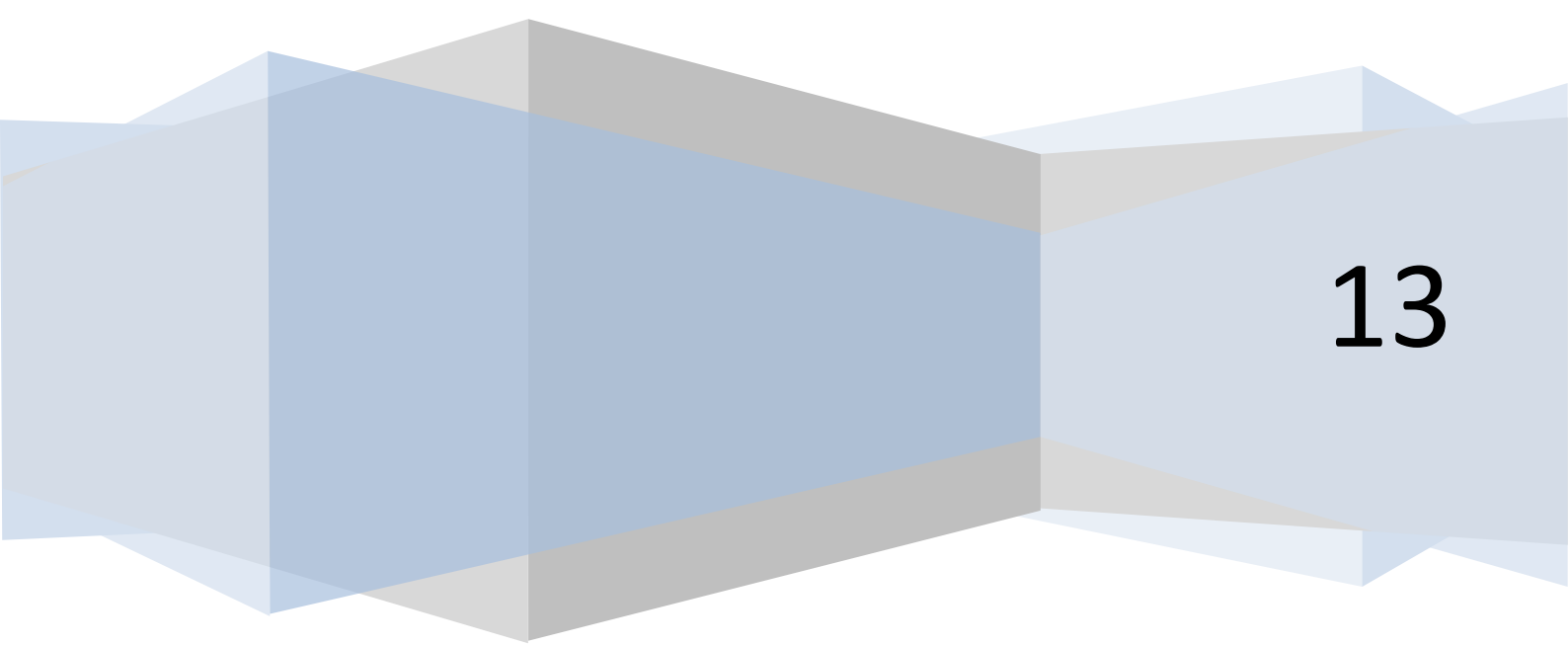


# Policy for Written Calculation

Ingatestone and Fryerning C of E Junior School



13

## **Ingatestone and Fryerning C of E Junior School Calculation Policy**

*The content of this policy is to give guidance regarding the progression which the majority of pupils will make. Developments are grouped into stages and not year groups to enable the teacher to identify and plan for the needs of each individual child.*

### **Introduction**

At Ingatestone and Fryerning C of E Junior School we believe that children should be introduced to the processes of calculation through practical, oral and mental activities. As children begin to understand the underlying ideas they develop ways of recording to support their thinking and calculation methods, use particular methods that apply to special cases, and learn to interpret and use the signs and symbols involved. Over time children learn how to use models and images, such as empty number lines, to support their mental and informal written methods of calculation. As children's mental methods are strengthened and refined, so too are their informal written methods. These methods become more efficient and succinct and lead to efficient written methods that can be used more generally. By the end of Year 6 children are equipped with mental, written and calculator methods that they understand and can use correctly. When faced with a calculation, children are able to decide which method is most appropriate and have strategies to check its accuracy. At whatever stage in their learning, and whatever method is being used, it must still be underpinned by a secure and appropriate knowledge of number facts, along with those mental skills that are needed to carry out the process and judge if it was successful.

The overall aim is that when children leave Ingatestone and Fryerning C of E Junior School is that they:

- have a secure knowledge of number facts and a good understanding of the four operations;
- are able to use this knowledge and understanding to carry out calculations mentally and to apply general strategies when using one-digit and two-digit numbers and particular strategies to special cases involving bigger numbers;
- make use of diagrams and informal notes to help record steps and part answers when using mental methods that generate more information than can be kept in their heads;
- have an efficient, reliable, compact written method of calculation for each operation that children can apply with confidence when undertaking calculations that they cannot carry out mentally;
- use a calculator effectively, using their mental skills to monitor the process, check the steps involved and decide if the numbers displayed make sense.

## **Mental methods of calculation**

Oral and mental work in mathematics is essential, particularly so in calculation. Early practical, oral and mental work must lay the foundations by providing children with a good understanding of how the four operations build on efficient counting strategies and a secure knowledge of place value and number facts. Later work must ensure that children recognise how the operations relate to one another and how the rules and laws of arithmetic are to be used and applied. Ongoing oral and mental work provides practice and consolidation of these ideas. It must give children the opportunity to apply what they have learned to particular cases, exemplifying how the rules and laws work, and to general cases where children make decisions and choices for themselves. The ability to calculate mentally forms the basis of all methods of calculation and has to be maintained and refined. A good knowledge of numbers or a 'feel' for numbers is the product of structured practice and repetition. It requires an understanding of number patterns and relationships developed through directed enquiry, use of models and images and the application of acquired number knowledge and skills.

## **Written methods of calculation**

The aim is that by the end of Key Stage 2, the great majority of children should be able to use an efficient written method for each operation with confidence and understanding. This guidance promotes the use of what are commonly known as 'standard' written methods - methods that are efficient and work for any calculations, including those that involve whole numbers or decimals. They are compact and consequently help children to keep track of their recorded steps. Being able to use these written methods gives children an efficient set of tools they can use when they are unable to carry out the calculation in their heads or do not have access to a calculator. We want children to know that they have such a reliable, written method to which they can turn when the need arises.

In setting out these aims, the intention is that we adopt greater consistency in our approach to calculation. The expectation is that teachers determine when their children should move on to a refinement in the method as they become confident and more efficient at each stage.

The correct use of vocabulary and mathematical symbols will be reinforced to ensure that it is mathematically correct.

## **Choosing the appropriate strategy**

Children should be equipped to decide when it is best to use a mental, written or calculator method based on the knowledge that they are in control of this choice as they are able to carry out all three methods with confidence.

## **Objectives**

### **Year 1 to Year 6**

The objectives in the revised Framework show the progression in children's use of written methods of calculation in the strands 'Using and applying mathematics' and 'Calculating'. They are included here from year 1 to show the requirements that should be taught prior to joining us in year 3.

## Using and applying mathematics

### Year 1

Solve problems involving counting, adding, subtracting, doubling or halving in the context of numbers, measures or money, for example to 'pay and 'give change' .

Describe a puzzle or problem using numbers, practical materials and diagrams; use these to solve the problem and set the solution in the original context

### Year 2

- Solve problems involving addition, subtraction, multiplication or division in contexts of numbers, measures or pounds and pence
- Identify and record the information or calculation needed to solve a puzzle or problem; carry out the steps or calculations and check the solution in the context of the problem

### Year 3

- Solve one-step and two-step problems involving numbers, money or measures, including time, choosing and carrying out appropriate calculations
- Represent the information in a puzzle or problem using numbers, images or diagrams; use these to find a solution and present it in context, where appropriate using £.p notation or units of measure

### Year 4

- Solve one-step and two-step problems involving numbers, money or measures, including time; choose and carry out appropriate calculations, using calculator methods where appropriate
- Represent a *puzzle* or problem using number sentences, statements or diagrams; use these to solve the problem; present and interpret the solution in the context of the problem

### Year 5

- Solve one-step and two-step problems involving whole numbers and decimals and all four operations, choosing and using appropriate calculation strategies, including calculator use
- Represent a puzzle or problem by identifying and recording the information or calculations needed to solve it; find possible solutions and confirm them in the context of the problem

### Year 6

Solve multi-step problems, and problems involving fractions, decimals and percentages; choose and use appropriate calculation strategies at each stage, including calculator use

- Represent and interpret sequences, patterns and relationships involving numbers and shapes; suggest and test hypotheses; construct and use simple expressions and formulae in words then symbols (e.g. the cost of  $c$  pens at 15 pence each is  $15c$  pence

## Calculating

### Year 1

- Relate addition to counting on; recognise that addition can be done in any order; use practical and informal written methods to support the addition of a one-digit number or a multiple of 10 to a one digit or two-digit number

Understand subtraction as 'take away' and find a '*difference*' by counting up; use practical and informal written methods to support the subtraction of a one-digit number from a one-digit or two-digit number and a multiple of 10 from a two-digit number

- Use the vocabulary related to addition and subtraction and symbols to describe and record addition and subtraction number sentences

### Year 2

- Represent repeated addition and arrays as multiplication, and sharing and repeated subtraction (grouping) as division; use practical and informal written methods and related vocabulary to support multiplication and division, including calculations with remainders
- Use the symbols  $+$ ,  $-$ ,  $\times$ ,  $\div$  and  $=$  to record and interpret number sentences involving all four operations; calculate the value of an unknown in a number sentence (e.g.  $D + 2 = 6$ ,  $30 - D = 24$ )

### Year 3

- Develop and use written methods to record, support or explain addition and subtraction of two-digit and three-digit numbers
  - Use practical and informal written methods to multiply and divide two-digit numbers (e.g.  $13 \times 3$ ,  $50 \div 4$ ); round remainders up or down, depending on the context
  - Understand that division is the inverse of multiplication and vice versa; use this to derive and record related multiplication and division number sentences

### Year 5

Use efficient written methods to add and subtract whole numbers and decimals with up to two places

- Use understanding of place value to multiply and divide whole numbers and decimals by 10, 100 or 1000
- Refine and use efficient written methods to multiply and divide HTU  $\times$  U, TU  $\times$  TU, U.t  $\times$  U and  $\text{HTU} \div \text{U}$

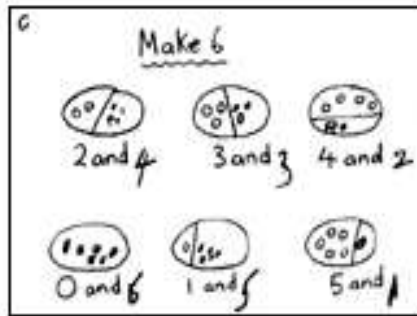
### Year 6

- Use efficient written methods to add and subtract integers and decimals, to multiply and divide integers and decimals by a one-digit integer, and to multiply two-digit and three-digit integers by a two-digit integer

## Progression through written calculations for addition

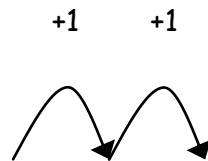
### Stage 1

Children will be encouraged to develop a mental picture of the number system in their heads to use for calculation. They will develop ways of recording calculations using pictures, etc.



Children will use number lines and practical resources to support calculation and teachers will *demonstrate* the use of the number lines.

$$3 + 2 = 5$$

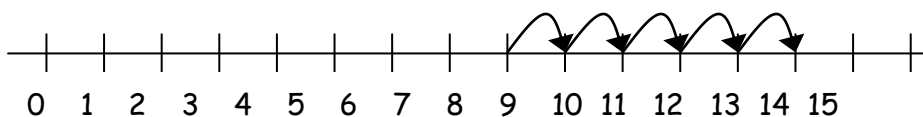


0 1 2 3 4 5 6 7 8 9

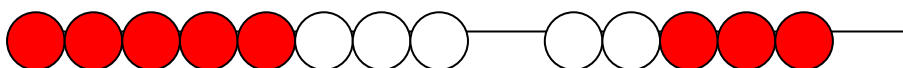
Children will then begin to use numbered lines to support their own calculations using a numbered line to count on in ones.

$$8 + 5 = 13$$

+1 +1 +1 +1 +1



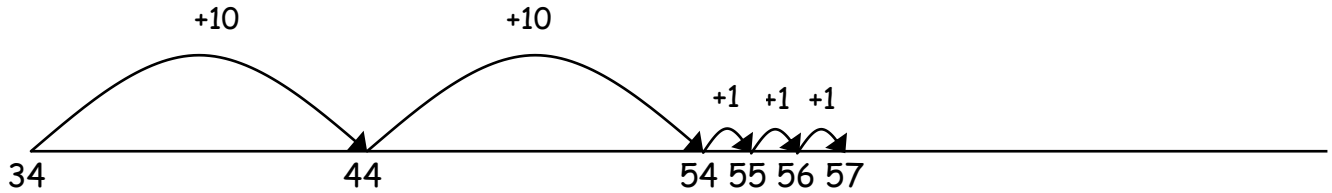
Bead strings or bead bars will be used to illustrate addition including bridging through ten by counting on 2 then counting on 3.



**Stage 2** - Children will begin to use 'empty number lines' themselves starting with the larger number and counting on.

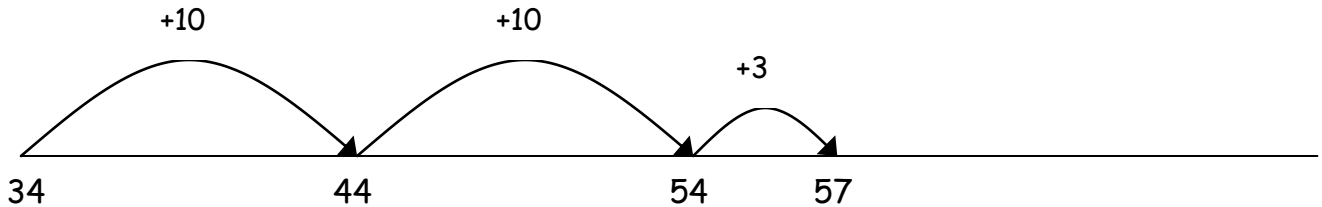
First counting on in tens and then ones.

$$34 + 23 = 57$$



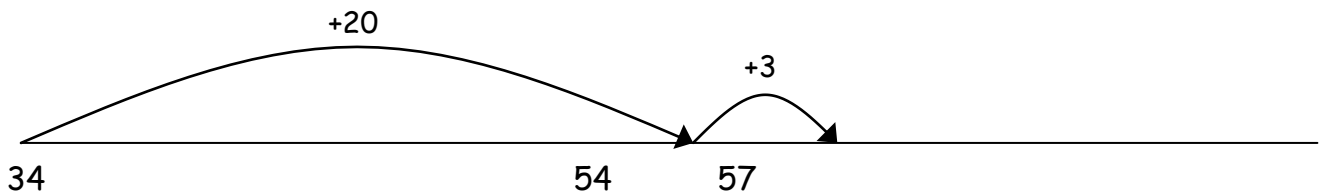
Then children will become more efficient by adding the units in one jump (by using the known fact  $4 + 3 = 7$ ).

$$34 + 23 = 57$$



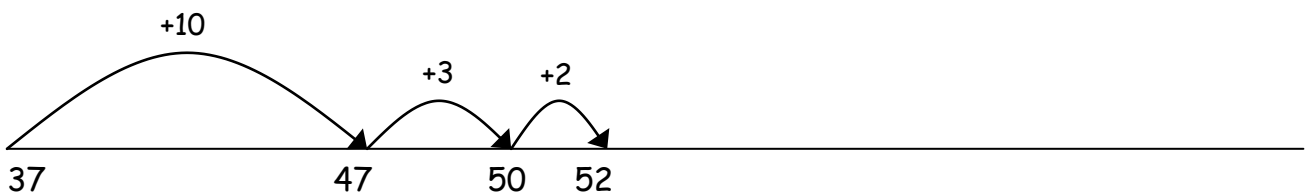
Followed by adding the tens in one jump and the units in one jump.

$$34 + 23 = 57$$



Bridging through ten will help children become more efficient.

$$37 + 15 = 52$$



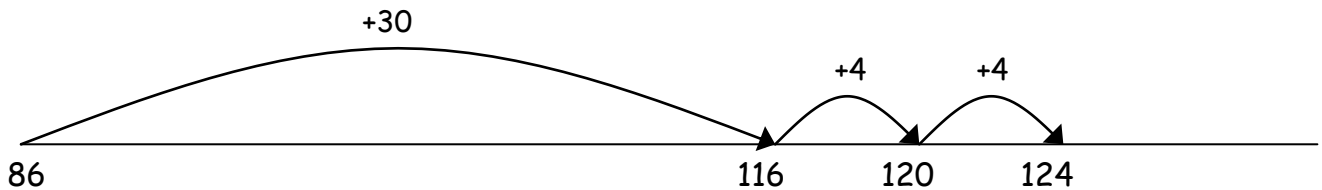
*It is anticipated that most children will be proficient in all written calculations within stages 1 and 2 by the end of Year 2, prior to entering Ingatestone and Fryerning C of E Junior School. However it is expected that teachers determine at which stage each child enters the school and plan appropriately.*

### Stage 3

Children will continue to develop their use of empty number lines with increasingly large numbers, including compensation when appropriate.

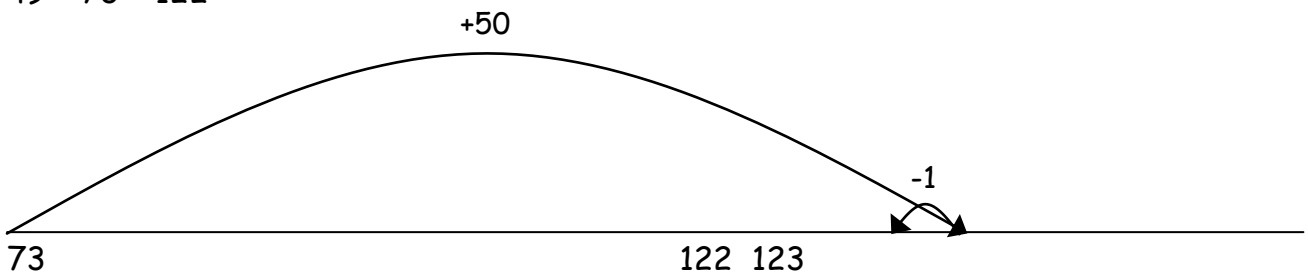
Count on from the largest number irrespective of the order of the calculation.

$$38 + 86 = 124$$



Compensation

$$49 + 73 = 122$$



Children will begin to use informal pencil and paper methods (jottings) to support, record and explain partial mental methods building on existing mental strategies.

Children will add the least significant digits first in preparation for 'carrying'.

$$\begin{array}{r} 67 \\ + 24 \\ \hline 11 \text{ ( } 7 + 4 \text{)} \\ 80 \text{ ( } 60 + 20 \text{)} \\ \hline 91 \end{array}$$

$$\begin{array}{r} 267 \\ + 85 \\ \hline 12 \text{ ( } 7 + 5 \text{)} \\ 140 \text{ ( } 60 + 80 \text{)} \\ \hline 200 \\ \hline 352 \end{array}$$

*Most children will be expected to be proficient in all written calculations within stage 3 by the end of Year 3.*

## Stage 4

Children will begin to carry below the line.

$$\begin{array}{r}
 625 \\
 + 48 \\
 \hline
 673 \\
 1
 \end{array}
 \qquad
 \begin{array}{r}
 783 \\
 + 42 \\
 \hline
 825 \\
 1
 \end{array}
 \qquad
 \begin{array}{r}
 367 \\
 + 85 \\
 \hline
 452 \\
 11
 \end{array}$$

Using similar methods, children will:

- add several numbers with different numbers of digits;
- begin to add two or more three-digit sums of money, with or without adjustment from the pence to the pounds;
- know that the decimal points should line up under each other, particularly when adding or subtracting mixed amounts,

e.g. £3.59 + 78p.

*Most children will be expected to be proficient in all written calculations within stage 4 by the end of Year4.*

## Stage 5

Children will extend the carrying method to numbers with at least four digits.

$$\begin{array}{r}
 587 \\
 + 475 \\
 \hline
 1062 \\
 11
 \end{array}
 \qquad
 \begin{array}{r}
 3587 \\
 + 675 \\
 \hline
 4262 \\
 111
 \end{array}$$

Using similar methods, children will:

- add several numbers with different numbers of digits;
- begin to add two or more decimal fractions with up to three digits and the same number of decimal places;
- know that decimal points should line up under each other, particularly when adding or subtracting mixed amounts,

e.g. 3.2 m - 280 cm.

*Most children will be expected to be proficient in all written calculations within stage 5 by the end of Year5.*



## Stage 6

Children should extend the carrying method to number with any number of digits.

$$\begin{array}{r} 7648 \\ + 1486 \\ \hline 9134 \\ 1\ 11 \end{array}$$

$$\begin{array}{r} 6584 \\ + 5848 \\ \hline 12432 \\ 1\ 1 \quad + \underline{4681} \end{array}$$

$$\begin{array}{r} 42 \\ 6432 \\ 786 \end{array}$$

$$\begin{array}{r} 11944 \\ 1\ 2\ 1 \end{array}$$

Using similar methods, children will:

- add several numbers with different numbers of digits;
- begin to add two or more decimal fractions with up to four digits and either one or two decimal places;
- know that decimal points should line up under each other, particularly when adding or subtracting mixed amounts,

e.g.  $401.2 + 26.85 + 0.71$ .

*Most children will be expected to be proficient in all written calculations within stage 6 by Year 6.*

## Progression through written calculations for subtraction

### Stage1

Children are taught to count back in ones, 10, 9, 8, etc.

In reception children are taught to subtract a small group of objects from a larger group of objects and are encouraged to show this in pictorially.

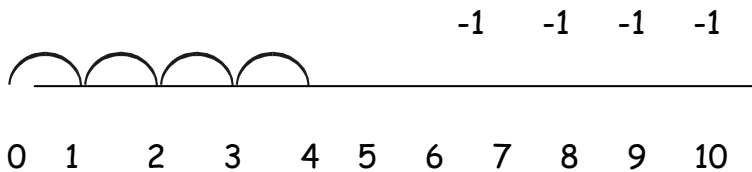
Children are introduced to the number sentence and the - and = signs.

Eg.  $6-2=4$

Higher achieving children are encouraged to use the number sentence alongside their Pictorial representations.

Children are introduced to the counting back method progressing to counting back in larger jumps,

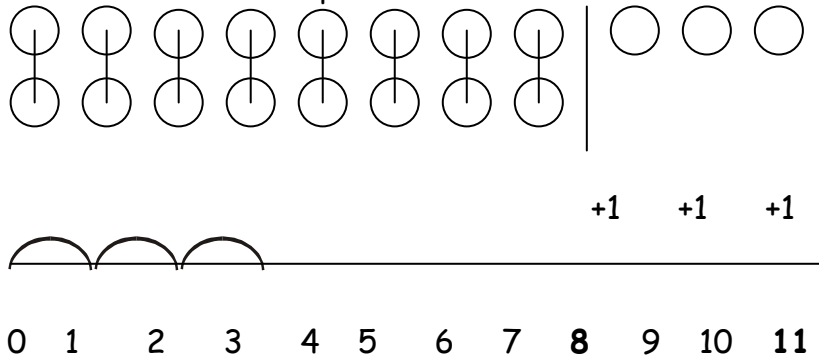
Eg.,  $10 - 5 =$  start on 10 count back 4 is 6



Children are introduced to subtraction as the difference between 2 numbers using a visual image alongside the counting on method.

Eg. Difference between 11 and 8 is 3

Start on 8 count up to 11



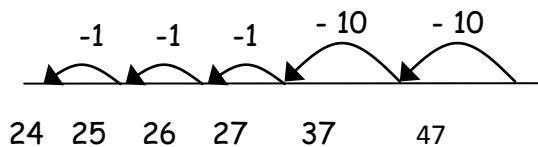
## Stage 2

Children will begin to use empty number lines to support calculations.

### Counting back

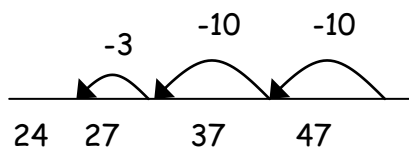
First counting back in tens and ones.

$$47 - 23 = 24$$



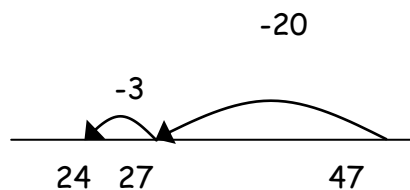
Then helping children to become more efficient by subtracting the units in one jump (by using the known fact  $7 - 3 = 4$ ).

$$47 - 23 = 24$$



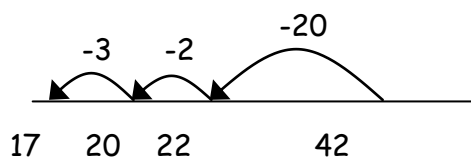
Subtracting the tens in one jump and the units in one jump.

$$47 - 23 = 24$$



Bridging through ten will help children become more efficient.

$$42 - 25 = 17$$



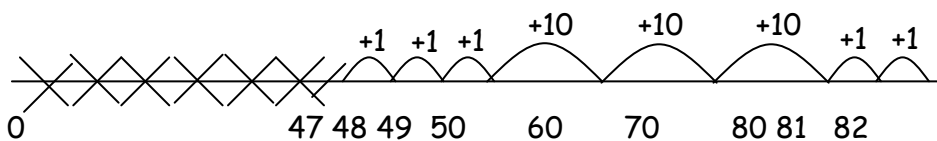
## Counting on

If the numbers involved in the calculation are close together or near to multiples of 10, 100 etc, it will be more efficient to count on. (complementary addition)

Count up from 47 to 82 in jumps of 10 and jumps of 1.

The number line will still show 0 so children can cross out the section from 0 to the smallest number. They then associate this method with 'taking away'.

$$82 - 47$$



Children will become more efficient with counting on by:

- Adding the units in one jump;
- Adding the tens in one jump and the units in one jump;
- Bridging through ten.

*Most children will be expected to be proficient in all written calculations within stage 1 and 2 by the end of Year 2, prior to entering Ingatestone and Fryerning C of E Junior School. However it is expected that teachers determine at which stage each child enters the school and plan appropriately.*

### Stage 3

Children will develop their use of empty number lines with increasingly large numbers. Children will begin to use informal pencil and paper methods (jottings) to support, record and explain partial mental methods building on existing mental strategies.

#### Partitioning and decomposition

This process will be demonstrated using e.g. by using place value cards to show the partitioning and the decomposition of the number. Initially, the children will be taught using examples that do not need the children to exchange.

$$\begin{array}{r} 89 \\ - 57 \\ \hline \end{array} = \begin{array}{r} 80 \\ + 9 \\ \hline \end{array} \quad \begin{array}{r} 50 \\ + 7 \\ \hline \end{array}$$

$$30 + 2 = 32$$

From this the children will begin to exchange.

$$\begin{array}{r} 71 \\ - 46 \\ \hline \end{array}$$

Step 1

$$\begin{array}{r} 70 \\ - 40 \\ \hline \end{array} + 1$$

Step 2

$$\begin{array}{r} 60 \\ - 40 \\ \hline \end{array} + \begin{array}{r} 11 \\ + 6 \\ \hline \end{array}$$

$$20 + 5 = 25$$

This will be recorded by the children as:

$$\begin{array}{r} 60 \\ - 40 \\ \hline \end{array} + \begin{array}{r} \cancel{70} \\ + 11 \\ \hline \end{array}$$

$$20 + 5 = 25$$

*Most children will be expected to be proficient in all written calculations within stage 3 by the end of Year 3.*

## Stage 4

### Year 4

The decomposition method is continued in year 4 and is extended to HTU. Calculations will be introduced that need adjustments.

Example: 74 - 27, adjustments from tens to ones.

70+4 <u>-20+7</u>	60+14 <u>- 20+ 7</u>	$\begin{array}{r} \overset{60}{\cancel{70}} + \overset{14}{\cancel{4}} \\ - 20 + 7 \\ \hline 40 + 7 \end{array}$ <p>Eventually make the layout shorter by crossing out and writing above.</p>
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Example: 563 - 271, adjustment from the hundreds to the tens

500+60+3 <u>- 200+70+1</u>	400+160+3 <u>- 200+70+1</u>	$\begin{array}{r} \overset{400}{\cancel{500}} + \overset{160}{\cancel{60}} + 3 \\ - 200 + 70 + 1 \\ \hline 200 + 90 + 2 \end{array}$ <p>Eventually make the layout shorter, by crossing out and writing above</p>
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This will lead to a compact method.

Example: 74 - 27

$$\begin{array}{r} \overset{6}{\cancel{7}} \overset{14}{4} \\ - 27 \\ \hline 47 \end{array}$$

Children will:

- be able to subtract numbers with different numbers of digits;
- begin to find the difference between two three-digit sums of money, with or without 'adjustment' from the pence to the pounds;
- know that decimal points should line up under each other.

*Most children will be expected to be proficient in all written calculations within stage 4 by the end of Year4.*

## Stage 5

Extending the decomposition method to adjustment from the tens to the ones and the hundreds to the tens. Show the expanded version first and then encourage children to use the compact way.

Example:  $741 - 367$

$\begin{array}{r} 700+40+1 \\ -300+60+7 \\ \hline \end{array}$	$\begin{array}{r} 700+30+11 \\ -300+60+7 \\ \hline 4 \end{array}$	$\begin{array}{r} 600+130+11 \\ -300+60+7 \\ \hline 300+70+4 \end{array}$	$\begin{array}{r} \overset{600}{700} + \overset{130}{40} + \overset{11}{1} \\ - 300 + 60 + 7 \\ \hline 300 + 70 + 4 \end{array}$	$\begin{array}{r} \overset{6}{7} \overset{13}{4} \overset{11}{1} \\ - 367 \\ \hline 374 \end{array}$
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Here both the tens and the ones digits to be subtracted are bigger than both the tens and the ones digits you are subtracting from. Discuss how  $40 + 1$  is partitioned into  $30 + 11$ , and then how  $700 + 30$  can be partitioned into  $600 + 130$ , and how this helps when subtracting.

Example:  $503 - 278$ , dealing with zeros when adjusting.

$\begin{array}{r} 500+ 0+3 \\ -200+70+8 \\ \hline \end{array}$	$\begin{array}{r} 400+100+3 \\ -200+ 70+ 8 \\ \hline \end{array}$	$\begin{array}{r} 400+90+13 \\ -200+70+ 8 \\ \hline 200+ 20+ 5 \end{array}$	$\begin{array}{r} \overset{400}{500} + \overset{90}{0} + \overset{13}{3} \\ - 200 + 70 + 8 \\ \hline 200 + 20 + 5 \end{array}$	$\begin{array}{r} \overset{4}{5} \overset{9}{0} \overset{13}{3} \\ - 278 \\ \hline 225 \end{array}$
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Here 0 acts as a place holder for the tens. The adjustment has to be done in two stages as there are 0 tens to make adjustments with. First the  $500 + 0$  is partitioned into  $400 + 100$  and then the  $100 + 3$  can be partitioned into  $90 + 13$ . Show the expanded version first and then encourage children to use the compact way once knowledge is secure.

Children will:

- be able to subtract numbers with different numbers of digits;
- begin to find the difference between two decimal fractions with up to three digits and the same number of decimal places;
- know that decimal points should line up under each other.

*Most children will be expected to be proficient in all written calculations within stage 5 by the end of Year 5.*

## Stage 6

Extend for use of larger numbers and decimal numbers.

The number of stages is reduced further.

Eg.

$$\begin{array}{r} \phantom{0} 5 \phantom{00} 13 \phantom{000} 16 \\ \phantom{0} 6 \phantom{00} 4 \phantom{000} 6 \phantom{00} 7 \\ - \phantom{0} 2 \phantom{00} 6 \phantom{000} 8 \phantom{00} 4 \\ \hline \phantom{0} 3 \phantom{00} 7 \phantom{000} 8 \phantom{00} 3 \end{array}$$

Children will:

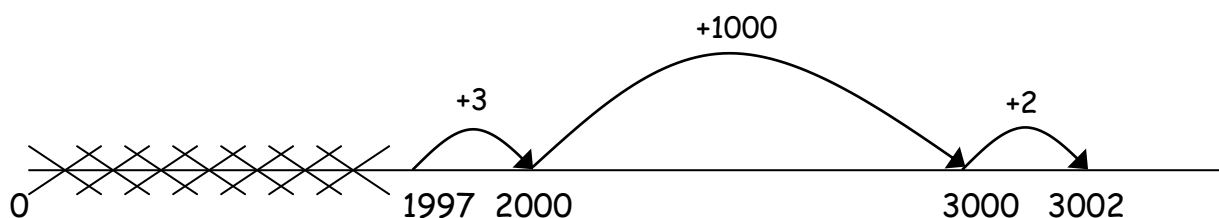
- be able to subtract numbers with different numbers of digits;
- be able to subtract two or more decimal fractions with up to three digits and either one or two decimal places;
- know that decimal points should line up under each other.

*Most children will be expected to be proficient in all written calculations within stage 6 by the end of Year 6.*

### NOTE Stages 3 to 6

There should be opportunities for the children to choose an appropriate method. For example; they should be reminded that where the numbers are involved in the calculation are close together or near to multiples of 10, 100 etc counting on using a number line may be more efficient.

$$3002 - 1997 = 1005$$

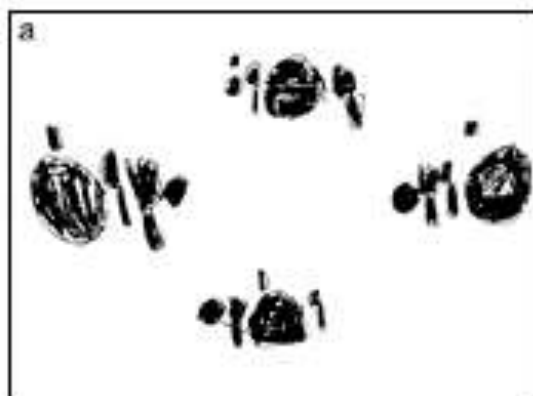




## Progression through written calculations for multiplication

### Stage 1

No formal method is introduced. Children will experience equal groups of objects and will count in 1s, 2s and 10s and begin to count in 5s. They will work on practical problem solving activities involving equal sets or groups.



### Stage 2.

Children are introduced to the  $\times$  sign.

Eg 3 times 5 is  $5+5+5=15$  or 3 lots of 5 or  $5 \times 3 = 15$

Children taught the repeated addition method alongside arrays and other pictorial representation.

Eg.  $+5 +5 +5$

$$3 \times 5 = 15$$

$$5 \times 3 = 15$$

*Most children will be expected to be proficient in all written calculations within stage 1 and 2 by the end of Year 2, prior to entering Ingatestone and Fryerning C of E Junior School. However it is expected that teachers determine at which stage each child enters the school and plan appropriately.*

### Stage 3

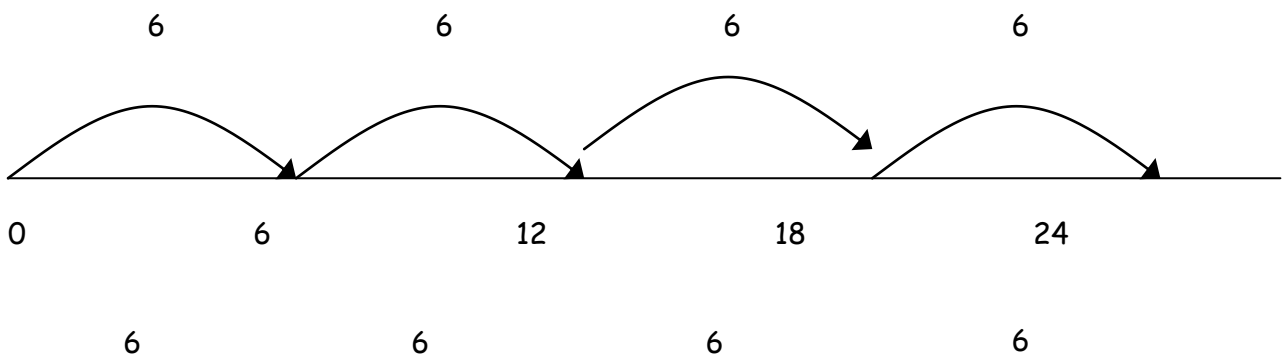
Children will continue to use:

#### Repeated addition

Children will develop their use of:

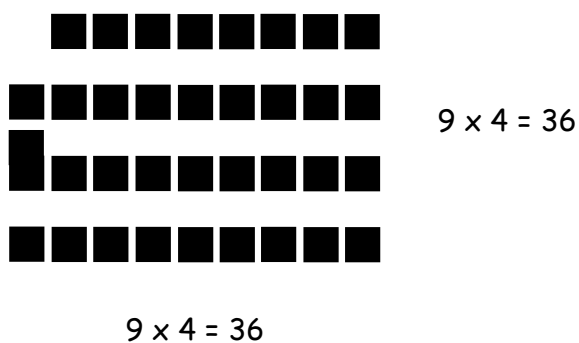
4 times 6 is  $6 + 6 + 6 + 6 = 24$  or 4 lots of 6 or  $6 \times 4$

Children will develop their use of number lines or bead bars to support their understanding.



#### Arrays

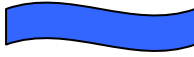
Children will be able to model a multiplication calculation using an array.



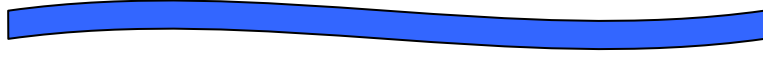
### Scaling

Children will also develop an understanding of scaling.

e.g. Find a ribbon that is 4 times as long as the blue ribbon



5 cm



20 cm

### Symbols

Children will understand how symbols stand for unknown numbers to complete equations using inverse operations

$$\square \times 5 = 20$$

$$3 \times \triangle = 18$$

$$\square \times \circ = 32$$

### Partitioning

$$\begin{aligned} 38 \times 5 &= (30 \times 5) + (8 \times 5) \\ &= 150 + 40 \\ &= 190 \end{aligned}$$

*Most children will be expected to be proficient in all written calculations within stage 3 by the end of Year3.*

## Stage 4

Children are then taught to use the grid method,  $T \times U$ .

Eg.  $23 \times 8 = 184$

X	20	3
8	160	24

*Most children will be expected to be proficient in all written calculations within stage 4 by the end of Year 4.*

## Stage 5

The grid layout extended to larger numbers,  $HTU \times U$ , and  $TU \times TU$ . Estimating and checking of answers should be encouraged.

Eg:  $56 \times 27 = (50 + 6) \times (20 + 7) =$

X	50	6
20	1000	120
7	350	42

Using similar methods, they will be multiply decimals with one decimal place by a single digit number, approximating first. They will know that the decimal points line up under each other.

e.g.  $4.9 \times 3$  Children will approximate first  $4.9 \times 3$  is approximately  $5 \times 3 = 15$

$$\begin{array}{r}
 \times \quad 4 \quad 0.9 \\
 3 \quad \boxed{12} \quad \boxed{2.7} \\
 \hline
 \phantom{3} \quad \phantom{12} \quad 12 \\
 + \quad \phantom{12} \quad 2.7 \\
 \hline
 \phantom{3} \quad \phantom{12} \quad 14.7 \\
 \hline
 \end{array}$$

*Most children will be expected to be proficient in all written calculations within stage 5 by the end of Year 5.*

## Stage 6

Children continue to use and extend the grid method using larger numbers Th, HTU  $\times$  U, and HTU  $\times$  TU. Estimating and checking of answers should be encouraged.

Eg.  $372 \times 24 = 8928$

X	300	70	2
20	6000	1400	40
4	1200	280	8

$$\begin{array}{r} 7440 \\ + 1488 \\ \hline 8928 \end{array}$$

Using similar methods, they will multiply decimals with up to two decimal places by a single digit number and then two digit numbers, approximating first. They will know that the decimal points line up under each other.

*For example:*

$$4.92 \times 3$$

Children will approximate first

$4.92 \times 3$  is approximately  $5 \times 3 = 15$

x	4	0.9	0.02
3	12	2.7	0.06

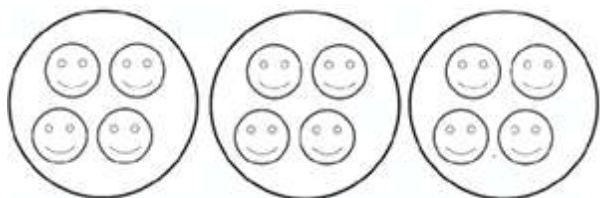
$$\begin{array}{r} 12 \\ + 0.7 \\ + \underline{0.06} \\ \hline 12.76 \end{array}$$

*Most children will be expected to be proficient in all written calculations within stage 6 by the end of Year 6.*

## Progression through written calculations for division

### Stage1

Children will understand equal groups and share items out in play and problem solving. They will count in 2s and 10s and later in 5s.

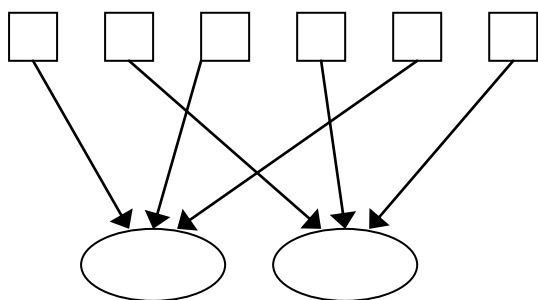


### Stage2

Children will use jottings to support calculation

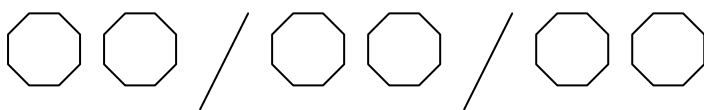
#### Sharing equally

6 sweets shared between 2 people, how many do they each get?



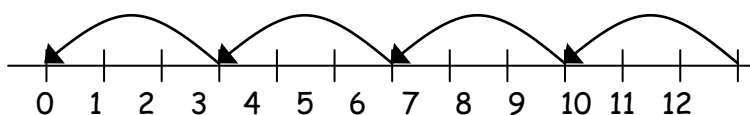
#### Grouping or repeated subtraction

There are 6 sweets, how many people can have 2 sweets each?



#### Repeated subtraction using a number line or bead bar

$$12 \div 3 = 4$$



This will be used to interpret division calculations such as  $10 \div 5$  as 'how many 5s make 10?'

### Symbols

Children will understand that symbols can stand for unknown numbers to complete equations using inverse operations

$$\square \div 2 = 4 \qquad 20 \div \triangle = 4 \qquad \square \div \triangle = 4$$

*Most children will be expected to be proficient in all written calculations within stage 1 and 2 by the end of Year 2, prior to entering Ingatestone and Fryerning C of E Junior School. However it is expected that teachers determine at which stage each child enters the school and plan appropriately.*

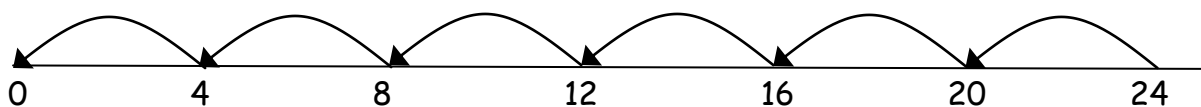
### Stage 3

The emphasis at this stage is on grouping rather than sharing.  
Children will continue to use:

#### Repeated subtraction using a number line

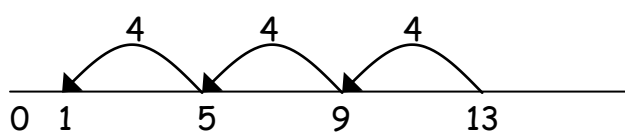
Children will use an empty number line to support their calculation.

$$24 \div 4 = 6$$



Children will also move onto calculations involving remainders.

$$13 \div 4 = 3 \text{ r } 1$$



### Symbols

Children will continue to develop their use of symbols to stand for unknown numbers to complete equations using inverse operations

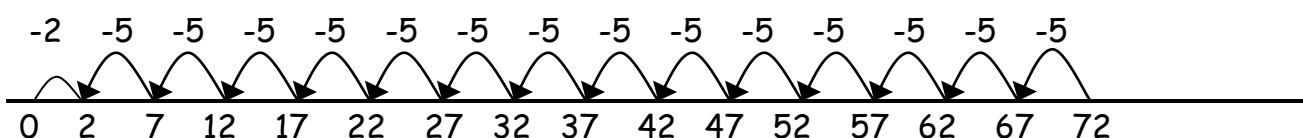
$$26 \div 2 = \square \qquad 24 \div \triangle = 12 \qquad \square \div 10 = 8$$

*Most children will be expected to be proficient in all written calculations within stage 3 by the end of Year 3.*

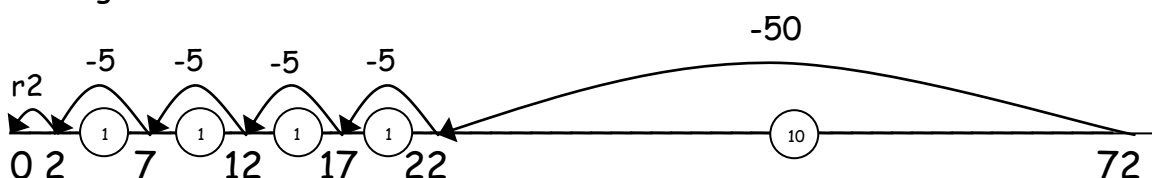
## Stage 4

Children will develop their use of repeated subtraction to be able to subtract multiples of the divisor. Initially, these should be multiples of 10s, 5s, 2s and 1s - numbers with which the children are more familiar.

$$72 \div 5$$



Moving onto:



Then onto the vertical method of chunking:

**Short division  $TU \div U$**

$$72 \div 3$$

$$\begin{array}{r}
 3 \overline{) 72} \\
 \underline{- 30} \quad 10 \times 3 \\
 42 \\
 \underline{- 30} \quad 10 \times 3 \\
 12 \\
 \underline{- 6} \quad 2 \times 3 \\
 6 \\
 \underline{- 6} \quad 2 \times 3 \\
 0
 \end{array}$$

Answer : 24

Leading to a contraction of the method by subtraction of other multiples by combining e.g.  $20 \times 3$  and  $4 \times 3$ .

Any remainders will be shown as integers, i.e. 14 remainder 2 or 14 r 2.

Children will be able to decide what to do after division and round up or down accordingly depending on the context.

*Most children will be expected to be proficient in all written calculations within stage 4 by the end of Year 4.*



## Stage 5

The chunking method is consolidated and extended using higher numbers, HTU  $\div$  U.

Eg.  $196 \div 6 = 32 \text{ r } 4$

However children need to recognise that chunking is inefficient if too many subtractions are involved. They should therefore be encouraged to reduce the number of steps and move on quickly to finding the largest possible multiples.

Children can start to subtract larger multiples of the divisor, e.g. 30x

HTU  $\div$  U

$196 \div 6$

32 r 4

$$\begin{array}{r} 6 \overline{) 196} \\ - 180 \\ \hline 16 \\ - 12 \\ \hline 4 \end{array}$$



Answer : 32 remainder 4 or 32 r 4

Any remainders should be shown as integers, i.e. 14 remainder 2 or 14 r 2.

Children will be able to decide what to do after division and round up or down accordingly. They will know how to make sensible decisions about rounding up or down after division. For example  $240 \div 52$  is 4 remainder 32, but whether the answer should be rounded up to 5 or rounded down to 4 depends on the context.

*Most children will be expected to be proficient in all written calculations within stage 5 by the end of Year 5.*

## Stage 6

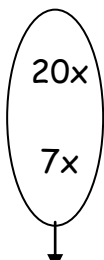
Children will continue to use written methods to solve division  
 $TU \div U$  and  $HTU \div U$ .

### Long division $HTU \div TU$

$$972 \div 36$$

27

$$\begin{array}{r}
 36 \overline{) 972} \\
 \underline{- 720} \\
 252 \\
 \underline{- 252} \\
 0
 \end{array}$$



Answer : 27

The next step is to record the answers to the individual divisions above the line without the corresponding multiplication sum. (see below)

Any remainders will be shown as fractions, i.e. if the children were dividing 32 by 10, the answer should be shown as  $3 \frac{2}{10}$  which could then be written as  $3 \frac{1}{5}$  in its lowest terms.

Extend to decimals with up to two decimal places. Children will know that decimal points line up under each other.

$$87.5 \div 7$$

12.5

$$\begin{array}{r}
 7 \overline{) 87.5} \\
 \underline{- 70.0} \\
 17.5 \\
 \underline{- 14.0} \\
 3.5 \\
 \underline{- 3.5} \\
 0
 \end{array}$$



Answer : 12.5

When the children are confident with the chunking method they can be introduced to the 'spacesaver' carrying forward method of division, initially for dividing by U and then by TU.

$$\begin{array}{r}
 078.33 \\
 \hline
 3 \overline{) 2^2 3^2 5.^1 0^1 0}
 \end{array}$$

*Most children will be expected to be proficient in all written calculations within stage 6 by the end of Year6.*