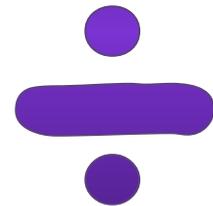
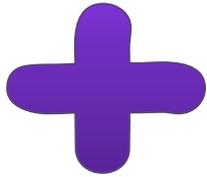


Our Lady and St Thomas
Primary School
Willington



Calculations Policy

Aims

Children should be able to choose an efficient method; mental, written or calculator appropriate, to the given task.

By the end of Year 6, children working at Level 4 and above will have been taught, and be secure with, a compact standard method for each operation.

General Progression

- Establish mental methods based on a good understanding of place value
- Use of informal jottings to aid mental calculations
- Use of partitioning and recombining to aid informal methods
- Introduce expanded written methods
- Develop expanded written methods into compact standard written form.

Before carrying out a calculation, children should be encouraged to consider:

- Can I do it in my head? (using rounding, adjustment)
- The size of an approximate answer (estimation)
- Could I do jottings to keep track of the calculation?
- Do I need to use an expanded or compact written method? (Children may not refer to these names but will understand the methods)

When are children ready for written calculations?

Addition and subtraction

- Do they know addition and subtraction facts to 20?
- Do they understand place value and can they partition numbers?
- Can they add three single digit numbers mentally?
- Can they add and subtract any pair of two digit numbers mentally?
- Can they explain their mental strategies orally and record them using informal jottings?

Multiplication and division

- Do they know the 2,3,4,5 and 10 times tables?
- Do they know the result of multiplying by 1 and 0?
- Do they understand 0 as a place holder?
- Can they multiply two and three digit numbers by 10 and 100?
- Can they double and halve two digit numbers mentally?
- Can they use multiplication facts they know to derive mentally other multiplication facts that they do not know?
- Can they explain their mental strategies orally and record them using informal jottings?

Vocabulary

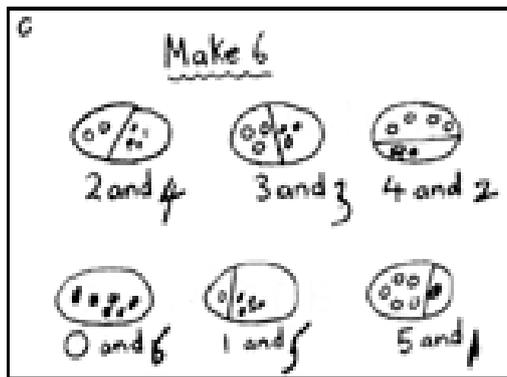
The correct terminology should be used when referring to the value of digits to support children's understanding of place value.

E.g. $68 + 47$ should be read 'sixty add forty' not 'six add four'.

ADDITION

YR and Y1

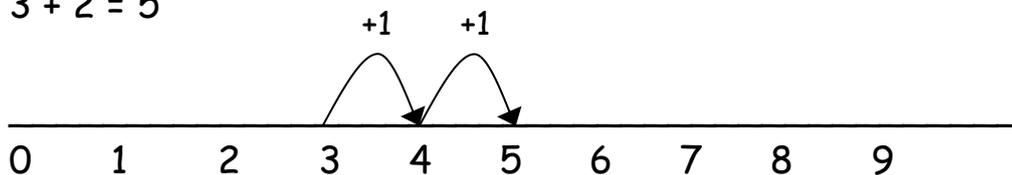
Children are encouraged to develop a mental picture of the number system in their heads to use for calculation. They develop ways of recording calculations using pictures, etc.



The children are encouraged to explore combining two groups in a practical way and to recognise that addition is putting two groups together.

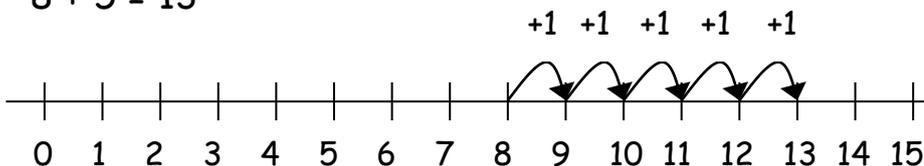
They use numberlines and practical resources to support calculation and teachers *demonstrate* the use of the numberline.

$$3 + 2 = 5$$



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

$$8 + 5 = 13$$



Y2

✓ Partitioning

Children will begin to partition numbers to add together.

$$56+23=$$

$$50+20= 70$$

$$6+3=9$$

$$70+9=79$$

The children will explore partitioning and adding through a range of practical activities. There will be very little carrying at this stage.

Y3

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 continue use partitioning to add two numbers involving more carrying.

$$34+28= 30+20= 50$$

$$4+8= 12$$

$$50+12=62$$

Children will use this to begin to use the expanded column method

H T U

4 6

+ 3 7

1 3

7 0

8 3

Y4

From this, children will begin to carry above the line.

$$\begin{array}{r} 625 \\ + 48 \\ \hline 673 \end{array}$$

$$\begin{array}{r} 783 \\ + 42 \\ \hline 825 \end{array}$$

$$\begin{array}{r} 367 \\ + 85 \\ \hline 452 \end{array}$$

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.*

Y5

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

$$\begin{array}{r} 587 \\ + 475 \\ \hline 1062 \end{array}$$

$$\begin{array}{r} 3587 \\ + 675 \\ \hline 4262 \end{array}$$

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.*

Y6

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

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

$$\begin{array}{r} 6584 \\ + 5848 \\ \hline 12432 \end{array}$$

$$\begin{array}{r} 42 \\ 6432 \\ 786 \\ 3 \\ + 4681 \\ \hline 11944 \end{array}$$

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.*

+ - + - + - + - + - + - +

By the end of year 6, children will have a range of calculation methods, mental and written. Selection will depend upon the numbers involved.

Children should not be made to go onto the next stage if:

- 1) they are not ready.
- 2) they are not confident.

Children should be encouraged to approximate their answers before calculating. Children should be encouraged to check their answers after calculation using an appropriate strategy.

Children should be encouraged to consider if a mental calculation would be appropriate before using written methods.

Calculation Guidelines for Gifted and Talented Children Working Beyond Primary Level

ADDITION

Extend to decimals with up to 2 decimal places, including:

- sums with different numbers of digits;
- totals of more than two numbers.

e.g. $76.56 + 312.2 + 5.07 = 398.83$

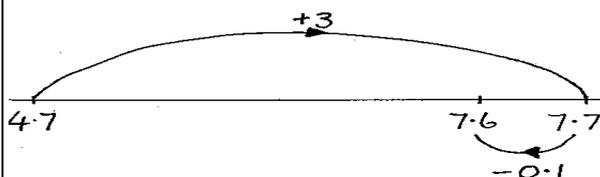
Use diagrams to illustrate adding fractions

$$\frac{2}{3} + \frac{1}{4} = \frac{11}{12}$$



Use compensation by adding too much, and then compensating

$$\begin{aligned} 4.7 + 2.9 &= 4.7 + 3 - 0.1 \\ &= 7.7 - 0.1 \\ &= 7.6 \end{aligned}$$



SUBTRACTION

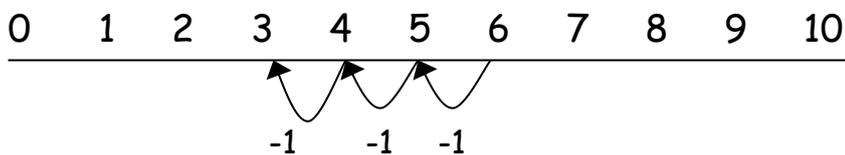
YR and Y1

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



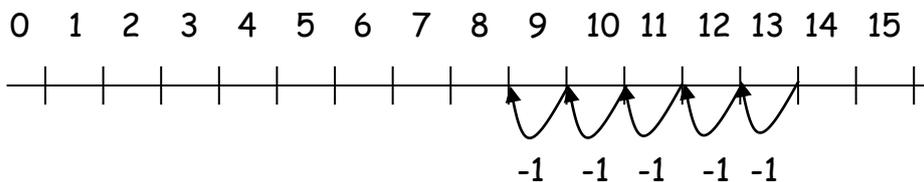
They use numberlines and practical resources to support calculation. Teachers *demonstrate* the use of the numberline and remind the children that subtraction involves taking one number from another.

$$6 - 3 = 3$$



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

$$13 - 5 = 8$$



Y2

Children will begin to use partitioning and 100 grids to support calculations.

Counting back

- ✓ First counting back in tens and ones.

Children will explore how moving across or down on a 100 grid changes a number

- ✓ They begin to partition the second number to subtract one from the other. The children must be aware that in subtraction one number remains whole while the other is partitioned to be subtracted.

$$64-36=$$

$$64-30=34$$

$$34-6=28$$

Y3

Partitioning and decomposition

Initially, the children will be taught using examples that do not need the children to include decomposition.

This process should be demonstrated using arrow cards or place value counters to show the partitioning and base 10 materials to show the decomposition of the number.

This method can be demonstrated by the teacher as means of introduction

$$\begin{array}{r} 89 \\ - 57 \\ \hline 32 \end{array} = \begin{array}{r} 80 \text{ and } 9 \\ 50 \text{ and } 7 \\ \hline 30 \text{ and } 2 \end{array}$$

Children would write

$$\begin{array}{r} 89 \\ - 57 \\ \hline 32 \end{array}$$

To introduce decomposition, this will be used as a demonstration method by the teacher

Step 1

$$\begin{array}{r} 70 \text{ and } 1 \\ - 40 \text{ and } 6 \\ \hline \end{array}$$

The calculation should be read as e.g. take 6 from 1.

$$\begin{array}{r} \text{Step 2} \quad 60 \text{ and } 11 \\ - 40 \text{ and } 6 \\ \hline 25 = 20 \text{ and } 5 \end{array}$$

This would be recorded by the teacher as

$$\begin{array}{r} \overset{60}{\cancel{70}} + 11 \\ - 40 + 6 \\ \hline 20 + 5 = 25 \end{array}$$

Children should know that units line up under units, tens under tens, and so on.

Y4

Partitioning and decomposition

In Year 4 children move on to subtracting TU from HTU, the partitioning method can be demonstrated if required.

$$\begin{array}{r} 754 = \\ - 86 \\ \hline \end{array}$$

$$\begin{array}{r} \text{Step 1} \quad 700 + 50 + 4 \\ - \quad \quad \quad 80 + 6 \\ \hline \end{array}$$

$$\begin{array}{r} \text{Step 2} \quad 700 + 40 + 14 \quad (\text{adjust from } T \text{ to } U) \\ - \quad \quad \quad 80 + 6 \\ \hline \end{array}$$

$$\begin{array}{r} \text{Step 3} \quad 600 + 140 + 14 \quad (\text{adjust from } H \text{ to } T) \\ - \quad \quad \quad 80 + 6 \\ \hline 600 + 60 + 8 = 668 \end{array}$$

This would be recorded by the children as decomposition

$$\begin{array}{r} \overset{6141}{\cancel{754}} \\ - 86 \\ \hline 668 \end{array}$$

Children should:

✓ *be able to subtract numbers with different numbers of digits;*

- ✓ *using this method, children should also 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.*

For example:

$$\begin{array}{r} 71 \\ 8.85 \\ - 4.38 \\ \hline \end{array}$$

Alternatively, children can set the amounts to whole numbers, i.e. 895 - 438 and convert to pounds after the calculation.

Y5

Decomposition

$$\begin{array}{r} 6141 \\ 7\cancel{5}4 \\ - 286 \\ \hline 468 \end{array}$$

The children will also be introduced to what they should do when a 0 appears in the number

Children should:

- ✓ *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.*

Y6

Decomposition

$$\begin{array}{r} 5131 \\ 6\cancel{4}67 \\ - 2684 \\ \hline 3783 \end{array}$$

Children should:

- ✓ *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.

+ - + - + - + - + - + - +

By the end of year 6, children will have a range of calculation methods, mental and written. Selection will depend upon the numbers involved.

Children should not be made to go onto the next stage if:

- 3) they are not ready.
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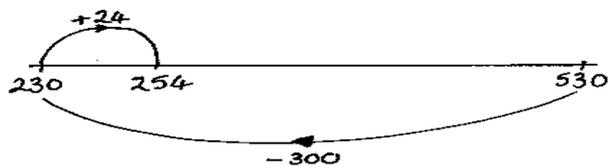
Calculation Guidelines for Gifted and Talented Children Working Beyond Primary Level

SUBTRACTION

Mental methods

Use compensation by subtracting too much, and then compensating

$$\begin{aligned}
 530 - 276 &= 530 - 300 + 24 \\
 &= 230 + 24 \\
 &= 254
 \end{aligned}$$



Use jottings such as an empty number line to support or explain methods for adding mentally.

Pencil and paper procedures (Written methods)
complicated fractions

Subtract more

For Example:

Extend to decimals with up to places, including:

- differences with digits
- totals of more than two

2 decimal

different num numbers.

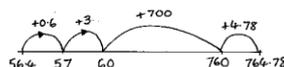
Know that fractions can be added/subtracted if they have the same denominator.

$$\frac{5}{6} - \frac{3}{4}$$

$$\frac{10}{12} - \frac{9}{12} = \frac{1}{12}$$

Complementary addition

$$764 - 78 - 56 \cdot 4 = 708 \cdot 38$$

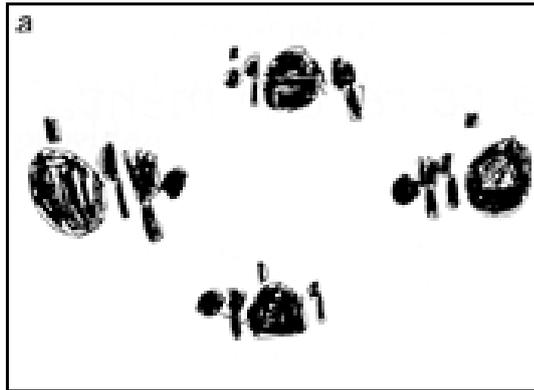


MULTIPLICATION

THE FOLLOWING ARE STANDARDS THAT WE EXPECT THE MAJORITY OF CHILDREN TO ACHIEVE.

YR and Y1

Children will experience equal groups of objects and will count in 2s and 10s and begin to count in 5s. They will work on practical problem solving activities involving equal sets or groups.



Children should be using and recording the concept of doubling

Y2

Children will develop their understanding of multiplication and use jottings to support calculation:

✓ **Repeated addition**

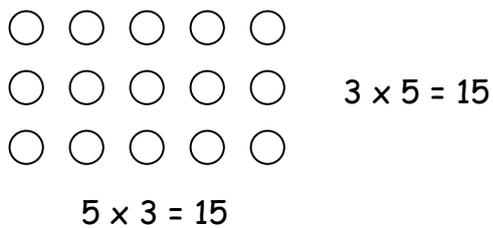
3 times 5 is $5 + 5 + 5 = 15$ or 3 lots of 5 or 5×3

Repeated addition can be shown easily on a number line:

$$5 \times 3 = 5 + 5 + 5$$

✓ **Arrays**

Children should be beginning to model a multiplication calculation using an array. This knowledge will support with the understanding of adding groups.



Y3

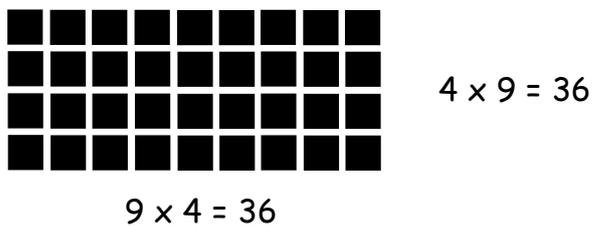
Children will continue to use:

✓ **Repeated addition**

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

✓ **Arrays**

Children should be able to model a multiplication calculation using an array. This knowledge will support with the understanding of the law of commutability.



✓ **Column Partitioning**

Children will begin to complete multiplications by partitioning.

$23 \times 4 = 92$

$20 \times 4 = 80$

$3 \times 4 = 12$

$80 + 12 = 92$

They will then begin to record this in a column style.

$$\begin{array}{r}
 33 \\
 \times 4 \\
 \hline
 12 \\
 \hline
 80 \\
 \hline
 92
 \end{array}$$

- ✓ Using symbols to stand for unknown numbers to complete equations using inverse operations

$$\square \times 5 = 20$$

$$3 \times \triangle = 18$$

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

Y4

Children will continue to use the long column method to solve TUxU and begin to extend this to HTUxU and TUxTU

| | |
|--|---|
| $\begin{array}{r} 234 \\ \times 6 \\ \hline 24 \\ 180 \\ \hline 1200 \\ \hline 1404 \end{array}$ | $\begin{array}{r} 32 \\ \times 15 \\ \hline 10 \\ 150 \\ \hline 20 \\ \hline 300 \\ \hline 480 \end{array}$ |
|--|---|

Y5

The children will continue to use long multiplication to solve a range of multiplications. They will begin to use the compact version of the multiplication methods.

| | |
|---|--|
| $\begin{array}{r} 234 \\ \times 6 \\ \hline 1404 \end{array}$ | $\begin{array}{r} 32 \\ \times 15 \\ \hline 480 \end{array}$ |
|---|--|

Y6

HTU x TU

(Long multiplication - multiplication by more than a single digit)

$$\begin{array}{r} 472 \\ \times 23 \\ \hline 6 \\ 210 \\ 1200 \\ 40 \\ 1400 \\ \hline 8000 \\ \hline 10856 \end{array}$$

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

For example:

$$4.92 \times 3$$

Children will approximate first

$$4.92 \times 3 \text{ is approximately } 5 \times 3 = 15$$

$$\begin{array}{r} 4.92 \\ \times 3 \\ \hline 0.06 \\ 2.70 \\ \hline 12.00 \\ \hline 14.76 \end{array}$$

Calculation Guidelines for Gifted and Talented Children Working Beyond Primary Level

ADDITION

Extend to decimals with up to 2 decimal places, including:

- sums with different numbers of digits;
- totals of more than two numbers.

e.g. $76.56 + 312.2 + 5.07 = 398.83$

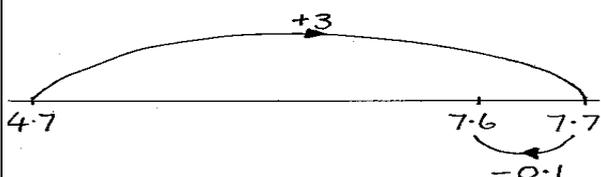
Use diagrams to illustrate adding fractions

$$\frac{2}{3} + \frac{1}{4} = \frac{11}{12}$$



Use compensation by adding too much, and then compensating

$$\begin{aligned} 4.7 + 2.9 &= 4.7 + 3 - 0.1 \\ &= 7.7 - 0.1 \\ &= 7.6 \end{aligned}$$



Division

YR and Y1

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.



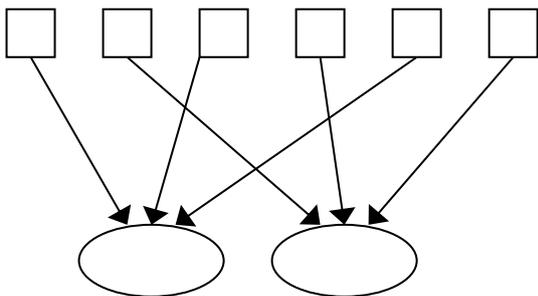
Children will be encouraged to share and half in a range of situations and begin to record some of their practical activities in pictorial forms

Y2

Children will develop their understanding of division and use jottings to support calculation

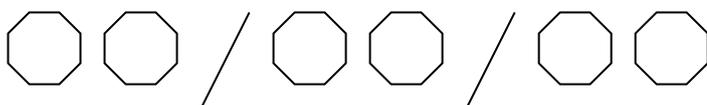
✓ **Sharing equally**

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?



- ✓ **Using symbols to stand for unknown numbers to complete equations using inverse operations**

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

Y3

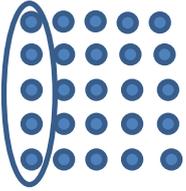
Ensure that in Y3 grouping is introduced and explored alongside sharing.

Children will continue to use:

- ✓ **Grouping and using multiples**

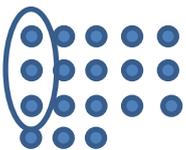
Children will use a sharing/grouping method to complete divisions. Either drawing dots or writing out the multiples

$$25 \div 5 = 5$$



Children should also move onto calculations involving remainders.

$$18 \div 5 = 3r3$$



Using symbols to stand for unknown numbers to complete equations using inverse operations

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

Y4

Children will develop their use of multiples 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.

✓ **Short Division**

Children will discuss the idea of digit speak and discuss the values of numbers. They will then begin to use the short form of division.

$$72 \div 5 =$$

$$\begin{array}{r} 5 \overline{) 72} \\ \underline{14} \\ 14 \\ \underline{14} \\ 0 \\ 14 \\ \underline{14} \\ 0 \\ 14 \\ \underline{14} \\ 0 \end{array}$$

The children should think how many 5s in the 7 then any remainder is recorded next to the next number

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

Children need to be able to decide what to do after division and round up or down accordingly. They should make sensible decisions about rounding up or down after division. For example $62 \div 8$ is 7 remainder 6, but whether the answer should be rounded up to 8 or rounded down to 7 depends on the context.

e.g. I have 62p. Sweets are 8p each. How many can I buy?

Answer: 7 (the remaining 6p is not enough to buy another sweet)

Apples are packed into boxes of 8. There are 62 apples. How many boxes are needed?

Answer: 8 (the remaining 6 apples still need to be placed into a box)

Y5

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

Short division HTU \div TU

$$724 \div 52 = 13 \text{ r } 48$$

$$\begin{array}{r} 52 \overline{) 724} \\ \underline{104} \\ 180 \\ \underline{156} \\ 240 \\ \underline{208} \\ 320 \\ \underline{304} \\ 160 \\ \underline{156} \\ 40 \\ \underline{40} \\ 0 \end{array}$$

Short division TU.t \div U

$$2.3 \div 4 = 0.56$$

$$\begin{array}{r} 4 \overline{) 2.30} \\ \underline{0.8} \\ 1.5 \\ \underline{1.2} \\ 30 \\ \underline{28} \\ 20 \\ \underline{20} \\ 0 \end{array}$$

Any remainders should begin to be shown as decimals.

Children need to be able to decide what to do after division and round up or down accordingly. They should 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.

Y6

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

Long division $HTU \div TU$

$264 \div 22$

$$\begin{array}{r} 22 \overline{)264} \\ \underline{12} \\ 144 \\ \underline{140} \\ 4 \end{array}$$

Any remainders should be shown as fractions as well as decimals, 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 it's lowest terms.

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

+ - + - + - + - + - + - +

By the end of year 6, children will have a range of calculation methods, mental and written. Selection will depend upon the numbers involved.

Children should not be made to go onto the next stage if:

- 5) they are not ready.
- 6) they are not confident.

Children should be encouraged to approximate their answers before calculating. Children should be encouraged to check their answers after calculation using an appropriate strategy.

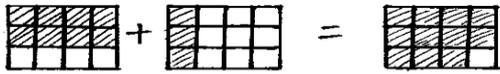
Children should be encouraged to consider if a mental calculation would be appropriate before using written methods.

| Calculation Guidelines for Gifted and Talented Children Working Beyond Primary Level |
|---|
| ADDITION |
| Extend to decimals with up to 2 decimal places, including: <ul style="list-style-type: none"> ▪ sums with different numbers of digits; ▪ totals of more than two numbers. |

e.g. $76.56 + 312.2 + 5.07 = 398.83$

Use diagrams to illustrate
adding fractions

$$\frac{2}{3} + \frac{1}{4} = \frac{11}{12}$$



Use compensation by adding too much, and then compensating

$$\begin{aligned} 4.7 + 2.9 &= 4.7 + 3 - 0.1 \\ &= 7.7 - 0.1 \\ &= 7.6 \end{aligned}$$

