Hearts Academy Calculation Policy Addition and Subtractions

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
- Construct number sentences alongside their practical addition.
- Support children to make a record in pictures, words or symbols, of addition activities.
- Introduce symbols as ways to record their addition activities
- Use Numicon with subtraction covers to emphasise the relationship between addition and subtraction.
- Children record addition sentences alongside their practical addition.

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.
- Introduce symbols as ways to record their addition activities
- Use Numicon with subtraction covers to emphasise the relationship between addition and subtraction.

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.

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

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.

<table>
<thead>
<tr>
<th>Tens</th>
<th>Ones</th>
<th>Expanded version</th>
<th>Formal written method</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>30 + 1</td>
</tr>
<tr>
<td></td>
<td>+10</td>
<td></td>
<td>+12</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>40 + 3 = 43</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>43</td>
</tr>
</tbody>
</table>

- Column addition, without crossing tens T0 + T , T0 +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

<table>
<thead>
<tr>
<th>Expanded version</th>
<th>Formal written method</th>
</tr>
</thead>
<tbody>
<tr>
<td>45 − 22</td>
<td>45</td>
</tr>
<tr>
<td>45 = 40 and 5</td>
<td>22</td>
</tr>
<tr>
<td>22 = 20 and 2</td>
<td>45</td>
</tr>
<tr>
<td>20 and 3 = 23</td>
<td></td>
</tr>
</tbody>
</table>

- 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.
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 problems.

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.

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.

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 + 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
### Progression for secure mental methods.

#### Year 3

- **Facts for 100 using multiples of 5 and 10**

<table>
<thead>
<tr>
<th>80</th>
<th>20</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

- **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.

  **Friendly number pairs**

  - 17 and 3 are a friendly number pair.
  - They fit together to make 20.

- **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 4

- **Recall and use addition and subtraction facts for 100**

  - **Number line**

    \[ 335 + 200 + 60 + 2 = \]

- **Unlabelled number line addition**

  Friendly number pairs:

  \[ 2 + 4 + 6 \]

  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.

#### 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.

#### Year 6

- **Making the next one, ten and hundred**

  \[ 36 + (7) = 43 \]

  \[ 4 \]

- **Friendly number pairs**

- **Adding 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.

- **Making the next one, ten and hundred**

  \[ 4 \times 3 = 12 \]

  \[ + <= > \text{ signs and missing numbers} \]
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

Friendly number pairs
Near doubles

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.

Mental addition 3 digits and tens
Children use partitioning to help to 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.
142 + 50 = 192

- Partition 142 into hundreds and tens and ones.
- Add the tens: 40 + 50 = 90
- Add the rest: 102 + 90 = 192
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 a 3-digit number using no regrouping. Use Dienes and a pictorial representation alongside the algorithm. Moving quickly from expanded method to compact.

**Written addition method (no regrouping)**

Once children are secure with no regrouping, 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.

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

<table>
<thead>
<tr>
<th>13.86</th>
<th>+</th>
<th>9.481</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23.341</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SUBTRACTION GUIDELINES

**Partition 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 2 tens and 1 ten make 7 tens.

Add the hundreds.

1 hundred and 9 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 and compact method with up to four digit numbers**

<table>
<thead>
<tr>
<th>37896</th>
<th>+</th>
<th>4265</th>
</tr>
</thead>
<tbody>
<tr>
<td>84161</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

Revert to expanded methods if the children experience any difficulty.
Progression for secure mental methods.

**Subtraction using a number line**

Jottings used to support mental methods of subtraction.

![Number Line Diagram](image1)

**Counting on to find change**

The previous ten is 10, so we need to subtract 5. We partition 8 into 5 and 3.

1. Subtract the 5.
2. Subtract the 3.

**Making the previous ten**

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

1. Subtract the 6.
2. Subtract the 1.

**Left to right subtraction**

4,356 - 2,000 = 2,356
2,356 - 400 = 1,956
1,956 - 60 = 1,896
1,896 - 7 = 1,889

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

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

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.

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

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.
Progression for secure written methods.

Subtraction no regrouping

Subtraction with no regrouping

<table>
<thead>
<tr>
<th>4,325</th>
<th>-1,214</th>
</tr>
</thead>
<tbody>
<tr>
<td>4325</td>
<td>1214</td>
</tr>
<tr>
<td>311</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
</tr>
</tbody>
</table>

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.

Subtraction with regrouping with numbers up to 6 digits

<table>
<thead>
<tr>
<th>92,275</th>
<th>-61,168</th>
</tr>
</thead>
<tbody>
<tr>
<td>92275</td>
<td>61168</td>
</tr>
<tr>
<td>31107</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
</tr>
</tbody>
</table>

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

Subtract the hundreds. 1 hundred from 2 hundreds.