1) ***All*** **of the pedagogy in the existing policy is** ***still*** **useful.**

Concrete objects, images, number lines, arrays, expanded methods etc are all there if the child needs support to understand the *structure* of the four operations. Also, these can be useful as mental methods. Teachers to judge when to use.

2) **A note on place value.**

The headings on calculations should still be as in the existing policy:

M 100 TH 10 TH TH H T U . t h th

However, it would be extremely useful (especially as by Y5 they need to 'recognise and use thousandths and relate them to tenths, hundredths and decimal equivalents e.g. one tenth is same as 100 th') for the pupils to regularly see (perhaps in a wall display) decimal place value shown in different ways:

e.g.	t	h	th
	1/10	1/100	1/1000
	0.1	0.01	0.001

3. A s**uggested Rounding method**

1. **Put place value headings above the number.**

2. **PUT A * OVER THE DIGIT YOU ROUNDING TO**

3. Go **one place to the right** of the * digit. Draw glasses over this digit. This is what you **look a**t.

e.g.	TH	H	T	U
		*		
	4	7	3	8

4: If the digit under the glasses is a **0, 1 , 2, 3 , or 4** You **round down**

If the digit under the glasses is a **5 , 6, 7, 8 ,** or **9 You round up**

5: When you round down, the * digit does not change.
When you round up, the * digit goes up by one.

6: All the digits to **left** of the * digit **stay the same**.

7: All the digits to the **right** of the * digit become **zeroes**.

1. Take care with 9 digits. You will have to change two columns.

Written addition

The Standard Written Method is expected from Y3. Only the size of numbers change.

```
   5  8 7
+  4  8 5
-------
  1 0  7 2
    1  1
```

Y3: add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction
Y4: add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate
Y5: •add and subtract whole numbers with more than 4 digits, including using formal written methods
Y6: add and subtract whole numbers with more than 4 digits and 2 place decimal fractions using formal written method

Key points:

2. Encourage to put place value headings above columns because of the larger numbers involved.
3. Start adding with smallest value digits on right.
4. Encourage crossing out of carries to ensure they are not forgotten.
5. *From* Y3 onwards, extend to decimal addition (money context)
6. *From* Y3 onwards, include questions with different numbers of digits to build understanding of place value e.g. 786 + 31
7. *From Y3 onwards*, include questions that require more than two numbers to be added e.g. 342 + 618 + 74
8. *From Y3 onwards*, encourage approximation to develop understanding of number size e.g 378 + 217 *must* be more than 500 because 300 + 200 = 500

Written subtraction

The Standard Written Method is expected from Y3. Only the size of numbers change.

$$\begin{array}{rrrr} & {}^{4}\cancel{5} & {}^{12}\cancel{3} & {}^{1}2 \\ - & 3 & 4 & 7 \\ \hline & 1 & 8 & 5 \\ \hline \end{array}$$

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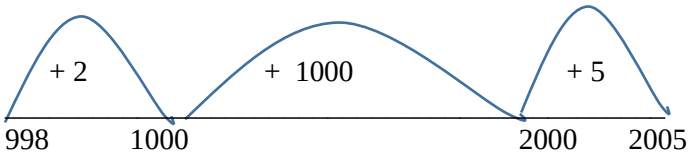
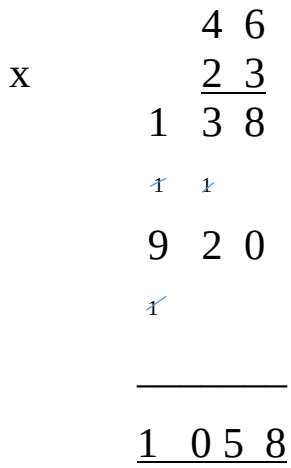
4. From Y3 onwards, extend to decimal addition (money context)
5. From Y3 onwards, include questions with different numbers of digits to build understanding of place value e.g. 786 – 31
6. From Y3 onwards, include questions that require more than two numbers to be subtracted e.g. 345 – 112 - 50
7. From Y3 onwards, encourage approximation to develop understanding of number size e.g 608 - 247 *is about 600 – 250 so answer must close to 350*
8. From Y3 onwards, include questions with zero in top row.
9. Help pupils realise that SWM is **not** always best method! Eg 2005 – 998 is *far easier* using a number line to count up using thousands as bridges



= 1007

Written multiplication

Standard Written Method from Y3 (*Unless a child first needs the expanded method to scaffold their understanding)*



1 0 5 8

Y3: Progress to formal written methods calculations as above (partitioning into T & U first) (TU x U)
Y4: multiply two-digit and three-digit numbers by a one-digit number using formal written layout
Y5: multiply numbers up to 4 digits by a one- or two-digit number using a formal written method, including long multiplication for two-digit numbers
Y6: multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication; multiply one-digit number with up to two decimal places by whole numbers

Notes

1. Start with **units in bottom row multiplying units in top row**. (As above)
2. Encourage crossing out of carries so not forgotten.
3. Encourage place value headings on top of columns.
4. If times tables not known then answer *will* be wrong so ***if*** needed encourage working out of times table facts (using array) at side.
5. The big step is the move from multiplying by one digit to multiplying by two digits so it is suggested that Y4 achieve HTU x U as a minimum.
6. The standard method of decimal multiplication taught in Y6 is to ignore the decimal point, do as a whole number multiplication, then count how many digits after the point in the question and make sure the answer has the same number of digits after the point. E.g. for 1.**22** x 3 do as 122 x 3 = 366 then change answer to 3.**66** because **two digits** after point in question.

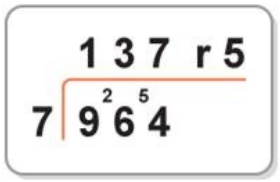
Division

Y3: Not explicitly stated but does say *solve problems, including missing number problems, involving multiplication and division*
Y4: Divide TU by U within times tables known (using bus stop method)
Y5: divide numbers up to 4 digits by a one-digit number using the formal written method of short division and interpret remainders appropriately for the context
Y6: 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 context

Use the bus stop sign from Y3.

Short division from Y3.

1) Pupils to write out the multiples of the divisor in a list. (**If they cannot do this, they *will* get the division wrong!)**
2) Then mark in where the dividend fits in.
3) Then count how many times the divisor 'goes into' the dividend.
4) Then count from the previous whole multiple up to the dividend to find the remainder.



Thinking: (Step 4)

'from 7 to 9 is remainder 2'

'from 21 to 26 is remainder 5'

'From 49 to 54 is remainder 5'

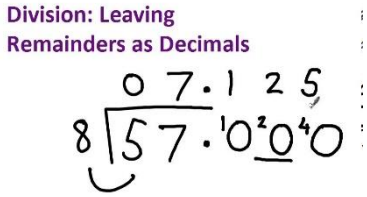
Thinking: does not need to be written out (Step 3)

7x	
7	* '7 goes into 9 one time'
9 →	
14	*
21	* '7 goes into 26 three times'
26 →	
28	*
35	*
42	*
49	* '7 goes into 54 seven times'
54 →	
56	
63	
70	
84	

Notes
New to Y5 is interpretation of remainders as fractions or decimals according to context

Fractions: This is just the remainder as a numerator over the original divisor
eg the above example would have answer 137 5/7

Decimals: Put a decimal point after the last digit you are dividing into. Do same above it in answer. Extend the dividend with a zero. Then continue as before with the remainders put next to the zeroes.



Long division (Y6)
This is where chunking (as in previous policy) is useful e.g.

		2	8	r 12	
15	4	3	2		
-	3	0	0		(20)
	1	3	2		
	-	7	5		(5)
		5	7		
	-	3	0		(2)
		2	7		
	-	1	5		(1)
		1	**2**		

Key facts

1	x	15	=	15
2	x	15	=	30
4	x	15	=	60
5	x	15	=	75
10	x	15	=	150
15	x	15	=	225
20	x	15	=	300
40	x	15	=	600

A note on efficiently deriving useful key facts:
Place value and doubles /halves are the key!
e.g. the **thinking above should go:**
' Double my 1 x 15 gives 2x = 30'
'Double again gives 4 x = 60'
'Use place value to get 10x = 150'
' Half of this is 75 which gives 5 x'
'Double my 10x gives 20x = 300'
'Double my 20x gives 40x = 600'

It is a balance between not deriving enough facts to be useful or spending too long deriving every single multiple.
Pupils should go to a key fact that is higher than the dividend.

Short division by a 2 digit number (Y6)

If dividing by 11 or 12 –can use times tables knowledge.

If dividing by anything larger then suggest a mixture of key facts (above) *combined* with standard short division method.

Fraction calculations

***Y3**: add and subtract fractions with the same denominator within one whole [for example, 5/7 + 1/7 = 6/7]*

***Y4**: add and subtract fractions with the same denominator within one whole [for example, 5/7 + 1/7 = 6/7]*

***Y5**: •add and subtract fractions with the same denominator and denominators that are multiples of the same number*

multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams

***Y6**: •add and subtract fractions with different denominators and mixed numbers, using the concept of equivalent fractions*

- *multiply simple pairs of proper fractions, writing the answer in its simplest form*
- *divide proper fractions by whole numbers*

Adding and subtracting

To avoid **mistakes** adding/subtracting denominators: e.g $\frac{2}{\mathbf{6}} + \frac{3}{\mathbf{6}} = \frac{5}{\mathbf{12}}$

do as $\frac{2}{6} + \frac{3}{6} = \frac{2+3}{6} = \frac{5}{6}$

This can still be used when adding / subtracting different denominators in later years. First change to same denominator:

e.g.

$\frac{3}{6} + \frac{4}{12}$

$\frac{6}{12} + \frac{4}{12} = \frac{6+4}{12} = \frac{10}{12}$

Multiplying

Good use can be made of the squares in the maths books

e.g. $3 \times \frac{1}{4}$ as $\frac{1}{4} + \frac{1}{4} + \frac{1}{4} = \frac{3}{4}$

As

This leads to understanding of $3 \times \frac{1}{4}$ as $\frac{3}{1} \times \frac{1}{4}$ where numerators multiply each other and so do denominators

Which leads to the ability to do e.g $\frac{3}{4} \times \frac{2}{5}$ as $\frac{6}{20}$ which is then reduced to simplest form of $\frac{3}{10}$

Dividing fractions

As above: first see that $\frac{1}{2} \div 4$ means $\frac{1}{2} \div \frac{4}{1}$

Then can work out the standard way i.e. multiply by reciprocal

So $\frac{1}{2} \div \frac{4}{1}$ is actually worked out as $\frac{1}{2} \times \frac{1}{4} = \frac{1}{8}$