

Meadowdale Academy Calculation Policy - Addition and Subtraction

By the end of Key Stage 2

Pupils should be taught to:

- add and subtract whole numbers with more than 4 digits, including using formal written methods (column addition and subtraction)
- add and subtract numbers mentally with increasingly large numbers
- use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy
- solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why

Learning to Add and Subtract

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Using a Number Square

This is useful for Addition and Subtractions

Count forwards or backwards in 1s; down or up in 10s.

e.g. $45 + 13 = 45 + 10 + 1 + 1 + 1 = 58$

$53 - 22 = 53 - 20 - 1 - 1 = 31$

Playing snakes and ladders can really help with this initial stage

Knowing number bonds to 10 ($2 + 8 = 10$, $3 + 7 = 10$) will really help speed up this initial stage
From these number bonds, progress to pairs to 20, then 100

Pairs to 10 can also be used when learning decimals to 1, e.g. $1 + 9 = 10$, so $0.1 + 0.9 = 1$

Partitioning

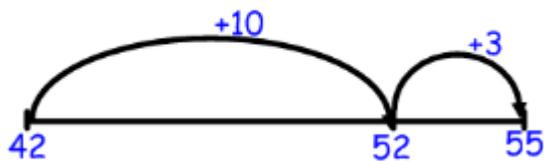
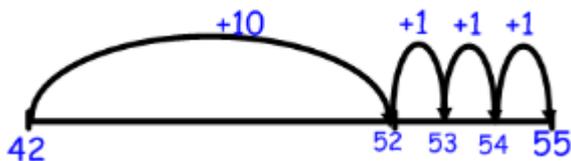
Breaking up the numbers using place value e.g. $468 = 400 + 60 + 8$

e.g. $43 + 56 = 40 + 50 + 3 + 6 = 90 + 9 = 99$

Using a Number Line

For addition, the number line starts with the largest number from the calculation, the jumps are made up from the second number in the calculation, finally adding up to the answer

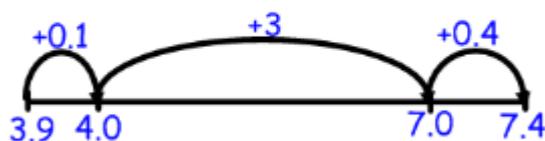
Jumps can be as small or as large as a pupil is comfortable with
e.g. $42 + 13 = 55$



For subtraction we also jump up, here we are finding the difference. Jumps should be to the next 1, 10, 100, 1000 etc. Once these jumps are made, the next jumps can be as small or large as a pupil is comfortable with
Start with the smallest number at the beginning of the number line and the largest number at the end. The jumps are creating the answer
e.g. $73 - 25 = 48$



e.g. $7.4 - 3.9 = 3.5$



Column Addition

The place value is vitally important, the numbers must line up in their columns. For addition, numbers can be added in any order, e.g. $23 + 56 = 56 + 23$. This method can be used to add three or more numbers
e.g. $175 + 37 = 212$

Column Addition

$$\begin{array}{r} 175 \\ + 37 \\ \hline 212 \end{array}$$

The 'carry on' can be placed below the calculation or within

$$\begin{array}{r} 175 \\ + 37 \\ \hline 212 \\ \text{1 1} \end{array}$$

To remember to include the 'carry on', it can be crossed off as it is added

This is the Meadowdale Preferred Method

$$\begin{array}{r} 175 \\ + 37 \\ \hline 212 \\ \text{X X} \end{array}$$

Zero place savers can be used to help the place value
e.g. $7.2 + 56.64 = 63.84$

$$\begin{array}{r} 07.20 \\ + 56.64 \\ \hline 63.84 \\ \text{X} \end{array}$$

Column Subtraction or the Borrowing Method

Again place value is vitally important. For subtraction, the largest number is always on the top. This method can only be used to subtract two numbers. We borrow from the adjacent column, adding ten to the column we are currently using **This is the Meadowdale Preferred Method**
e.g. $351 - 237 = 114$

$$\begin{array}{r} 351 \\ - 237 \\ \hline 114 \end{array}$$

There will be times when you will borrow more than once
e.g. $634 - 276$

$$\begin{array}{r} 634 \\ - 276 \\ \hline 358 \end{array}$$

If borrowing is not possible from the adjacent column, keep going left until borrowing is possible and take this as a whole number, incorporating all the columns
e.g. $4000 - 675 = 3325$ (For this calculation, the number line method may be easier)

$$\begin{array}{r} 4000 \\ - 675 \\ \hline 3325 \end{array}$$

Prior to any calculation, an estimate should be made. This uses rounding, to give an approximate answer. Estimates should be easily calculated mentally
e.g. $347 + 278 \approx 350 + 300 = 650$

After calculating the exact answer, use the estimate to see if your answer is within the right region. Calculating again using a different method can also be used to check your answer

The inverse can also be used to check calculations. For addition, the inverse is subtraction
e.g. $7.2 + 56.64 = 63.84$, so check using $63.84 - 56.64 = 7.2$

To check a subtraction calculation, the inverse is addition
e.g. $35.4 - 15 = 20.4$, so check using $20.4 + 15 = 35.4$

When making any calculation, a pupil should choose their preferred method, this can include a mental calculation. The calculations shown are the most common methods, though pupils can still use alternative methods if they find them more efficient

Meadowdale Academy Calculation Policy - Multiplication and Division

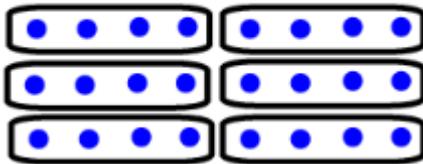
By the end of Key Stage 2

Pupils should be taught to

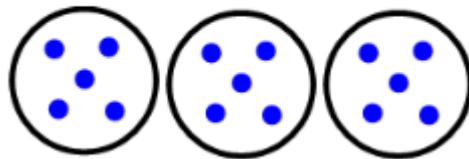
- recall multiplication and division facts for multiplication tables up to 12×12
- multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication
- divide numbers up to 4 digits by a two-digit whole number using the formal written method of long division, and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context
- divide numbers up to 4 digits by a two-digit number using the formal written method of short division where appropriate, interpreting remainders according to the context
- perform mental calculations, including with mixed operations and large numbers
- identify common factors, common multiples and prime numbers
- use their knowledge of the order of operations to carry out calculations involving the 4 operations
- solve problems involving addition, subtraction, multiplication and division
- use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy

Learning to Multiply and Divide

Multiplication is repeated addition, this can be shown visually
e.g. $6 \times 4 = 4 + 4 + 4 + 4 + 4 + 4 = 24$



Division is sharing into groups, this can be shown visually
e.g. $15 \div 3 = 5$



Multiplication Facts up to 12×12

There is no one correct way to learn these, other than repetition. We advise writing them out, chanting them, testing yourself and playing games using them. As often as you practise these, the more accurate and faster you will become

Multiplication can be done in any order, e.g. $6 \times 4 = 4 \times 6$

This also applies when multiplying 3 or more numbers, e.g. $2 \times 6 \times 5 = 10 \times 6 = 60$ (multiply the 2 by 5 first, to make the mental calculation easier)

It is important to realise \div is the inverse of \times , so for each \times fact, there is a related \div fact, e.g. $6 \times 4 = 24$, so $24 \div 6 = 4$

Combining these two together, leads to realising that for every \times fact, 4 facts are known, e.g. $6 \times 4 = 24$, $4 \times 6 = 24$, so $24 \div 6 = 4$ and $24 \div 4 = 6$

Related Facts

From knowing any \times fact, other facts can be derived, e.g. $3 \times 7 = 21$, $30 \times 7 = 210$, $300 \times 7 = 2100$, $3000 \times 7 = 21000$, $0.3 \times 7 = 2.1$ etc.

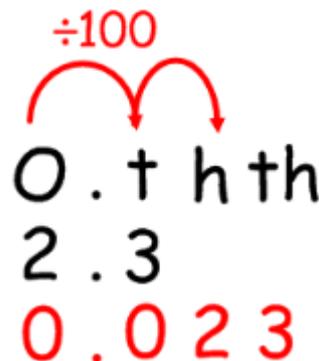
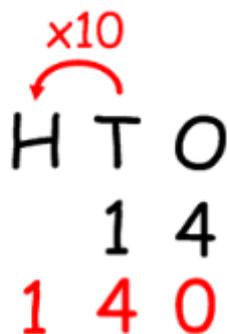
The relating \div facts can also be derived, e.g. $21 \div 3 = 7$, $210 \div 30 = 7$, $2.1 \div 0.3 = 7$ etc.

Multiplying and Dividing by 10, 100 and 1000

We move the digits by either 1, ($\times 10$) 2 ($\times 100$) or 3 ($\times 1000$) places. Digits move left to \times (getting larger) or right to \div (getting smaller). The digits are locked together, never losing their original order. A zero is placed in any empty columns

e.g. $14 \times 10 = 140$

e.g. $2.3 \div 100 = 0.023$



Partitioning

Breaking up the number using place value
 e.g. $42 \times 6 = (40 \times 6) + (2 \times 6) = 240 + 12 = 252$

Grid Method

Using the partitioning method for more complex numbers
 e.g. $65 \times 32 = 2080$

$$\begin{array}{r|l}
 \times & 60 & 5 \\
 \hline
 30 & 1800 & 150 \\
 \hline
 2 & 120 & 10 \\
 \hline
 & & + 130 \\
 \hline
 & & 2080
 \end{array}$$

Column Multiplication

Long Multiplication

This is the New Curriculum Preferred Method

e.g. $67 \times 32 = 2144$

$$\begin{array}{r}
 67 \\
 \times 32 \\
 \hline
 134 \\
 2010 \\
 \hline
 2144
 \end{array}$$

Expanded Method

e.g. $65 \times 32 = 2018$

$$\begin{array}{r}
 65 \\
 \times 32 \\
 \hline
 10 \quad (2 \times 5) \\
 120 \quad (2 \times 60) \\
 150 \quad (30 \times 5) \\
 1800 \quad (30 \times 60) \\
 \hline
 2080
 \end{array}$$

e.g. $3.7 \times 64 = 236.8$

Notice the place saving zeros

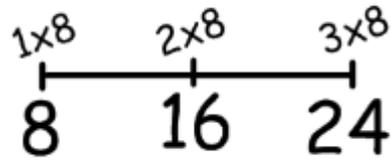
$$\begin{array}{r}
 3.7 \\
 \times 64.0 \\
 \hline
 148 \\
 2220 \\
 \hline
 236.8
 \end{array}$$

An estimation should also be carried out prior to completing a multiplication or division calculation. This estimation will show if the answer is in the correct region

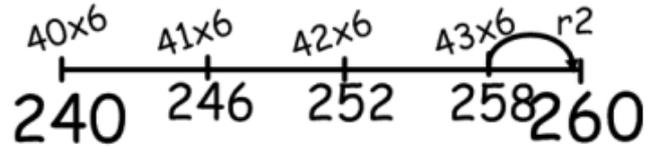
Also checking the calculation can be done using a different method or completing the inverse calculation. The inverse of multiplication is division and vice versa

Dividing along a Number Line

Use the number line to jump up to the desired result
 e.g. $24 \div 8 = 3$



For larger calculations, use related facts to make a large initial jump
 e.g. $260 \div 6 = 43 \text{ r}2$



Chunking

Using multiplication and subtraction to aid \div this is particularly efficient for dividing by larger numbers

e.g. $157 \div 6 = 26 \text{ r}1$ or $26 \frac{1}{6}$

e.g. $157 \div 14 = 11 \frac{3}{14}$

$$\begin{array}{r}
 6 \overline{)157} \\
 \underline{120} \quad (20 \times 6) \\
 37 \\
 \underline{36} \quad (6 \times 6) \\
 1 = 26 \text{ r}1
 \end{array}$$

$$\begin{array}{r}
 14 \overline{)157} \\
 \underline{140} \quad (10 \times 14) \\
 17 \\
 \underline{14} \quad (1 \times 14) \\
 3 = 11 \text{ r}3
 \end{array}$$

Short Division

This is the Meadowdale Preferred Method

e.g. $372 \div 5 = 74 \frac{2}{5}$

$$\begin{array}{r}
 074 \text{ r}2 \\
 5 \overline{)372} \\
 \underline{35} \quad 20 \\
 20
 \end{array}$$

By expanding the original number to include tenths and 'carrying on' the remainder, we can now show this remainder as a decimal
 e.g. $372 \div 5 = 74.4$

$$\begin{array}{r}
 074.4 \\
 5 \overline{)372.20} \\
 \underline{35} \quad 20 \\
 20
 \end{array}$$

Long Division

e.g. $372 \div 5 = 74 \frac{2}{5}$

$$\begin{array}{r}
 074 \\
 5 \overline{)372} \\
 \underline{35} \\
 22 \\
 \underline{20} \\
 2
 \end{array}$$