

The Stour Academy Trust Mathematics Calculation Policy

Y3

Addition

To add and subtract numbers mentally, including: a three-digit number and ones, a three-digit number and tens and a three-digit number and hundreds.

To add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction.

Children will begin to use informal pencil and paper methods (jottings) to support, record and explain partial mental methods building on existing mental strategies. 100 squares, number lines, cubes may be used.

Children will:

- learn to set out addition calculations vertically by adding the least significant digits first
- Use paper and pencil procedures alongside manipulatives such as Dienes equipment and numicon.
- Move onto the formal compact method of addition if and when they are confident using the expanded formal method.

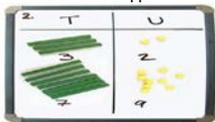
✓ Continue with partitioning method to add 3 digit numbers

$$\begin{array}{r} 200 \ 40 \ 3 \\ 100 \ 20 \ 7 \\ \hline 300 \ 60 \ 10 = 370 \end{array}$$

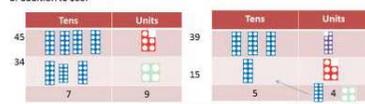
✓ Expanded formal method to add 3 digit numbers

$$\begin{array}{r} 67 \\ + 24 \\ \hline 11 \ (7 + 4) \\ 80 \ (60 + 20) \\ \hline 91 \end{array} \qquad \begin{array}{r} 267 \\ + 85 \\ \hline 12 \ (7 + 5) \\ 140 \ (60 + 80) \\ \hline 352 \end{array}$$

Dienes Rods to support:



Numicon to support:



The Bar Model (Singapore maths) will be used alongside the written methods of addition, to support problem solving using the generalisation that $b+c=a$. Children will focus on using the abstract representation.

Subtraction

To add and subtract numbers mentally, including: a three-digit number and ones, a three-digit number and tens and a three-digit number and hundreds.

To add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction.

Children will be encouraged to:

- Approximate
- Calculate
- Check it (matel)

Children will continue to use empty number lines with increasingly large numbers, with numbers that are appropriate for taking away and also finding the difference:

$$102 - 89 = 13$$



Children should also be taught how to set out subtraction problems vertically using the following equipment to support understanding:

✓ Partitioning and decomposition

- Partitioning - demonstrated using arrow cards
- Decomposition - base 10 materials

STEP 1: introduce this method with examples where **no exchanging** is required.

NOTE When solving the calculation $89 - 57$, children should know that 57 **does NOT EXIST AS AN AMOUNT** - it is what you are subtracting from the other number. Therefore, when using base 10 materials, children would need to count out only the 89 and then remove 5 tens and 7 ones.

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

STEP 2: introduce "exchanging" through practical subtraction.

Make the larger number with Base 10/Dienes Rods, then subtract the smaller number from it.

$$71 - 46 =$$

$$\begin{array}{r} \text{Step 1} \quad 70 + 1 \\ - 40 + 6 \\ \hline 30 + 7 = 37 \end{array}$$

This would be recorded by the children as

$$\begin{array}{r} 70 + 1 \\ - 40 + 6 \\ \hline 30 + 7 = 37 \end{array}$$

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

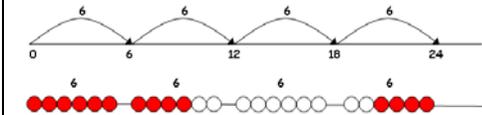
Multiplication

To write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods

Children will continue to use:

✓ Repeated addition

4 times 6 is $6 + 6 + 6 + 6 = 24$ or 4 lots of 6 or 6×4
Children should use number lines or bead bars to support their understanding.



✓ Scaling

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



✓ Using symbols to stand for unknown numbers to complete equations using inverse operations, relating to commutativity (role of the =).

$$\begin{array}{l} \square \times 5 = 20 \qquad 3 \times \triangle = 18 \qquad \square \times \circ = 32 \\ 20 = \square \times 5 \qquad 18 = 3 \times \triangle \qquad 32 = \square \times \circ \end{array}$$

✓ Arrays:

Children will continue to use arrays where appropriate leading to an understanding of partitioning as a mental strategy (see Year 2)

Place value counters may be used for higher ability children in year 3 (an abstract manipulative)

This leads to the use of the grid method of recording:

✓ Grid method

TU x U

(Short multiplication - multiplication by a single digit)

$$23 \times 8$$

Children will approximate first 23×8 is approximately $25 \times 8 = 200$

$$\begin{array}{r} \times 20 \ 3 \\ 8 \ 160 \ 24 \\ \hline 184 \end{array}$$

Dienes rods/Base 10 equipment will be used to support this.

The Bar Model (Singapore maths) should be used to support problem solving involving multiplication using a part whole model, alongside the written methods.

e.g. If a farmer has 3 times as many cows as sheep in his field and he has 6 sheep, how many cows are there?

Division

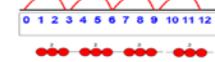
To write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods

Ensure that the emphasis in Y3 is on grouping (repeated subtraction) rather than sharing whilst being linked to the inverse.

Children will continue to use:

✓ Repeated jumps using a number line

Note: arrows will point in the other direction to multiplication.



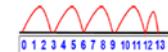
$$12 \div 3 = 4$$

Bead strings, cubes and bowls, double sided counters and place value counters may be used (place value counters for higher ability children).

Children will also be encouraged to use their developing times table knowledge to derive division facts.

Children should also move onto calculations involving remainders.

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

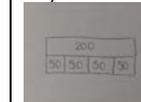


✓ Using symbols to stand for unknown numbers to complete equations using inverse operations, relating to commutativity (role of the =).

$$\begin{array}{l} 26 \div 2 = \square \qquad 24 \div \triangle = 12 \qquad \square \div 10 = 8 \\ \square = 26 \div 2 \qquad 12 = 24 \div \triangle \qquad 8 = \square \div 10 \end{array}$$

The Bar Model (Singapore maths) will be introduced in year 3 for division to solve problems involving division using a part whole model.

e.g. If Suzie had 200 marbles and shared them equally between herself and three friends, how many marbles will they each have?



Key vocabulary

share, share equally, one each, two each..., group, groups of, lots of, array, divide, divided by, divided into, division, grouping, number line, left, left over, **inverse, short division, carry, remainder, multiple**

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Y4

Addition

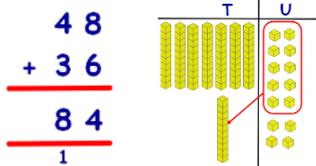
To add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate.
To estimate and use inverse operations to check answers to a calculation.

Children will, when ready, learn to internalise the empty number line to complete 2 digit addition mentally, using jottings as needed for support.

Children to move on from Least Significant Digits addition to a compact representation involving carrying below the line:

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

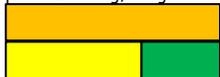
Children will use manipulatives such as Dienes /base 10 to support their written calculations:



Using the formal compact method, 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;
- be able to apply this method to adding units of measure.

The **Bar Model** should continue to be used as an aid to problem solving, alongside written methods.



Key vocabulary

add, more, plus, and, make, altogether, total, equal to, equals, double, most, count on, number line, sum, tens, units, partition, addition, column, tens boundary hundreds boundary, increase, vertical, 'carry', expanded, compact, **thousands, hundreds, digits, invers**

Subtraction

To add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate.
To estimate and use inverse operations to check answers to a calculation.

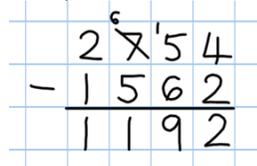
Partitioned column subtraction with "exchanging" using 4-digit numbers (decomposition) as introduced in year 3.

$$\begin{array}{r} 2754 - 1562 = 1192 \\ \hline \end{array}$$

600

$$\begin{array}{r} 2000 + 700 + 50 + 4 \\ - 1000 + 500 + 60 + 2 \\ \hline 1000 + 100 + 90 + 2 \end{array}$$

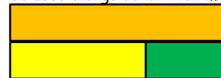
Children will then move on to the compact representation. Decomposition should be shown as follows: *Tens and Units equipment should be used initially alongside the calculation to reinforce children's understanding of decomposition. Singapore place value counters may be used.*



Children will:

- 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.

The **Bar Model** should continue to be used as an aid to problem solving and support children in unpicking the problems. This will be used alongside written methods.



Key vocabulary

equal to, take, take-away, less, minus, subtract, leaves, distance between, how many more, how many fewer/less than, most, least count back, how many left, how much less is..difference, count on, strategy, partition, tens units, exchange, digit, value, hundreds, **inverse**

Multiplication

To multiply two-digit and three-digit numbers by a one-digit number using formal written layout.

Children will continue to use arrays where appropriate to reinforce their understanding of partitioning as a mental method and should then build on their understanding of arrays to use the grid method for TU x U then HTU x U:

The use of place value counters are the recommended manipulatives to be used for grid method.
e.g. 142 x 3=



- ✓ Children should then move on (building on their understanding of partitioning) to learn a **vertical method of recording multiplication** with 2 and then 3 digit numbers:

$$\begin{array}{r} 625 \\ \times 6 \\ \hline 30 \text{ (5 x 6)} \\ 120 \text{ (20 x 6)} \\ \hline 3600 \text{ (600 x 6)} \\ 3750 \end{array}$$

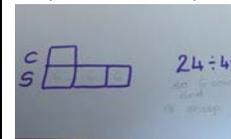
- ✓ **Short multiplication**

Once children are secure with the partitioning method of multiplication, they should move onto the short method.

$$\begin{array}{r} 625 \\ \times 6 \\ \hline 3750 \\ 13 \end{array}$$

Children must have experience of multiplying more than 2 digits e.g. 3 x 4 x 5 = ?

The **Bar Model** (Singapore maths) should continue to be used for problem solving involving multiplication alongside written methods. e.g. *The farmer has 24 animals. There are three times as many sheep as cows. How many sheep and how many cows?*

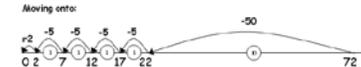
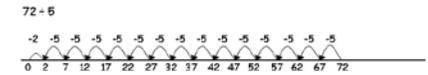


Key vocabulary

groups of, lots of, times, array, altogether, multiply, multiplied by, repeated addition, sets of, equal groups, times as big as, commutative, partition, grid method, multiple, product,

Division

Children will continue to develop their use of repeated jumps of the divisor moving on to multiples (or chunks) of the divisor. Initially, these should be multiples of 10s, 5s, 2s and 1s - numbers with which the children are more familiar.



As the children work with larger numbers, jottings can be used to support calculations. This is intended to be a mental method and children should be encouraged to visualise what they are doing rather than becoming dependent on the numberline.

The following short division method should be introduced. Children should be encouraged to use their mental skills to estimate first. All calculations should have **no remainders** or have any digits which require carrying initially (each digit must be a multiple of the divisor).

STEP 1: The layout of short division will be introduced by comparing it to an array.



(See attached Notebook file which illustrates this)

STEP 2: Extended method should be introduced

$$\begin{array}{r} 3 \overline{)96} \\ -90 \text{ (30 x 3)} \\ \hline 6 \\ -6 \text{ (2 x 3)} \\ \hline 0 \end{array}$$

STEP 3: Introduce the short version and get children to compare extended and short division methods

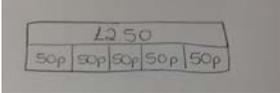
$$\begin{array}{r} 32 \\ \hline 3 \overline{)96} \end{array}$$

Use place value counters to support

Remind children of correct place value, that 96 is equal to 90 and 6, but in short division, pose:

- How many 3s in 9? 3, and record it above the **9** tens. Link to number facts knowledge- if there are 3 3s in 9, then there are 30 3s in 90 (3 tens).
- How many 3s in 6? 2, and record it above the **6** units.

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	Addition	Subtraction	Multiplication	Division
			<p>tens, units, value, <i>inverse</i></p>	<p>STEP 4: Introduce carrying</p> $\begin{array}{r} 18 \\ 4 \overline{) 72} \end{array}$ <p>STEP 4: Introduce remainders</p> $\begin{array}{r} 12 \text{ r } 6 \\ 7 \overline{) 92} \end{array}$ <p>Any remainders should be shown as integers, i.e. 12 remainder 6 or 12 r 6.</p> <p>Children need to be able to decide what to do after division and round up or down accordingly. <i>e.g. An egg box can hold 4 eggs. If I have 73 eggs, how many egg boxes will I need so that all the eggs are in a box?</i></p> <p>A bead string or Place value counters can be used to support.</p> <p><u>The Bar Method</u> (Singapore maths) will continue to be used, alongside written methods of division, to support children in unpicking problems and working out what they are asking them. These problems will be more complex than in year 3.</p>  <p>Key vocabulary share, share equally, one each, two each..., group, groups of, lots of, array, divide, divided by, divided into, division, grouping, number line, left, left over, inverse, short division, 'carry', remainder, multiple, divisible by, factor</p>