

Sacred Heart Catholic Primary School



Whole School Written Calculation Policy Pencil and paper procedures Key Stages 1 and 2

Addition

Level 1

+ = signs and missing numbers

$$3 + 4 = \square \qquad \square = 3 + 4$$

$$3 + \square = 7 \qquad 7 = \square + 4$$

$$\square + 4 = 7 \qquad 7 = 3 + \square$$

$$\square + \nabla = 7 \qquad 7 = \square + \nabla$$

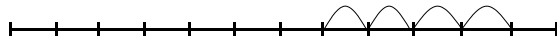
Promoting covering up of operations and numbers.

Number lines (blank)

Using blank number lines

(Teacher model number lines with missing numbers)

$$7 + 4 = 11$$



Level 2

+ = signs and missing numbers

Continue using a range of equations as in Year 1 but with appropriate, larger numbers.
Extend to
 $14 + 5 = 10 + \square$
and adding three numbers
 $32 + \square + \square = 100 \quad 35 = 1 + \square + 5$

Partition into tens and ones and recombine

$$12 + 23 = 10 + 2 + 20 + 3$$

$$= 30 + 5$$

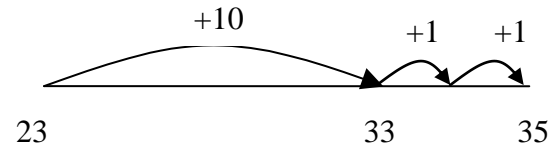
$$= 35$$

refine to partitioning the second number only:

$$23 + 12 = 23 + 10 + 1 + 1$$

$$= 33 + 1 + 1$$

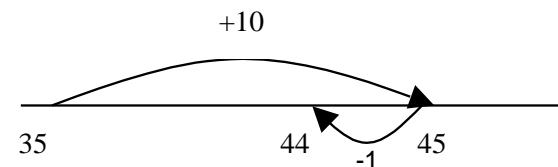
$$= 35$$



Mental Method

Add 9 or 11 by adding 10 and adjusting by 1

$$35 + 9 = 44$$



Level 3 (Low)

+ = signs and missing numbers

Continue using a range of equations as in Year 1 and 2 but with appropriate, larger numbers.

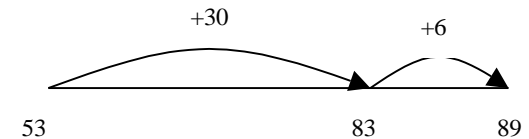
Partition into tens and ones and recombine

Partition both numbers and recombine. Refine to partitioning the second number only e.g.

$$36 + 53 = 53 + 30 + 6$$

$$= 83 + 6$$

$$= 89$$



Add a near multiple of 10 to a two-digit number

Continue as in Year 2 but with appropriate numbers e.g. $35 + 19$ is the same as $35 + 20 - 1$.

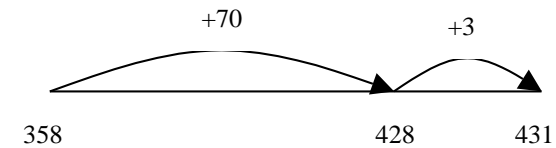
Partition into hundreds, tens and ones and recombine

Either partition both numbers and recombine or partition the second number only e.g.

$$358 + 73 = 358 + 70 + 3$$

$$= 428 + 3$$

$$= 431$$



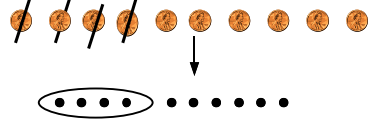
| Addition | | |
|---|--|---|
| Level 3 (secure) | Level 4 | Level 5 |
| <p>Pencil and paper procedures</p> <p>83 + 42 = 125</p> <p style="text-align: right;">Progressing to units first</p> $\begin{array}{r} 80 + 3 \\ + 40 + 2 \\ \hline 120 + 5 = 125 \end{array}$ <p style="margin-left: 150px;">to</p> $\begin{array}{r} 83 \\ + 42 \\ \hline 125 \end{array}$ <p>358 + 73 = 431</p> <p>either</p> $\begin{array}{r} 300 + 50 + 8 \\ + \quad 70 + 3 \\ \hline 300 + 120 + 11 = 431 \end{array}$ | <p>Pencil and paper procedures</p> <p>Leading to formal method, showing numbers carried underneath</p> $\begin{array}{r} 358 \\ + 73 \\ \hline 431 \\ \hline \text{11} \end{array}$ <p>Extend to numbers with at least four digits</p> $3587 + 675 = 4262$ $\begin{array}{r} 3587 \\ + 675 \\ \hline 4262 \\ \hline \text{111} \end{array}$ <p>Extend to decimals (same number of decimals places) and adding several numbers (with different numbers of digits). <i>Model negative numbers using a number line.</i></p> | <p>Pencil and paper procedures</p> <p>Extend to numbers with any number of digits and decimals with 1 and 2 decimal places.</p> $124.9 + 117.25 = 242.15$ <p style="text-align: right;"><i>add in a zero to keep the place value</i></p> $\begin{array}{r} 124.90 \\ + 117.25 \\ \hline 242.15 \\ \hline \text{11} \end{array}$ |

Subtraction

Level 1

Pictures / marks

Sam spent 4p. What was his change from 10p?



- = signs and missing numbers

| | |
|------------------------|------------------------|
| $7 - 3 = \square$ | $\square = 7 - 3$ |
| $7 - \square = 4$ | $4 = \square - 3$ |
| $\square - 3 = 4$ | $4 = 7 - \square$ |
| $\square - \nabla = 4$ | $4 = \square - \nabla$ |

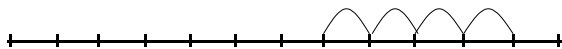
Visual / practical activities

Number lines (empty)



The difference between 7 and 11
(Counting on)

To reinforce concept. Practical strategies essential to see 'difference'.



Recording by - drawing jumps on prepared lines
- constructing own lines

(Teachers model jottings appropriate for larger numbers)

Level 2

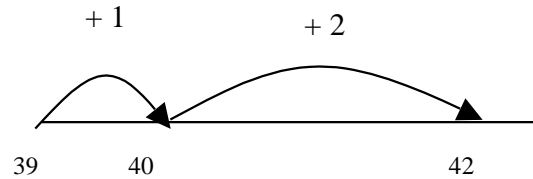
- = signs and missing numbers

Continue using a range of equations as in Level 1 but with appropriate numbers.

Extend to $14 + 5 = 20 - \square$

Find a small difference by counting up

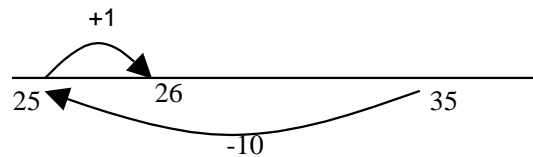
$$42 - 39 = 3$$



Mental Method

Subtract 9 or 11. Begin to add/subtract 19 or 21

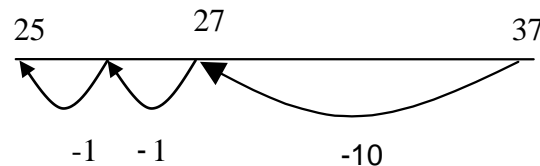
$$35 - 9 = 26$$



Use known number facts and place value to subtract

(partition second number only)

$$\begin{aligned} 37 - 12 &= 37 - 10 - 2 \\ &= 27 - 2 \\ &= 25 \end{aligned}$$



Level 3 (low)

Find a small difference by counting up

Continue as in Level 2 but with appropriate numbers e.g. $102 - 97 = 5$

Use known number facts and place value to subtract

Continue as in Level 2 but with appropriate numbers e.g. 3 digit number - 2 digit number.

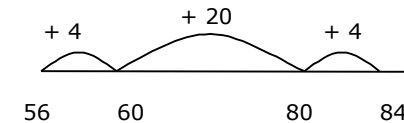
$$197 - 15 = 182$$



Pencil and paper procedures

Complementary addition

$$84 - 56 = 28$$

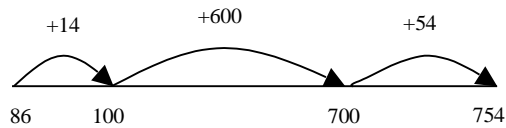


Subtraction

Level 3 (Secure)

Pencil and paper procedures

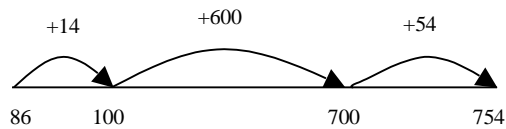
Complementary addition
 $754 - 86 = 668$



$$\begin{array}{r} 98 \\ - 24 \\ \hline 4 \quad (8-4) \\ 70 \quad (90-20) \\ \hline 74 \end{array}$$

Pencil and paper procedures

Complementary addition
 $754 - 86 = 668$



Use decomposition with top set when appropriate

$$\begin{array}{r} 90 + 2 \quad \longrightarrow \quad 80 + 12 \\ 30 + 8 \quad \quad \quad - \quad 30 + 8 \\ \hline \quad \quad \quad \quad \quad \quad 50 + 4 \end{array}$$

Level 4

Find a difference by counting up

e.g. $8006 - 2993 = 5013$
 This can be modelled on an empty number line

Pencil and paper procedures

$$\begin{array}{r} 8 \quad 1 \\ \cancel{8} \quad 2 \\ - \quad 3 \quad 8 \\ \hline 5 \quad 4 \end{array}$$

Level 5

- = signs and missing numbers

Pencil and paper procedures

Use decomposition

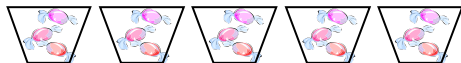
$$\begin{array}{r} 2 \quad 4 \quad 1 \\ \cancel{3} \quad \cancel{5} \quad 2 \\ - \quad 1 \quad 7 \quad 8 \\ \hline 1 \quad 7 \quad 4 \end{array}$$

Multiplication

Level 1

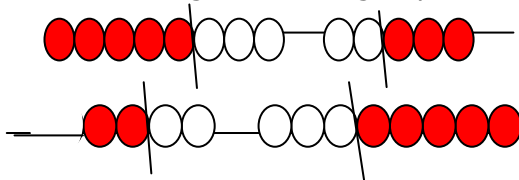
Pictures and symbols

There are 3 sweets in one bag.
How many sweets are there in 5 bags?



(Recording on a number line modelled by the teacher when solving problems)

Use of bead strings to model groups of.



Level 2

x = signs and missing numbers

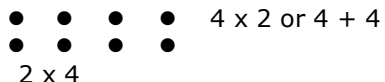
$$7 \times 2 = \square \qquad \square = 2 \times 7$$

$$7 \times \square = 14 \qquad 14 = \square \times 7$$

$$\square \times 2 = 14 \qquad 14 = 2 \times \square$$

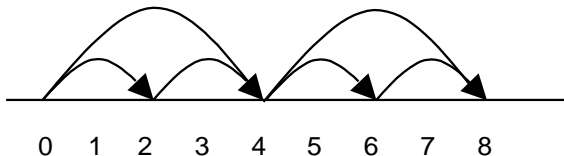
$$\square \times \nabla = 14 \qquad 14 = \square \times \nabla$$

Arrays and repeated addition



or repeated addition

$$2 + 2 + 2 + 2$$



Doubling multiples of 5 up to 50

$$15 \times 2 = 30$$

Partition

$$\begin{array}{r} (10 \times 2) + (5 \times 2) \\ 20 \quad + \quad 10 \\ \hline = 30 \end{array}$$

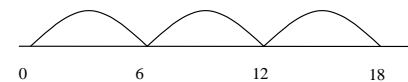
Level 3 (Low)

x = signs and missing numbers

Continue using a range of equations as in Level 2 but with appropriate numbers.

Number lines

$$6 \times 3$$



$$35 \times 2 = 70$$

Partition

| | | |
|---|----|----|
| x | 30 | 5 |
| 2 | 60 | 10 |

Multiplication

Level 3 (Secure)

Pencil and paper procedures

Grid method

TU x U

23 x 7 is approximately 20 x 10 = 200

23 x 7 = 161

| | | |
|---|-----|----|
| | T | U |
| x | 20 | 3 |
| 7 | 140 | 21 |

HTU x U

123 x 3 = 369

| | | | |
|---|-----|----|---|
| | H | T | U |
| x | 100 | 20 | 3 |
| 3 | 300 | 60 | 9 |

Level 4

x = signs and missing numbers

Continue using a range of equations as in Year 2 but with appropriate numbers

Pencil and paper procedures

Grid method

72 x 38 is approximately 70 x 40 = 2800

| | | | |
|----|------|----|------------------|
| x | 70 | 2 | |
| 30 | 2100 | 60 | = 2160 |
| 8 | 560 | 16 | = <u>576</u> + |
| | | | <u>2736</u> 1 |

Estimate and check

Moving on to formal method when appropriate.
'Carried' numbers to sit on top line of answer box

1125 x 7 = 7875

| | | | | |
|---|------|-----|-----|----|
| | Th | H | T | U |
| x | 1000 | 100 | 20 | 5 |
| 7 | 7000 | 700 | 140 | 35 |

Only for children who already know this method (and are accurate with it).

$$\begin{array}{r}
 1125 \\
 \times \quad 7 \\
 \hline
 7875 \\
 13 \\
 \hline
 \end{array}$$

and TU x TU, HTU x TU

Level 5

x = signs and missing numbers

Continue using a range of equations as in Year 2 but with appropriate numbers

Pencil and paper procedures

Grid method

Estimate and check

372 x 24 is approximately 400 x 20 = 8000

| | | | | |
|----|------|------|----|-----------------|
| x | 300 | 70 | 2 | |
| 20 | 6000 | 1400 | 40 | = 7440 |
| 4 | 1200 | 280 | 8 | = <u>1488</u> + |
| | | | | <u>8928</u> |

Grid method for decimals

7.2 x 3.8

| | | | |
|-----|-----|------|-------------------|
| x | 7 | 0.2 | |
| 3 | 21 | 0.6 | = 21.60 |
| 0.8 | 5.6 | 0.16 | = <u>5.76</u> + |
| | | | <u>27.36</u> 1 |

Only for children who already know this method (and are accurate with it).

$$\begin{array}{r}
 125 \\
 \times \quad 7 \\
 \hline
 875 \\
 13 \\
 \hline
 \end{array}$$

Division

Level 1

Pictures / marks

12 children get into teams of 4 to play a game.
How many teams are there?



Level 2

\div = signs and missing numbers

$$6 \div 2 = \square \qquad \square = 6 \div 2$$

$$6 \div \square = 3 \qquad 3 = 6 \div \square$$

$$\square \div 2 = 3 \qquad 3 = \square \div 2$$

$$\square \div \nabla = 3 \qquad 3 = \square \div \nabla$$

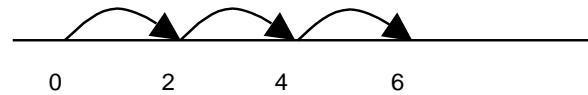
Understand division as sharing and grouping

Sharing – 6 sweets are shared between 2 people. How many do they have each?



$6 \div 2$ can be modelled as:

Grouping – There are 6 sweets. How many people can have 2 each? (How many 2's make 6?)



Level 3 (low)

\div = signs and missing numbers

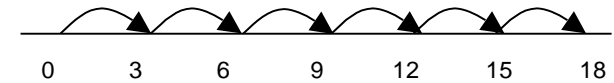
Continue using a range of equations as in Level 2 but with appropriate numbers.

Understand division as sharing and grouping

$18 \div 3$ can be modelled as:

Sharing – 18 shared between 3 (see Level 2 diagram)

Grouping - How many 3's make 18?

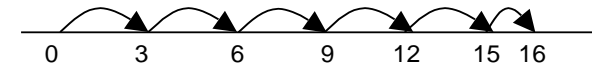


Remainders

$16 \div 3 = 5 \text{ r}1$

Sharing - 16 shared between 3, how many left over?

Grouping – How many 3's make 16, how many left over?
e.g.



Division

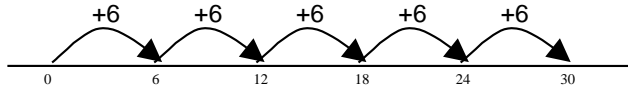
Level 3 (secure)

÷ = signs and missing numbers

Recall methods from year 3

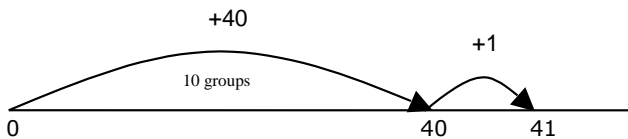
Sharing and grouping

30 ÷ 6 can be modelled as:
grouping – groups of 6 taken away and the number of groups counted e.g.



sharing – sharing among 6, the number given to each person

$41 \div 4 = 10 \text{ r}1$



OR $41 = (10 \times 4) + 1$

Level 4

÷ = signs and missing numbers

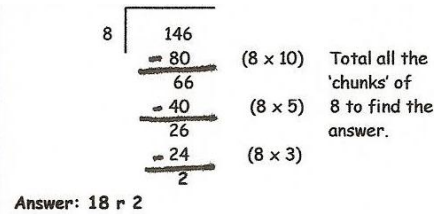
Recall methods from year 4

Remainders

Quotients expressed as fractions or decimal fractions
 $61 \div 4 = 15 \frac{1}{4}$ or 15.25

Pencil and paper procedures

Using chunking for division



Level 5

÷ = signs and missing numbers

Remainders

Quotients expressed as fractions or decimal fractions
 $676 \div 8 = 84.5$

Pencil and paper procedures

$977 \div 36$ is approximately $1000 \div 40 = 25$

Using chunking for division of larger number and dividing by 2-digit numbers. See e.g. in Level 4.