

## CALCULATION POLICY: ADDITION AND SUBTRACTION

### Mission Statement:

By living out our Catholic faith

TOGETHER

we ENCOURAGE

and ACHIEVE.

*He has called you by name.*

### Introduction:

This policy outlines the teaching, organisation and management of mathematics taught and learnt at Sacred Heart. The policy is based on the 2014 expectations and aims of the 'New Curriculum' for mathematics and the Early Years 'Development Matters' EYFS document. This ensures continuity and progression in the learning and teaching of mathematics. The policy has been drawn up by the mathematics leader, shared and discussed with all staff and has the full agreement of the Governing Body.

### Aims:

The National Curriculum for mathematics aims to ensure that all pupils:

- become **fluent** in the fundamentals of mathematics, including through varied and frequent practice with increasingly complex problems over time, so that pupils have conceptual understanding and are able to recall and apply their knowledge rapidly and accurately to problems
- **reason mathematically** by following a line of enquiry, conjecturing relationships and generalisations, and developing an argument, justification or proof using mathematical language
- can **solve problems** by applying their mathematics to a variety of routine and non-routine problems with increasing sophistication, including breaking down problems into a series of simpler steps and persevering in seeking solutions.

Mathematics is a subject in which pupils need to be able to move fluently between representations of mathematical ideas. The programmes of study are organised in a distinct sequence and structured into separate domains. Pupils should make connections across mathematical ideas to develop fluency, mathematical reasoning and competence in solving increasingly sophisticated problems. They should also apply their mathematical knowledge to science and other subjects.



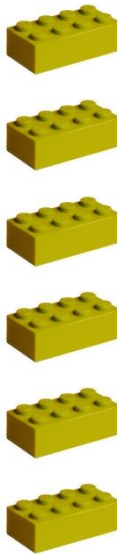
## Numbers as objects



Max has **MORE** than Ann  
Max has the **MOST**

Ann has **LESS** than Max  
Ann has the **LEAST**

## One more and one less

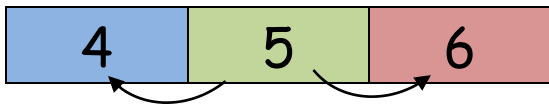
4	5	6
		

4 is 1 less  
than 5

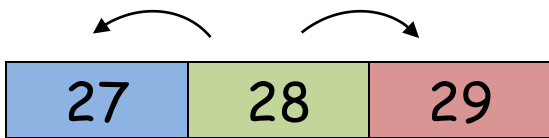
5

6 is 1 more  
than 5

## One more or less



1 less than 1 more than



## Total number in two groups

$2 + 6 = 8$

Dice 1 and Dice 2 altogether

## Mathematical statements involving (+) (-) and (=)

**We read:** 2 added to 6 makes 8

**We write:**  $2 + 6 = 8$

**We read:** 8 subtract 2 makes 6

**We write:**  $8 - 2 = 6$

## Number bonds



Number

$$1 + 9 = 10 \quad \text{OR} \quad 9 + 1 = 10$$

$$10 - 1 = 9 \quad \text{OR} \quad 10 - 9 = 1$$

bonds

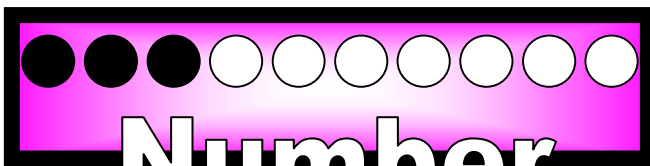


to 10!  
Number

$$2 + 8 = 10 \quad \text{OR} \quad 8 + 2 = 10$$

$$10 - 2 = 8 \quad \text{OR} \quad 10 - 8 = 2$$

bonds



Number

$$3 + 7 = 10 \quad \text{OR} \quad 7 + 3 = 10$$

$$10 - 3 = 7 \quad \text{OR} \quad 10 - 7 = 3$$

bonds

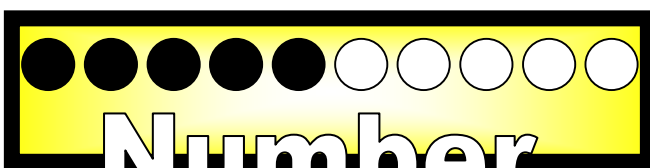


to 10!  
Number

$$4 + 6 = 10 \quad \text{OR} \quad 6 + 4 = 10$$

$$10 - 4 = 6 \quad \text{OR} \quad 10 - 6 = 4$$

bonds



Number

$$5 + 5 = 10$$

bonds

$10 - 5 = 5$

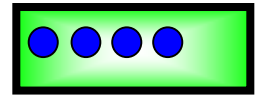
## Addition and subtraction (to be taught alongside)

### Addition

Example:

$$\begin{array}{r} 8 + 6 \\ \phantom{8} + 2 \phantom{4} \\ \hline = 10 + 4 \\ = 14 \end{array}$$

I need +2 to make 10



Number

r

bond

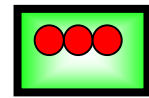
ds

### Subtraction

Example:

$$\begin{array}{r} 13 - 5 \\ \phantom{13} - 3 \phantom{2} \\ \hline = 10 - 2 \\ = 8 \end{array}$$

I need -3 to make 10



Number

r

bond

ds

## Addition & subtraction problems

3 balloons and 4 balloons make 7 balloons



We can write:  $3 + 4 = 7$

7 balloons but 3 balloons burst leaves 4 balloons



We can write:  $7 - 3 = 4$

**NOTICE**  $7 - 3 = 4$

$$\begin{array}{c} \uparrow \\ 3 + 4 \end{array}$$

# Words for ADD

altogether

sum of

total

plus

## Addition facts to 10

●	●	●	●	●	●	●	●	●	10
1	●	●	●	●	●	●	●	●	9
●	2	●	●	●	●	●	●	●	8
●	●	3	●	●	●	●	●	●	7
●	●	●	4	●	●	●	●	●	6
●	●	●	●	5	●	●	●	●	5
●	●	●	●	●	6	●	●	●	4
●	●	●	●	●	●	7	●	●	3
●	●	●	●	●	●	●	8	●	2
●	●	●	●	●	●	●	●	9	1

$0 + 10$	$1 + 9$	$2 + 8$	$3 + 7$	$4 + 6$
$10 + 0$	$9 + 1$	$8 + 2$	$7 + 3$	$6 + 4$
		$5 + 5$		

## Addition facts to 20

$10 + 10$	$11 + 9$	$12 + 8$	$13 + 7$	$14 + 6$
$15 + 5$	$16 + 4$	$17 + 3$	$18 + 2$	$19 + 1$
		$20 + 0$		

# Words for SUBTRACT

take away

how many left?

difference

how many more?

how many less?

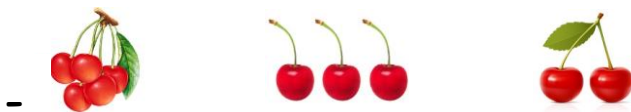
**Subtraction is the inverse of addition**



$$3 + 2 = 5$$



$$5 - 2 = 3$$



$$5 - 3 = 2$$

**Watch out!!!!!!**

**7 + 3 = 10 is the same as 3 + 7**



**10 - 7 = 3 is NOT the same as 7 - 10**






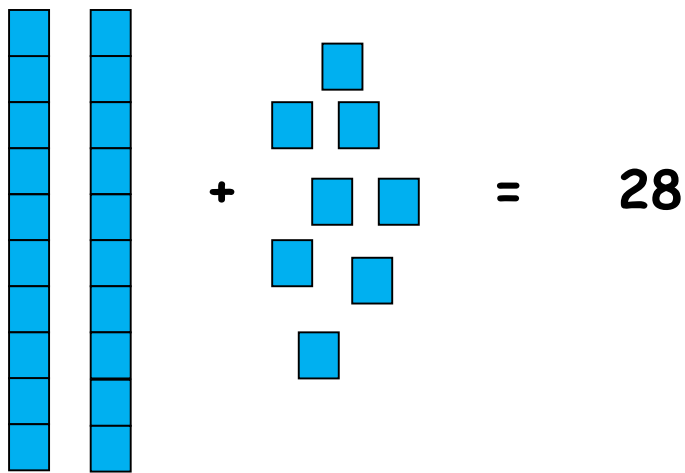
# Strategies for adding & subtracting larger numbers

(CONCRETE)

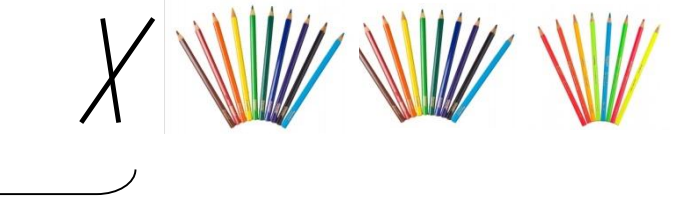
Introduce by using every day and practical resources



A concrete addition strategy using pencils. On the left, a bracket groups two bundles of 10 pencils each, representing the number 20. To the right of these are two more bundles of 4 pencils each, representing the number 8. Below the pencils is the equation  $20 + 8 = 28$ .

$$20 + 8 = 28$$


A concrete addition strategy using blocks. On the left, there are two vertical towers of 10 blue blocks each, representing the number 20. To the right of these is a group of 8 scattered blue blocks, representing the number 8. Below the blocks is the equation  $= 28$ .

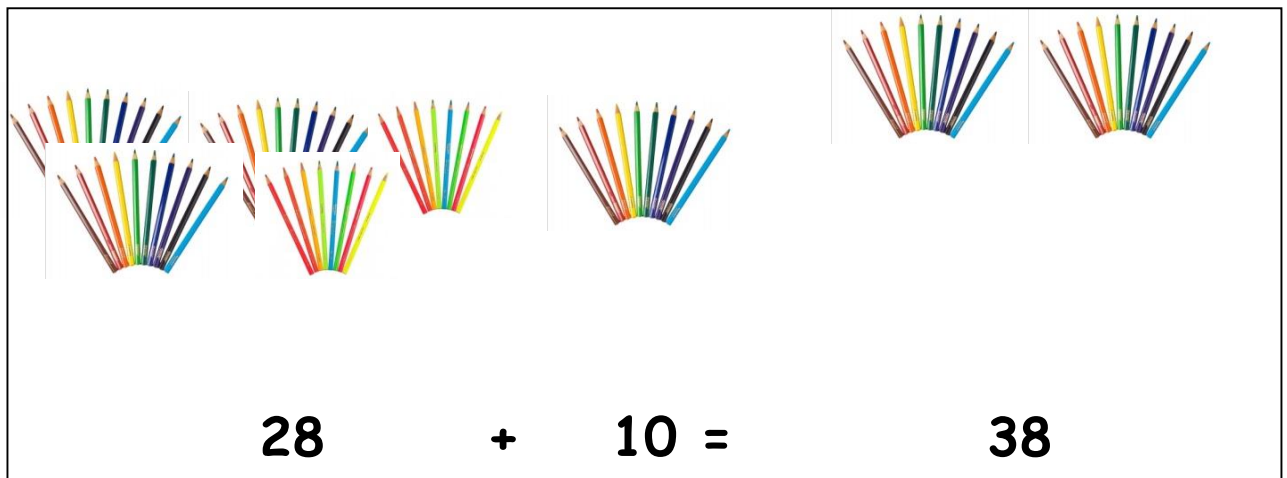
$$= 28$$


A concrete subtraction strategy using pencils. On the left, a large 'X' is drawn over a bracket that groups three bundles of 10 pencils each, representing the number 28. To the right of these are two more bundles of 4 pencils each, representing the number 8. Below the pencils is the equation  $28 - 3 = 25$ .

$$28 - 3 = 25$$

When children can carry out similar calculations then ...

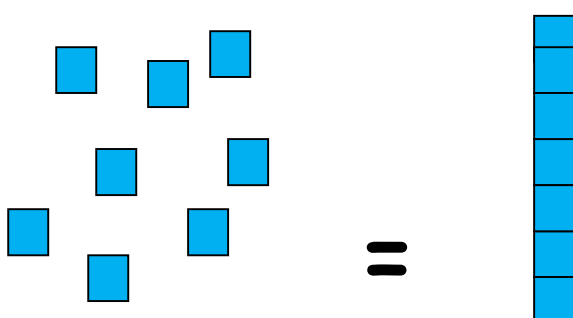
(PICTORIAL REPRESENTATIONS)



A pictorial representation of the addition 28 + 10 = 38. On the left, there are two groups of 10 colored pencils each, representing 20, and eight individual colored pencils, representing 8. In the middle, there is a single group of 10 colored pencils, representing 10. On the right, there are two groups of 19 colored pencils each, representing 38. Below the pencils is the equation:  $28 + 10 = 38$ .

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

Model using tens and ones equipment.





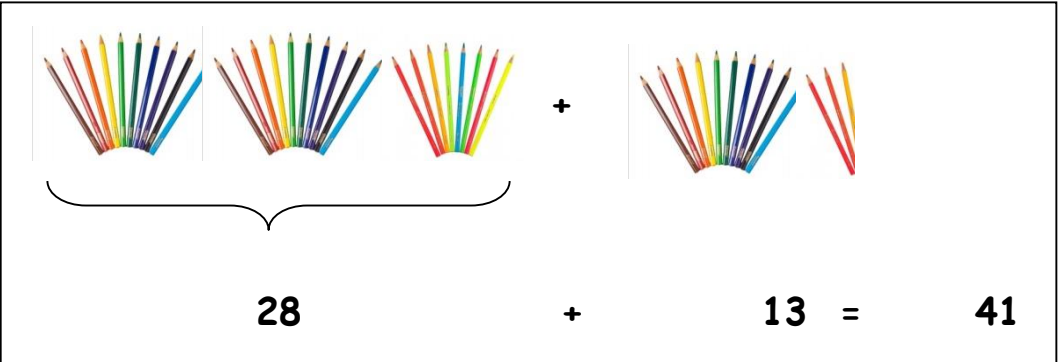
**28 - 10 = 18**

Show that when we add or subtract 10 we jump on (up) and jump back (down) on a 100 square.

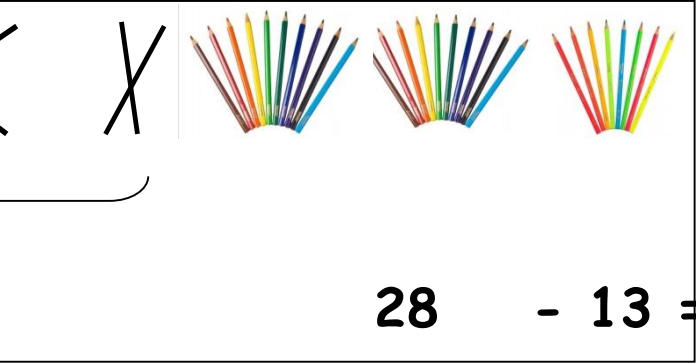
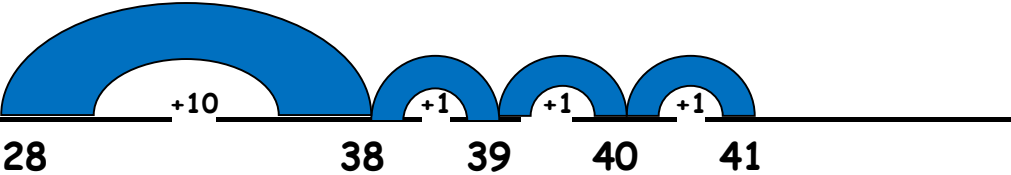
The ones do not change.

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

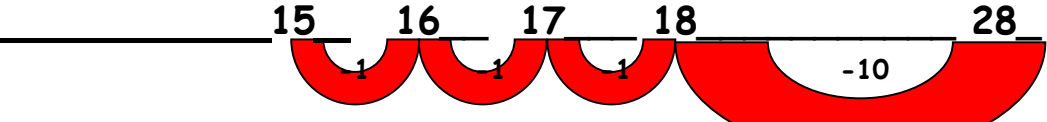
When children are confident using practical equipment and place value then introduce blank number lines to add and subtract the tens and the units.



To add jump on along the top



To subtract jump back along the bottom



When children are confident with concept practically and pictorially then we introduce symbolic representations.

**Expanded Method**

$28 + 13 =$

$$\begin{array}{r} 28 = 20 + 8 \\ + \underline{13} = \underline{10 + 3} \\ \underline{41} = \underline{40 + 1} \\ \phantom{0}1 \phantom{0}10 \end{array}$$

**Compact Method**

$28 + 13 =$

$$\begin{array}{r} 28 \\ + \underline{13} \\ \underline{41} \\ \phantom{0}1 \end{array}$$

**Expanded Method**

$28 - 13 =$

$$\begin{array}{r} 28 = 20 + 8 \\ - \underline{13} = \underline{10 + 3} \\ \underline{15} = \underline{10 + 5} \end{array}$$

**Compact Method**

$28 - 13 =$

$28$

$$\begin{array}{r} - 13 \\ \underline{15} \end{array}$$

## Fact family for add and subtract

$$13 + 7 = 20$$

$$7 + 13 = 20$$


$$20 - 13 = 7$$

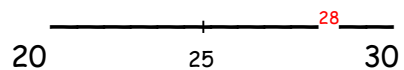
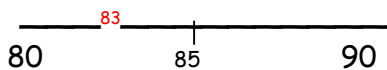
$$20 - 7 = 13$$

## Estimating answers to calculations

- Round each number up or down.

$$83 \begin{array}{c} \downarrow \\ 80 \end{array}$$

$$28 \begin{array}{c} \uparrow \\ 30 \end{array}$$



- Then do the calculation
- Check using the inverse

Example: Estimate  $83 - 28$

$$80 - 30 = 50$$

$$\text{Inverse: } 50 + 30 = 80 \checkmark$$

## Missing number problems

Fact family for +/-

$$34 + 23 = 57$$

$$57 - 23 = 34$$

$$23 + 34 = 57$$

$$57 - 34 = 23$$

## Mental methods for addition

Add 3 digit numbers mentally

### Partitioning

$$236 + 319$$

I start by partitioning the number into Hundreds, Tens and Ones:

$$\begin{aligned} & 200 + 30 + 6 + 300 + 10 + 9 \\ &= 500 + 40 + 15 \\ &= 555 \end{aligned}$$

Now I add up the Hundreds,  
Tens and Ones separately.

Now I need to recombine.

Think of:  $45 + 32$  as  $45 + 30 + 2$

- But in your head say: 45 75 77

Think of:  $1236 + 415$  as  $1236 + 400 + 10 + 5$

- But in your head say: 1236 1636 1646 1651



## Mental methods for subtraction

### Subtract 3 digit numbers mentally

$$363 - 126$$

#### Partitioning

$$\begin{aligned} & \overleftarrow{\quad} \overrightarrow{\quad} \\ & 363 - 100 - 20 - 6 \\ & = 263 - 20 - 6 \\ & = 243 - 6 \\ & = 237 \end{aligned}$$

#### Counting on from 126

$$\begin{aligned} & (126) + 4 \\ & 130 + 3 \\ & 133 + 230 \\ & = 363 \end{aligned}$$

Think of:  $56 - 32$  as  $56 - 30 - 2$

- But in your head say: 56      26      24

Think of:  $1236 - 415$  as  $1236 - 400 - 10 - 5$

- But in your head say: 1236      836      826      821 **Start**  
from **LEFT to RIGHT**

$$\text{Answer} = 237$$

## Written method for addition

- Line up the digits in the correct columns

### Expanded Method

e.g.  $132 + 239$

$$\begin{array}{r} \text{H T U} \\ 1 \ 3 \ 2 \\ + \underline{2 \ 3 \ 9} \\ \hline 3 \ 7 \ 1 \end{array} \quad \begin{array}{l} = 100 + 30 + 2 \\ = \underline{200 + 30 + 9} \\ \underline{300 + 70 + 1} \\ 10 \end{array}$$

### Compact Method

$$\begin{array}{r} \text{H T U} \\ 1 \ 3 \ 2 \\ + \underline{2 \ 3 \ 9} \\ \hline 3 \ 7 \ 1 \\ 1 \end{array}$$

## Written method for subtraction

- Line up the digits in the correct columns

e.g.  $327 - 119$

### Expanded Method

$$\begin{array}{r} \text{H T U} \\ 3 \ 2 \ 7 \\ - \underline{1 \ 1 \ 9} \\ \underline{2 \ 0 \ 8} \end{array} \qquad \begin{array}{l} 10 \\ = 300 + \cancel{20} + ^17 \\ = \underline{100 + 10 + 9} \\ \underline{200 + 00 + 8} \end{array}$$

### Compact Method

$$\begin{array}{r} \text{H T U} \\ 3 \ \cancel{2} \ ^17 \\ - \underline{1 \ 1 \ 9} \\ \underline{2 \ 0 \ 8} \end{array}$$

## Add & subtract

- Line up digits from right to left

Example 1: Add 4735 and 386

$$\begin{array}{r} 4735 \\ + 386 \\ \hline 5121 \\ \hline \end{array}$$

1 1 1

$$\begin{array}{r} 4735 \\ + 386 \\ \hline 5121 \\ \hline \end{array}$$

Example 2: Subtract 637 from 2476

$$\begin{array}{r} 2476 \\ - 637 \\ \hline 1839 \\ \hline \end{array}$$

$$\begin{array}{r} 2476 \\ - 637 \\ \hline 1839 \\ \hline \end{array}$$

## Adding 3 numbers

- Line up the digits in the correct columns
- Start from RIGHT to LEFT

e.g.  $48 + 284 + 9$

H	T	U
	4	8
2	8	4
		<u>9</u> +
<u>3</u>	<u>4</u>	<u>1</u>
1	2	

- Line up the digits in the correct columns

e.g.  $48\text{p} + \text{£}2.84 + \text{£}9$

0	.	4	8
2	.	8	4
9	.	0	0
<u>          </u> +			
£1	2	.	3 2
	<u>1</u>	<u>1</u>	<u>1</u>

