Hearts Academy Calculation Policy Addition and Subtractions

Practical and written methods

Year One

Pupils should be taught to:

- Given a number up to 100, identify one more and one less
- read, write and interpret mathematical statements involving addition (+), subtraction (–) and equals (=) signs
- represent and use number bonds and related subtraction facts within 20
- add and subtract one-digit and two-digit numbers to 20, including zero
- solve one-step problems that involve addition and subtraction, using concrete objects and pictorial representations, and missing number problems

Pupils should use real objects and apparatus to develop the concepts of addition and subtraction. They use a wide range of objects and use calculation in a range of contexts to develop a broad understanding and fluency in their skills. Talking about what they are doing with peers and adults is a very important part of the process of developing concepts. Addition and subtraction are explored as related operations

Understanding addition as combining two sets of objects

• Use games, songs and practical activities to develop understanding of addition in a wide range of different contexts and develop the vocabulary of addition.

• Support children to make a record in pictures, words or symbols, of addition activities.

• Construct number sentences verbally to go with practical activities.

- Solve simple word problems
- Introduce symbols as ways to record their addition activities
- Use Numicon to explore pattern in addition and support visualisation of addition facts.
- Children record addition sentences alongside their practical addition.
- Explore the concept of “is equal to” and relate this to the = sign. They begin with the format 2+3=5 and then use 5=2+3
- They are supported to move on from counting both sets to counting on from the first number

Understanding subtraction as 'taking away'

Use games, songs and practical activities to develop understanding of subtraction in a wide range of different contexts and develop the vocabulary of subtraction

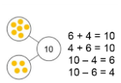
• Support children to make a record of subtraction activities in pictures, words or symbols.

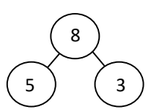
• Construct number sentences verbally to go with practical activities

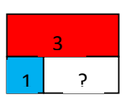
- Solve simple word problems
- Use Numicon with subtraction covers to emphasise the relationship between addition and subtraction.
- Introduce symbols as ways to record their addition activities
- Children record addition sentences alongside their practical addition.

Exploring the relationship between addition and subtraction

Children use the part / part whole model to explore the relationship between addition and subtraction and to construct fact families.







They solve problems with missing numbers

3 + 4 = □ □ = 3 + 4 3 + □ = 7 7 = □ + 4 7 = 3 + □ 4- □ = 1 7 = □ – 9 □ – 9 = 7

Year Two

Pupils should be taught to:

Represent and use add and subtract numbers using concrete objects, pictorial representations, and mentally, including:

- a two-digit number and ones, a two-digit number and tens, two two-digit numbers
- adding three one-digit numbers
- show that addition of two numbers can be done in any order (commutative)
- recognise and use the inverse relationship between addition and subtraction and use this to check calculations and solve missing number problems.

Place Value

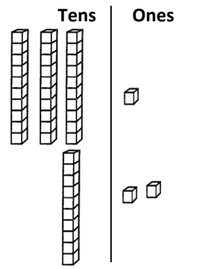
Pupils need to have a secure understanding of place value in order to calculate with 2 digit numbers. To secure this they need opportunities to explore different aspects of place value using a variety of models and representations including dienes apparatus, place value counters, Numicon and arrow cards. They should play simple base 10 exchange games to build understanding of the values represented by digits and exchange between tens and ones.

They will practise using their understanding of place value to add a two-digit number and ones and a two-digit number and tens.

They partition 2 digit numbers in different ways e.g. 23 = 20+3 or 13+10.

Combine numbers using Dienes or place value counters vertically placed

Children begin by using an expanded written method for column addition to secure their understanding of the process and then move onto using the formal written method.



Expanded version

30 + 1

+ 10 + 2

40 + 3 = 43

Formal written method

31

+12

43

- Column addition, without crossing tens TO + T , TO +TO
- Then Column addition regrouping ones to tens

At each stage

Begin with practical method, describe process verbally and represent as expanded version. When understanding is secure, represent as column addition. Retain models alongside written representations, including Dienes, money and Numicon until children are secure.

Subtract numbers using Dienes, vertically placed

- Column subtraction, without regrouping TU - T , then TU -TU

Expanded version

45 – 22

45 = 40 and 5

-22 = 20 and 2

20 and 3 = 23

Formal written method

45

-22

23

- Children who are secure in subtraction without exchange will move onto column subtraction with exchange. This is a requirement for children who are working at Greater Depth.

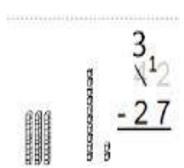
Expanded version

42 – 27

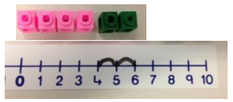
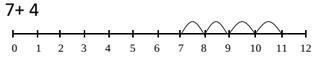
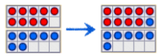
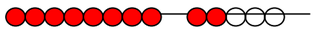
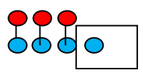
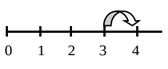
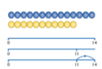
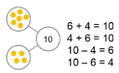
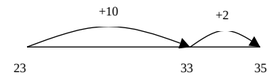
42 = 30 and 12

-27 = 20 and 7

10 and 5 = 15



HEARTSACADEMYTRUST

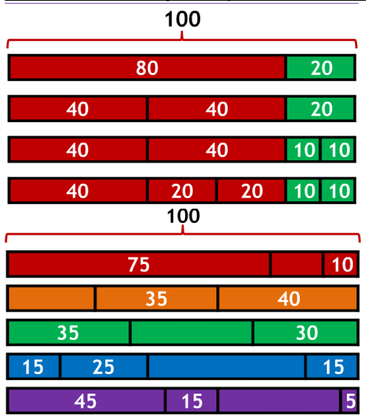
		Using the relationship between addition and subtraction • Children continue to use the part whole models introduced in Year 1 to support them in recognising and using the inverse relationship between addition and subtraction and using this to check calculations and solve missing number problem
mental calculations and informal written methods	**Mental methods** **Understanding addition as increasing numbers and subtraction as decreasing numbers** • Find 'one more' and one less to one hundred by counting or back on verbally • Children begin to use floor and table number lines to support their own calculations counting on in ones within 20.  7+ 4  8 - 3 = 5  Children count on mentally to add and count back mentally to subtract using fingers to record the count if needed. Ten frames or bead strings are used to represent addition including bridging through ten. 9+7=16  8 + 5 = 13.  **Understand subtraction as difference** Use practical apparatus, drawings and number lines to solve problems by finding the difference between two numbers    **Mental Recall of facts and Calculation strategies** Use practical apparatus and visual images to reinforce number facts and introduce specific calculation strategies.    Children explore the strategies practically explaining how they are working out the calculation. They are encouraged to find the most efficient strategy to work to calculations. • Memorise and reason with number bonds of 4, 5, 6, 7, 8, 9 and 10 in several forms (for example, 2 + 7 = 9; 9 – 7 = 2; 2 = 19 – 7). This is an important focus in Year 1. • Derive and use bonds to 20. • Count on and back in ones from a given 2-digit number • Add three single-digit numbers identifying doubles or pairs to 10 • Add 10 to a single digit number; Subtract 10 from any given 2-digit number • Use number facts to add single-digit numbers to two-digit numbers, e.g. use 4 + 3 to work out 14 + 3, • Add by putting the larger number first • Recognise doubles of numbers up to double 10. • Use the commutative law: 5+4 = 4+5 • Use number facts to subtract single-digit numbers from two-digit numbers, e.g. use 7 – 2 to work out 17 – 2,	**Mental methods** **Use a range of mental calculation strategies increasing or decreasing numbers e.g.** • **Count on or back in tens and ones,** 23 + 12 = 23 + 10 + 2  • **Partitioning and bridging through 10 and multiples of ten** Children continue to use ten frames to model bridging through ten and multiples of ten. They represent this on a number line. 19 + 7 = 26 1 9+ 1+6=26  • **Find the difference by counting up in tens and ones** This method is used when solving problems involving finding change from an amount of money What is the difference between 56 and 72?  **Mental Recall of facts and Calculation strategies** Pupils use table number lines then draw empty number lines to support or explain their mental calculation strategies. • Number bonds – know all the pairs of numbers which make all the numbers to 20, • derive and use related addition facts to 100 • Count on in ones and tens from any given 2-digit number • Add two or three single-digit numbers identifying doubles or pairs to 20 • Add a single-digit number to any 2-digit number using number facts, including bridging multiples of 10. (E.g. 45 + 4, 38 + 7) • Add 10 and small multiples of 10 to any given 2-digit number

HEARTSACADEMYTRUST

Progression for secure mental methods.

Year 3

Facts for 100 using multiples of 5 and 10

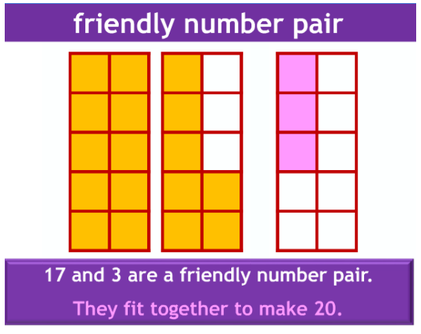


Partitioning and bridging through 10 and multiples of ten

Children continue to use ten frames to model bridging through ten and multiples of ten. They represent this on a number line.

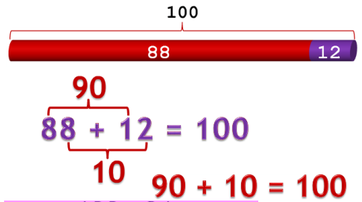
19 + 7 = 26 1 9+ 1+6=26

Friendly number pairs



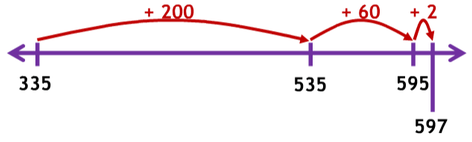
Year 4

Recall and use addition and subtraction facts for 100



Number line

335 + 200 + 60 + 2 =



not to scale

Unlabelled number line addition

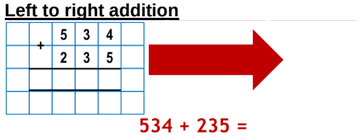
Friendly number pairs

22 + 33 + 28 + 37 =

50 + 70 = 120

22 + 33 + 28 + 37 = 120

Left to right addition



534 + 235 =

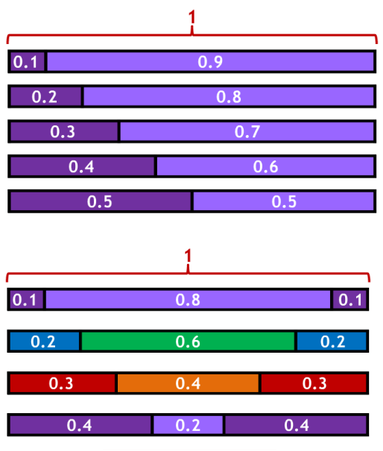
500 + 30 + 4 + 200 + 30 + 5 =

700 60 9

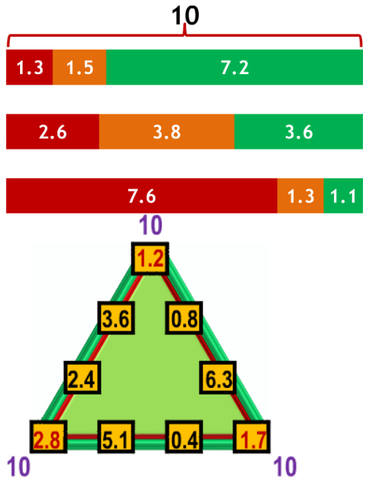
Year 5

Recall and use addition and subtraction facts for 1 with decimal numbers to one decimal place

Children use their knowledge of friendly numbers pairs, applying the knowledge to decimal numbers.



Recall and use addition and subtraction facts for 10 with decimal numbers.

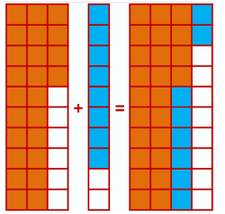


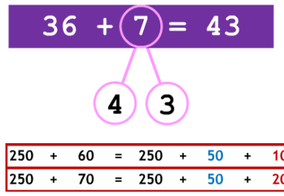
Making the next one, ten and hundred.

Year 6

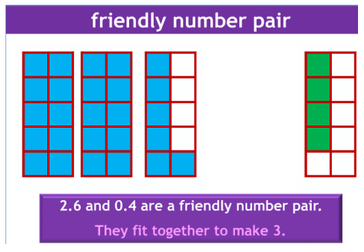
Children continue to recall and derive addition and subtraction facts for 1 with decimal numbers to one decimal place. (see year 5)

Making the next one, ten and hundred.





Friendly number pairs



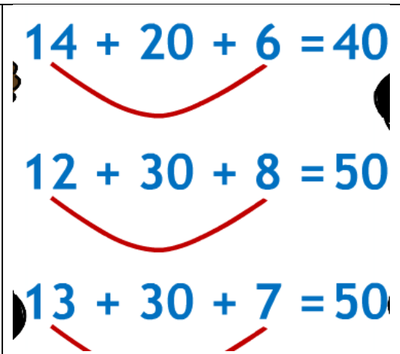
Adding 3 one digit numbers e.g. 2 + 4 + 6

After you have added the 2 to the 2 to get 4, you need to take 2 off the six. The leave the other 4 as it is. Now I have got 3 fours.

2	+	4	+	6
+		+		-
2		0		2
=		=		=
4		4		4

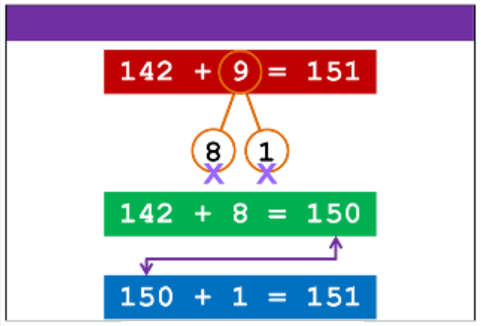
4 × 3 = 12

+ = < > signs and missing numbers

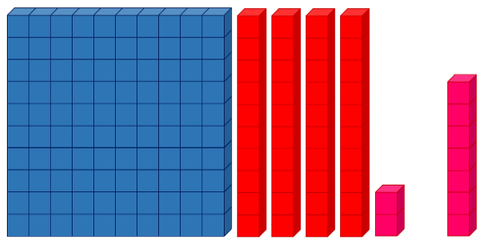


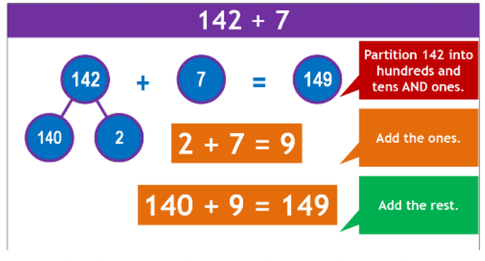
Mental addition 3 digits and 1s

Bridging through multiples of 10



Children partition the single digit you make the next ten and add on the rest. They use Dienes to help them understand what is happening.

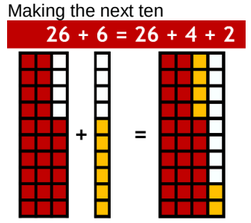




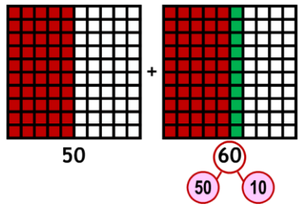
Mental addition 3 digit numbers and 1s with regrouping

Taught strategies

Making the next ten

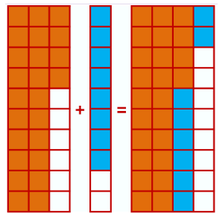


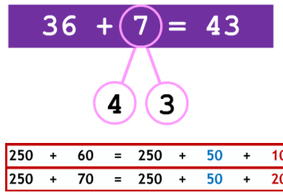
Near doubles

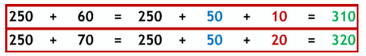


+ = < > signs and missing numbers

Continue using a range of equations as in Year 3,4,5, but with appropriate numbers.



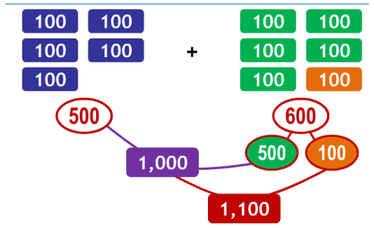


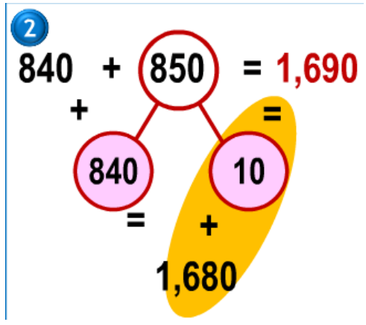


Friendly number pairs

Near doubles

500 + 600 = 1,100



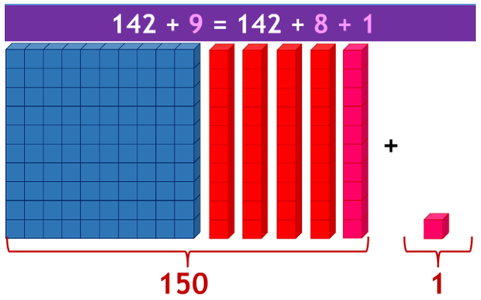


+ = < > signs and missing numbers

Continue using a range of equations as in Year 3,4,5, but with appropriate numbers.

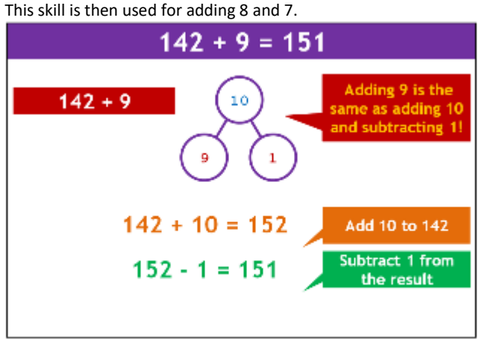
Continue using a range of equations as in Year 3,4,5 but with appropriate numbers.

Children partition the ones digit to find the next multiple of ten (friendly numbers). They then add the rest.



Using compensation

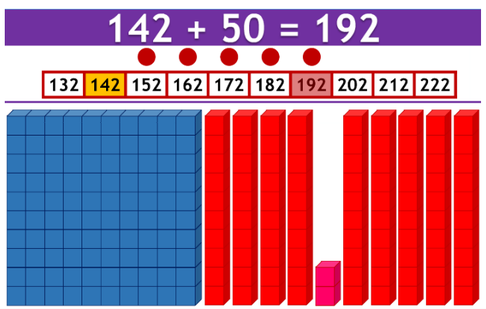
Children learn that adding ten and taking away one is the same as adding nine. This skill is then used for adding 8 and 7.



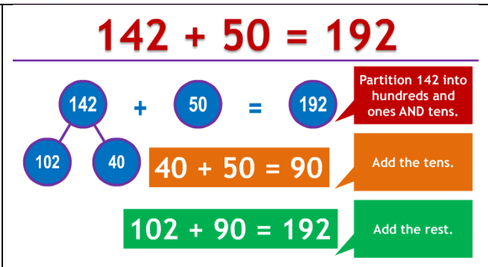
Using compensation

Mental addition 3 digits and tens

Children use partitioning to help add tens to a 3-digit number. They partition the 3-digit number into hundreds and ONES and TENS. They can then add tens and add the rest.



HEARTSACADEMYTRUST

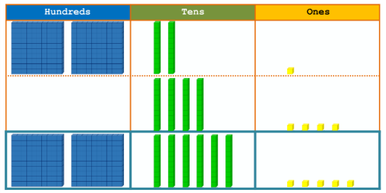
				

HEARTSACADEMYTRUST

Progression for secure written methods.

Written addition method (no regrouping)

Following on from year 2 children continue to use the formal column method of addition. First, they add a 2-digit number to 3 digit numbers using no regrouping. Use Dienes and a pictorial representation alongside the algorithm. Moving quickly from expanded method to compact.

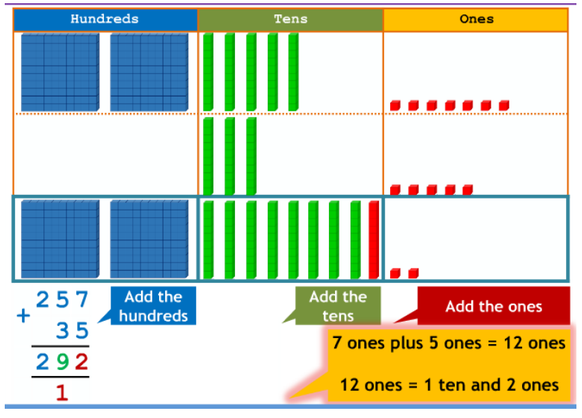



```
  257
+  35
  ---
   12
   80
  200
  ---
  292
```

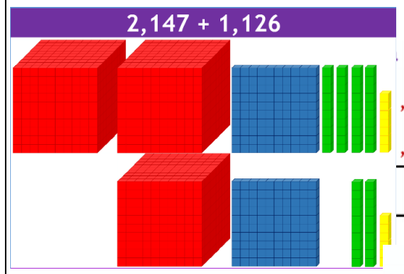
```
  221
+  44
  ---
  265
```

Written addition method (no regrouping)

Once children are secure with no re-grouping they move onto regrouping in the tens and then hundreds. They use Dienes, alongside a pictorial representation and the algorithm. The tens is displayed in the tens column underneath



Add and subtract numbers with up to 4 digits using the formal written methods of columnar addition where appropriate regrouping in the tens, hundreds and thousands.



Add the ones

7 ones and 6 ones make 13 ones. 13 ones are the same as
1 ten and 3 ones

Add the tens

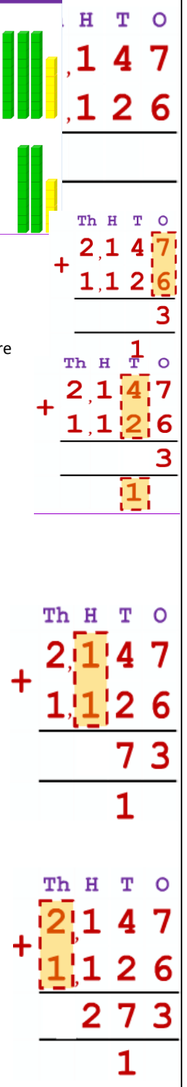
4 tens and 2 tens and 1 ten make 7 tens

Add the hundreds

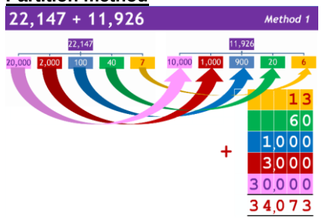
1 hundred plus 1 hundred equals 2 hundreds

Add the thousands

2 thousands plus 1 thousand equals 3 thousands.

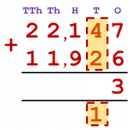


Partition method

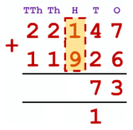


Compact column method

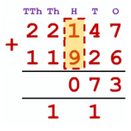
Add the ones.
7 ones and 6 ones make 13 ones. 13 ones are the same as 1 ten and 3 ones.



Add the tens.
4 tens and two tens and one ten make 7 tens.

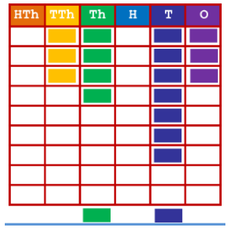


Add the hundreds.
1 hundred and nine hundreds make 10 hundreds.
10 hundreds are the same as 1 thousand.

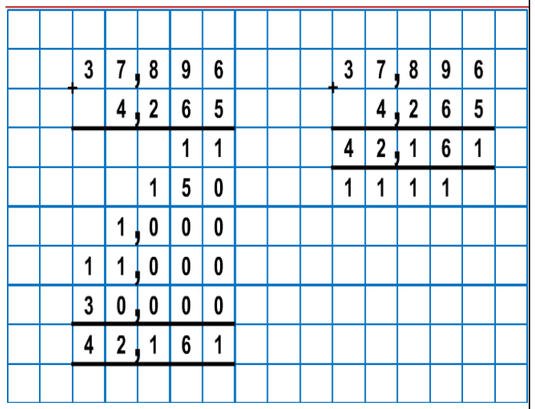


Add the thousands.
2 thousands and 1 thousand and 1 thousand make 4 thousands (don't forget the comma).

Add the ten thousands.
2 ten thousands and 1 ten thousands make 3 ten thousands.



Expanded method and compact method with up to six digit numbers



Extend to numbers with any number of digits and decimals with 1, 2 and/or 3 decimal places. Include money contexts.

13.86 + 9.481 = 23.341

```
  13.86
+  9.481
  23.341
  1 1 1
```

Revert to expanded methods if the children experience any difficulty.

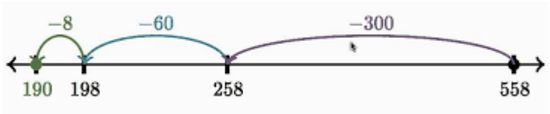
SUBTRACTION GUIDELINES

	Year 3	Year 4	Year 5	Year 6

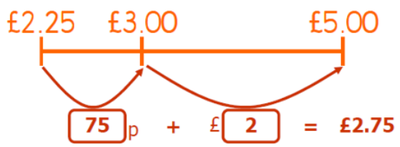
Progression for secure mental methods.

Subtraction using a number line

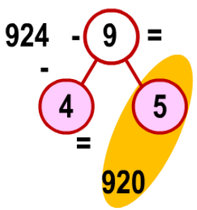
Jottings used to support mental methods of subtraction.



Counting on to find change

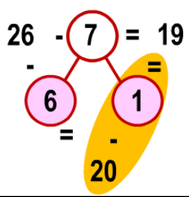


Subtraction – Using partitioning to find the answer



Subtraction - Making the previous ten

The previous ten is 20, so we need to subtract 6. We partition 7 into 6 and 1. Subtract the 6 and then subtract the 1.

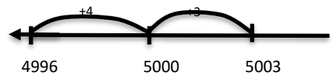


Continue use of jottings to support mental calculations

Count back in repeated steps of 1,10,100 and 1000

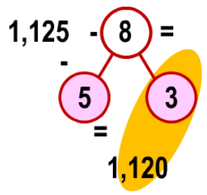
Find a small difference by counting on.

ThHTU – ThHTU e.g. 5003 – 4996 = 7



Making the previous ten

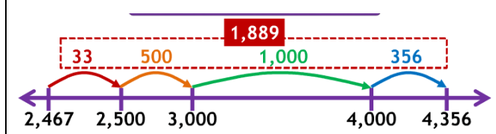
The previous ten is 20, so we need to subtract 5. We partition 8 into 5 and 3. Subtract the 5 and subtract the 3.



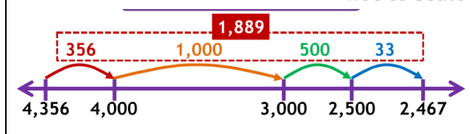
Continue use of jottings to support mental calculations

Count back in repeated steps of 1,10,100 and 1000 from numbers up to 6 digits

Find a difference by counting on/back



not to scale



not to scale

Left to right subtraction

4,356 – 2,467 = 1,889

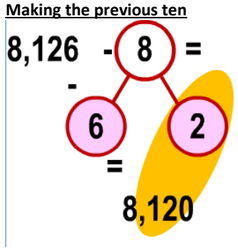
4,356 - 2,000 = 2,356

2,356 - 400 = 1,956

1,956 - 60 = 1,896

1,896 - 7 = 1,889

Making the previous ten



Continue use of jottings to support mental calculations

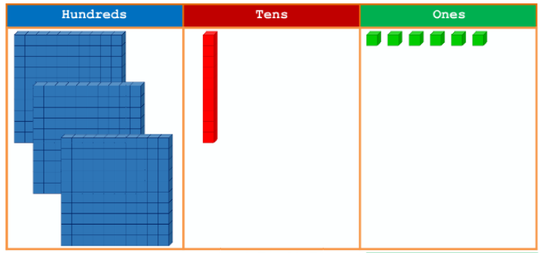
Count back in repeated steps of 1,10,100 and 1000 from numbers up to 6 digits

Revision of key strategies from year 3,4 and 5 using numbers with up to 7 digits.

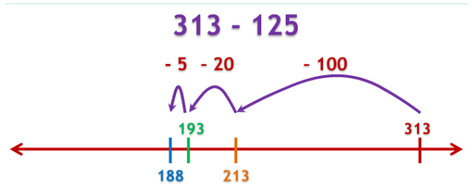
HEARTSACADEMYTRUST

Progression for secure written methods.

Subtraction no regrouping



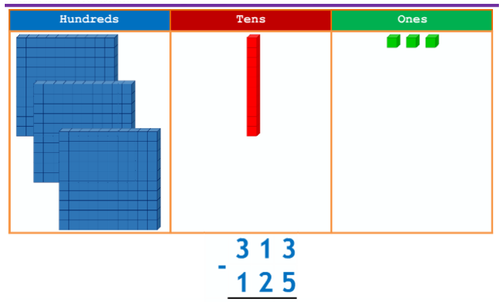
Subtraction with number line



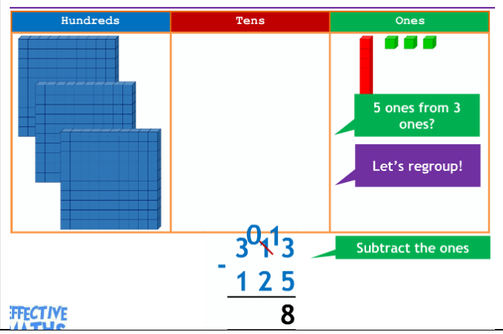
313 - 125 = 313 - 100 - 20 - 5

Subtraction with regrouping

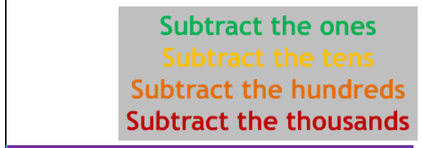
Subtract the ones

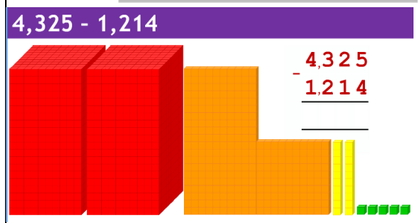


5 ones from 3 ones? That's tricky. Let's regroup



Subtraction with no regrouping





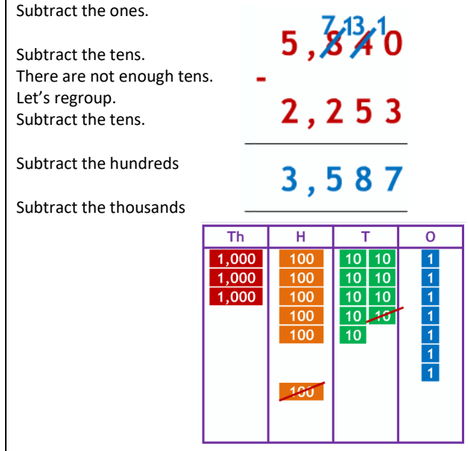
Subtraction with regrouping

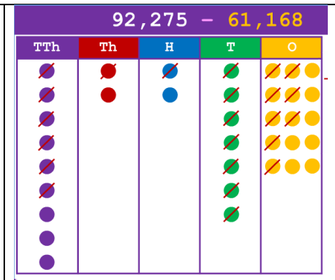
Subtract the ones.
There are not enough ones.
Let's regroup.
Subtract the ones.

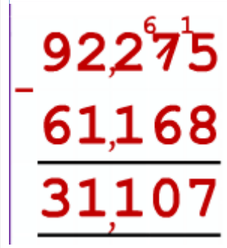
Subtract the tens.
There are not enough tens.
Let's regroup.
Subtract the tens.

Subtract the hundreds

Subtract the thousands





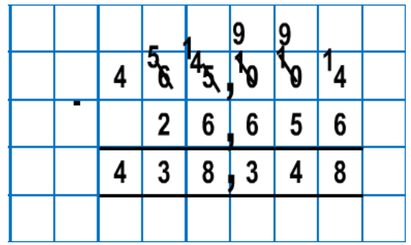


Subtract the ones.
There are not enough ones.
Let's regroup.
Subtract the ones.

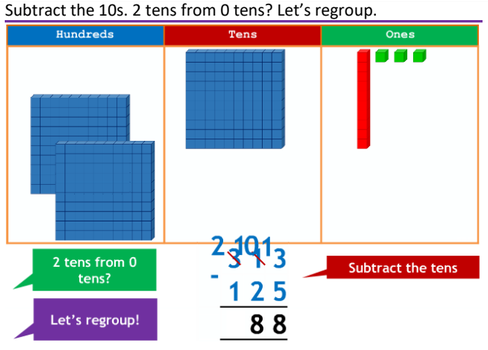
Subtract the tens.
There are not enough tens.
Let's regroup.
Subtract the tens.

Subtract the hundreds.
Subtract the thousands.
Subtract the ten thousands.

Subtraction with regrouping with numbers up to 6 digits



Subtract the 10s. 2 tens from 0 tens? Let's regroup.



Subtract the hundreds. 1 hundred from 2 hundreds.