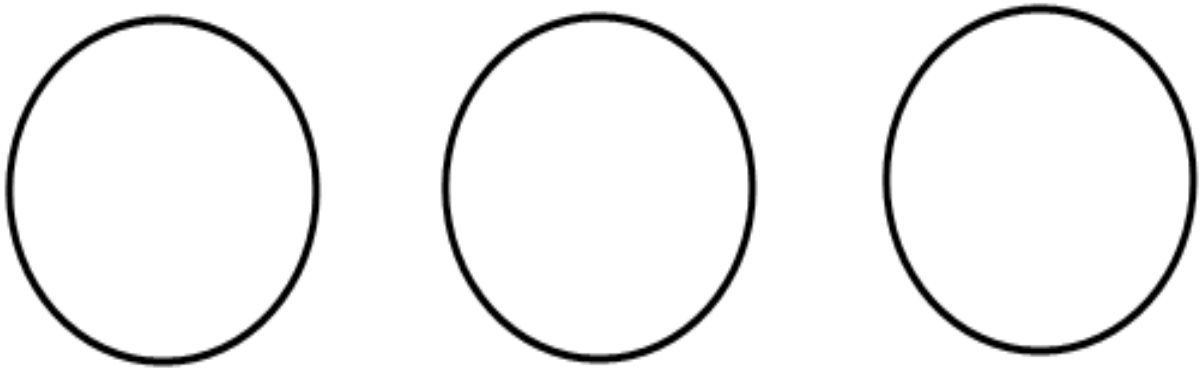


Objective & Strategy	Concrete	Pictorial	Abstract
Division as sharing *Use Gordon ITPs for modelling*	   I have 10 cubes, can you share them equally in 2 groups?	Children use pictures or shapes to share quantities.  8 shared between 2 is 4 Sharing:  12 shared between 3 is 4	12 shared between 3 is 4

Division

By sharing ÷

The farmer had 12 sheep. He put them into three fields. How many sheep were in each field.



12 ÷ 3 =

Division

$12 \div 3 =$

Using a number line

and repeated subtraction

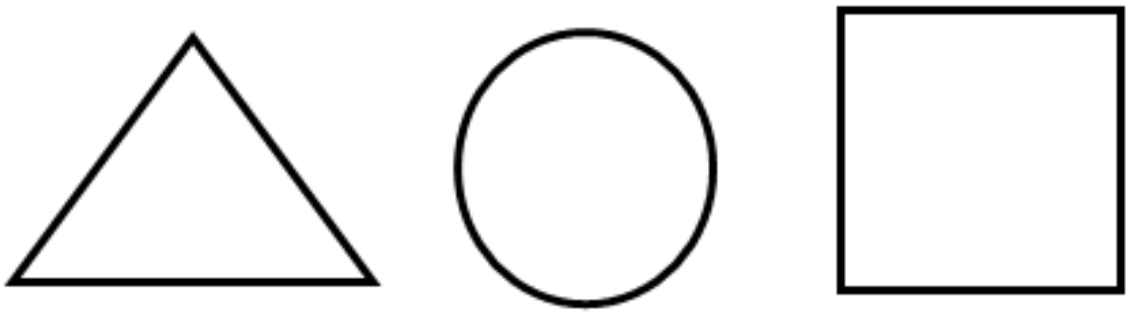
12

Mental starters - brain warmers!

Prove it!! (Explain and justify)

Which is the odd one out?

4 5 8



Mental starters - brain warmers!

Missing number problems...

14 + ____ = 23

25 - _____ = 20

Mental starters - brain warmers!

20 + 14 = 30 + 4

(is the same as)

30 + 11 = 20 + ___

Bar model – pictorial representation of a problem

Using this model children can understand these relationships:

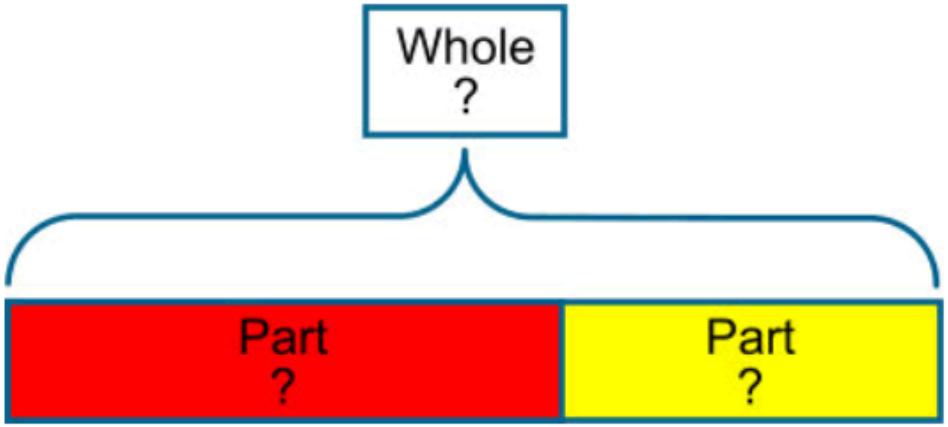
$b + c = a$

$c + b = a$

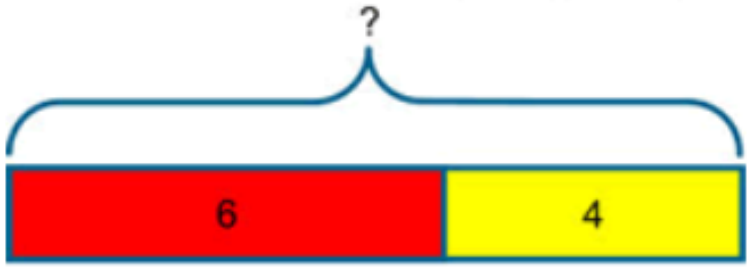
$a - b = c$

$a - c = b$

In problems involving addition and subtraction there are three possible unknowns as illustrated below and given the value of two of them the third can be found.



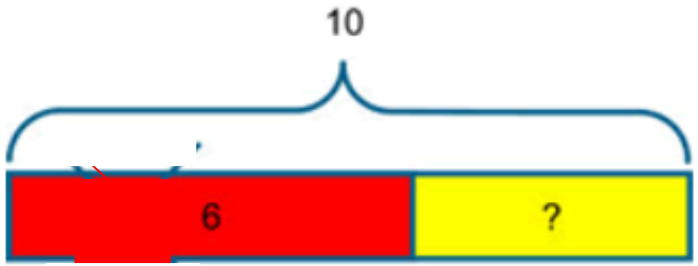
Addition



I have 6 red pencils and 4 yellow pencils. How many pencils do I have?

(I combine two quantities to form the whole)

Subtraction
- Take Away

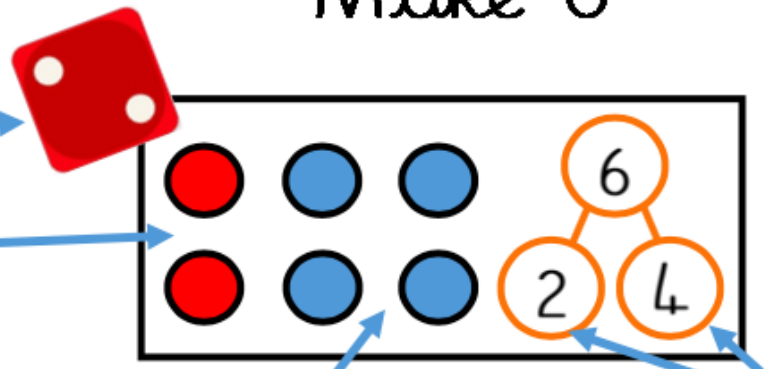


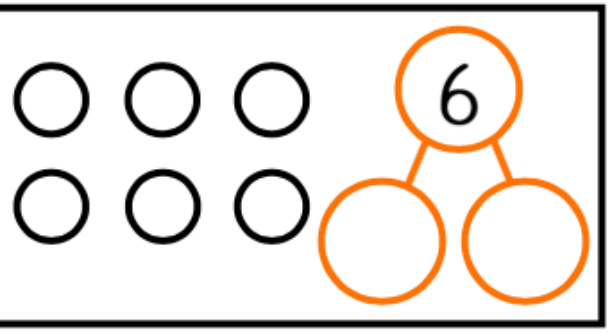
I had 10 pencils and I gave 6 away, how many do I have now?

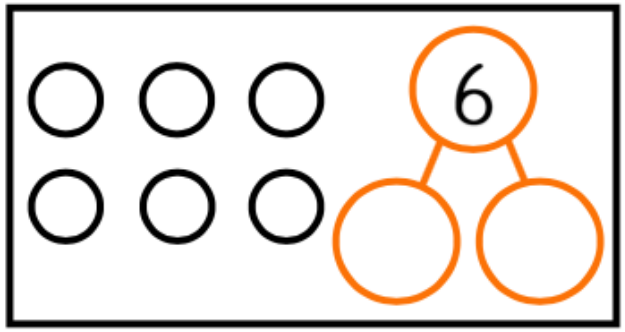
(This time we know the whole but only one of the parts, so the whole is partitioned and one of the parts removed to identify the missing part)

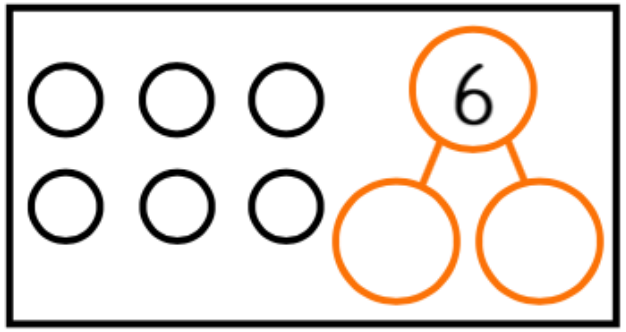
Make 6

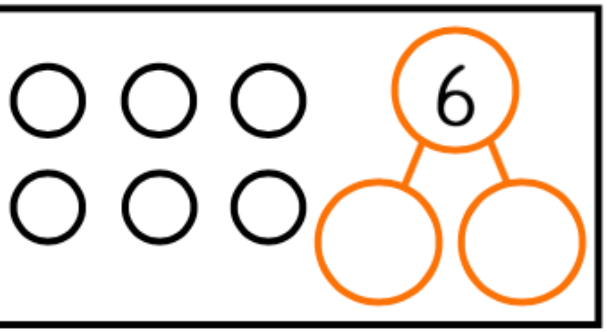
1. Roll dice
2. Colour dice number
3. Colour other part
4. The parts are...

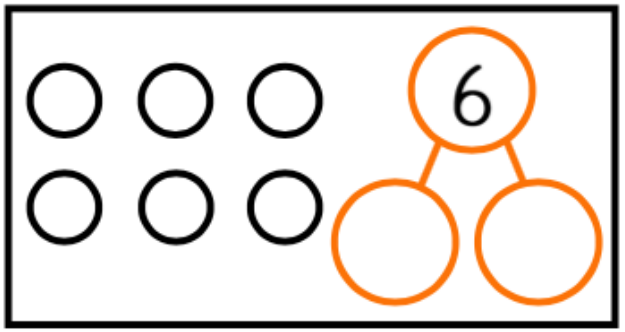


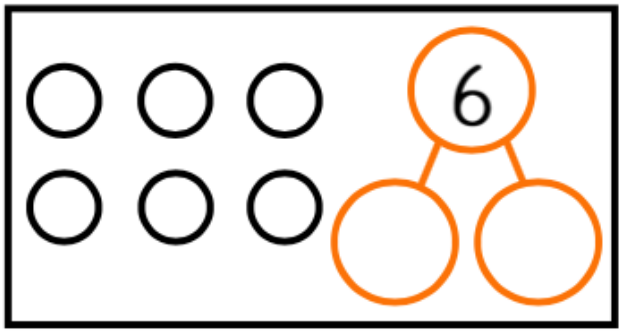












Easiest? Hardest?

32 - 29

32 - 21

32 - 19

Different ways

26 - 18 = □

Count on from □ to □

Take away 20 then add □

Do 26 take away 16 then take away □

Different ways

25 - 19 = □

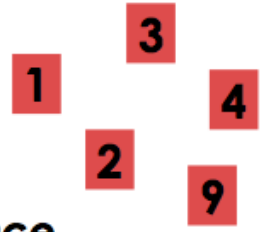
Count on from □ to □

Take away □ then add □

Do 25 take away 15 then take away □

Digit cards game

You need these digit cards:



Use each digit once.

Complete the number sentence.

Challenge: do in different ways.

Digit cards game

You need digit cards 0 to 9

Use seven of the cards.

Complete the number sentences.

□□ − □ = □

□ − □ = □

Challenge: use the **0** *card.*

Fill the gaps

13 − 8 = 5 *Spot the pattern*

1 ☐ − 7 = 5

1 ☐ − 6 = 5

1 ☐ − 5 = 5

Fill the gaps

14 − 8 = 6 *Spot the pattern*

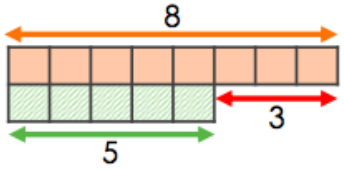
14 − ☐ = 7

14 − ☐ = 8

14 − ☐ = 9

True or false? ✓ ✗

8 - 5 = 3



5 + 3 = 8 ✓

5 - 8 = 3

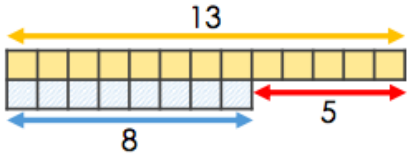
8 - 3 = 5

8 = 5 + 3

3 + 5 = 8

True or false? ✓ ✗

13 - 8 = 5



13 - 5 = 8 ✓

13 = 5 + 8

5 - 13 = 8

13 - 5 = 8

5 = 8 + 13