Year 5

Addition & Subtraction

- Children use columns in written addition and subtraction, accurately adding and subtracting numbers with more than four digits. They use mental methods to add and subtract increasingly large numbers, and use rounding to check their answers. With support they choose appropriate operations and methods, and work out the level of accuracy required to answer a particular problem. They will continue to develop this work in Year 6.

DEVELOPING MENTAL FLUENY STRATEGIES

ADDITION

Reordering Children should understand why it is more efficient to reorder numbers when adding to put the largest number first.

Bridging They should then use knowledge of number bonds and bridging.

156 + 45 becomes 156 + 4 + 41 = 160 + 41 = 201

12.3 + 6.8 becomes 12.3 + 0.7 + 6.1 = 19.1

1½ + 3/4 bridge to 2 and add remaining 1/4

Partition both numbers then add and recombine.

145 + 123 = 100 + 100 + 40 + 20 + 5 + 3

= 200 + 60 + 8

= 268

Partitioning just the smaller addend

234 + 122 becomes 234 + 100 + 20 = 2

= 334 + 20 + 2

= 354 + 2 = 356

Doubles and near doubles

143 + 145 = double 140 + 8 = 288

6.2 + 6.3 = double 6 + 0.5 = 6.5

Compensating ~ adding a close multiple of 10 (e.g. 18, 19, 21, 22)

273 + 19 becomes 273 + 20 = 293 – 1 = 292

2.4 + 0.8 becomes 2.4 + 1 = 3.4 – 0.2 = 3.2

Deriving new facts from known. 4 + 8 = 12 therefore 0.4 + 0.8 = 1.2

SUBTRACTION

Bridging through ten and multiples of ten should also be use when subtracting.

142 – 23 becomes 142 -20 –2- 1

Counting on to find the difference

Count on because the minuend and subtrahend are close together

3641 – 2991 = 5001 – 1997 =

0.63 - 0.48 =

Partition before count back if minuend and subtrahend are further apart

464 – 129 becomes 464 – 100 = 364 364 – 20 = 344 344- 4 – 5 335

Compensating ~ subtracting a close multiple of 10, 100 or 1 (e.g. 18, 19,101, 1.9)

12.4 -1.8 becomes 12.4 – 2.0 = 10.4 + 0.2 = 10.6

Year 5

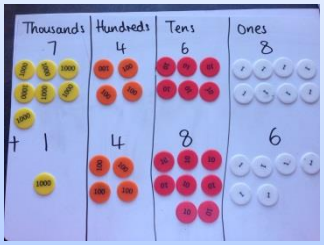
Addition - children will be calculating ThHTO + ThHTO and decimals - using the formal written method of columnar addition when appropriate.

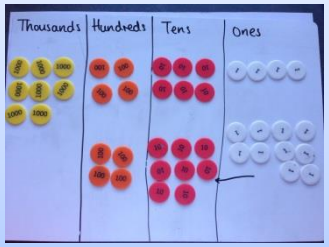
NB Ensure that children are secure with the methods outlined in the previous year's guidance before moving on

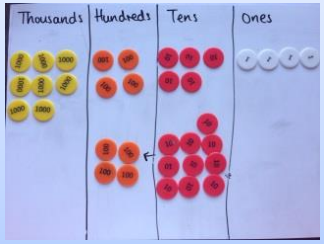
- Use models, images and make connections between different methods using SAME/DIFFERENT approach. Use range of resources e.g. Dienes, counters, addition squares, place value cards and other resources to ensure that children have a secure knowledge of place value to 2 decimal places. Place stress on children understanding the value of a digit and what happens when this is exchanged. Ensure that children are taught from the start to line up decimal calculations correctly and can explain the rationale behind this. Children should use column method as Year 4 - with the least significant different first.

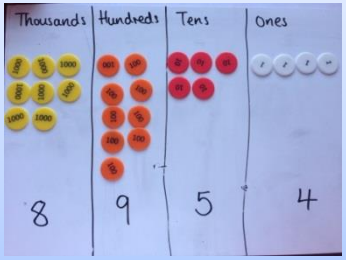
MODELS TO WRITTEN

DIENES and Place Value Counters used to show explain formal column



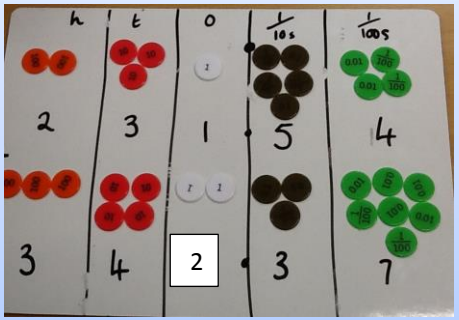


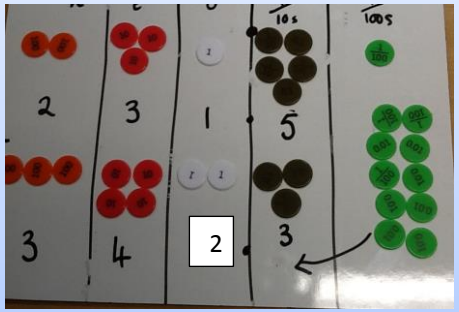


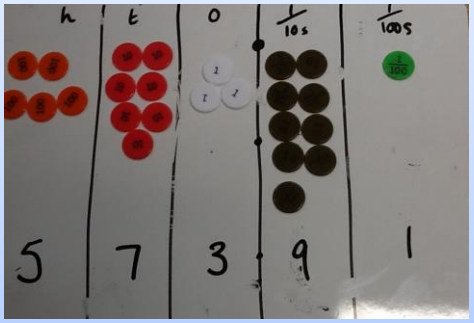


7468
+ 1486
8954

231.54 + 342.37 Modelled using place value counters to show column addition







Year 5

Subtraction - Up to 4 digits using a formal written method

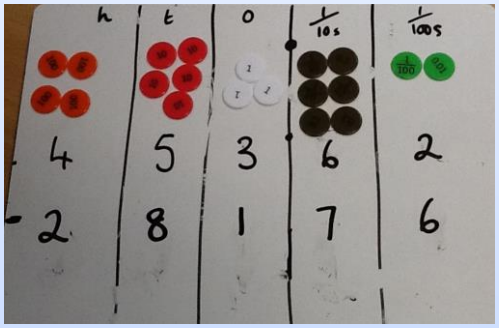
Formal column

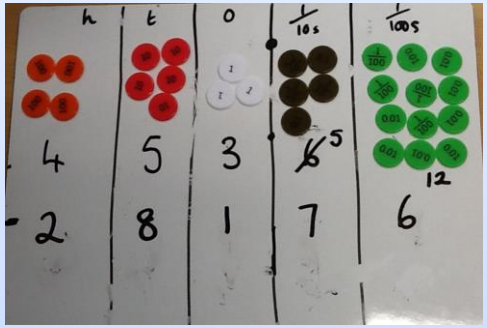
3597 - 1324	3000		500	90	7		3597
	1000		300	20	4		1324
	2000	+	200	+ 70	+ 3	= 2273	2273

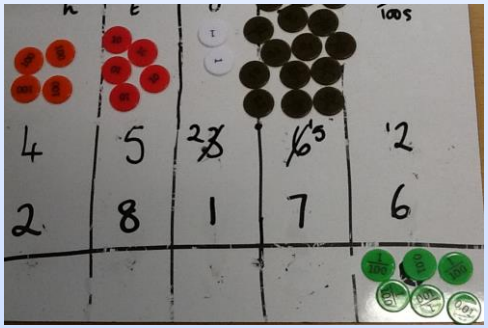
Same /Different? Children should compare both methods side by side and identify similarities/differences and be able to explain these.
CHILDREN should be encouraged to check answers using inverse operation or alternative method.

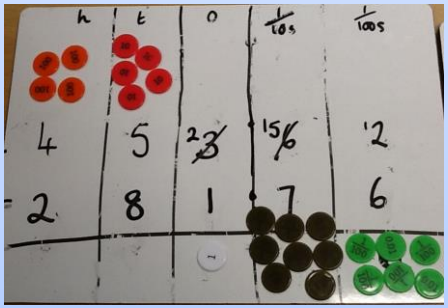
453.62 – 281.76

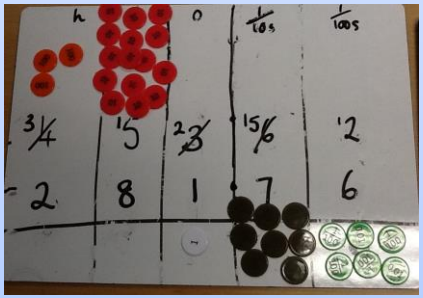
Children work through calculations using place value counters before moving onto abstract

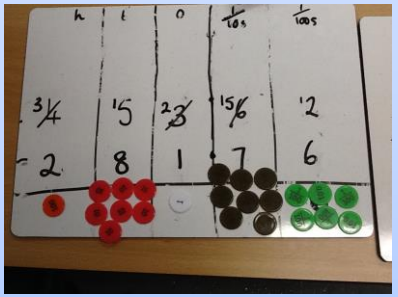


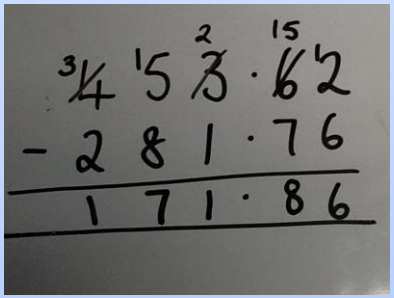












Year 5

Multiplication and Division

- Developing mental fluency in multiplication and division.

DEVELOPING MENTAL FLUENY STRATEGIES

Need to know

2 distinct characteristics:
Quantitative value: knowing and using the fact that e.g. 64.3 is 60 and 4 and 3 tenths
Columnar value: know that the 6 is in the 10s column and the 4 is in the ones column and the 3 is on the tenths column.

Multiplication facts (including squares) to 12 x 12.

Factor pairs
e.g. factor pairs of 12 = 1,12, 2,6,3,4,
therefore 1 x 12, 2 x 6, 3 x 4 = 12

Understand terms factor, multiple, prime, square and cube numbers and use them to construct equivalent statements
e.g. 4 x 35 = 2 x 2 = 35

Multiples of 2,3,4,5,6,8 10 ,25 and 50

Divisibility/multiple rules
e.g. multiple of 3 if *'addition of digit roots sum to multiple of 3'*
48= 4 + 8 = 12 therefore 48 multiple of 3.
Multiple of 6 is even and digit roots sum to multiple of 3 e.g. 72 = even = 7 + 2 = 9 therefore 72 multiple of 6.

Need to know

2 distinct characteristics:
Quantitative value: knowing and using the fact that e.g. 64 is 60 and 4
Columnar value: know that the 6 is in the 10s column and the 4 is in the ones column.

Division facts (+ square roots) derived from multiplication tables to 12 x 12

Factor pairs
e.g. factor pairs of 12 = 1,12, 2,6,3,4,
therefore 12 is divisible by1,12,2,6,3,14,

Multiples of 2,3,4,5,6,8 10 , 25 and 50

Divisibility/multiple rules
Divisibility rules:
e.g. *An even dividend divided by 2 will give a quotient which is even.*
An even whole number with a divisor of 6 will give a whole number quotient if dividend is an even number and the digit roots sum to a multiple of 3.
486 ÷ 6 486 even; 4+ 8 + 6 = 18 multiple of 3 therefore divisible by 6.

DEVELOPING MENTAL FLUENY

Recall prime numbers to 19.
Use multiplication facts to identify if a number from 1 to 100 is a prime number.

Recognise multiplication as **repeated addition** –E.g. plant growth is 3cm per day therefore over 7 even days plant will be 21cm

Use above for approximation – operating first with all the digits that have the greatest value (left to right)
e.g. 42 x 4 ≠160
123 x 4 ≠ 480

Children should have implicit understanding of commutative law
e.g. a = 1, b = 2 , c = 3
a x b = b x a i.e. 1 x 2 = 2 x 1
Associative law
(a x b) x c = a x (b xc)
(1 x 2) x 3 = 1 x (2 x 3)
Distributive law
a x (b + c) = a x b + a x c
1 x (2 +3) = 1 x 2 + 1 x 3 – Can also be expressed as:
a x (b + c) = ab + ac

Use prime numbers to decide is a number up to 100 is divisible by more than 0, 1, and itself.

Recognise division as **repeated subtraction but not always discrete.** E.g. Plant growth over one week is 21 cm therefore daily growth is approx. 3cm.
Use above for approximation – operating first with all the digits that have the greatest value (left to right)
e.g. 168 ÷4 ≠ 40
469÷4 ≠ 110

Children should know that
commutative law, associative law and distributive law are **not applicable** for division
a = 1, b= 2 ,c = 3
i.e. Commutative law
a ÷b is not equal to b÷a
Associative law
a ÷b ÷c is not equal to (1÷ 2÷3)
Distributive law
A ÷(b ÷c) is not equal to 1 ÷(2÷3)

STRATEGIES SHOULD ALSO INCLUDE THE FOLLOWING.

Place value:
Use place value knowledge to multiply by 10,100 or 1000.e.g. 10 x 18 = 180 therefore 100 x 18 = 1800, 100 x 180 = 18,000 10 x 1.8 = 18
Use place value to derive unknown facts e.g. 3 x 40 = 120 therefore 3 x 400 = 3 x 40 x 10 = 1200, 30 x 40 = 3 x 4 x 100.

Doubling and halving :
Use doubling/halving to calculate unknown facts
E.g. to multiply by 4 – double and double again.
To multiply by 5, multiply by 10 and halve.
60 x 4 = 120 therefore 30 x 4 = 60

Using related facts
e.g. 19 x 4 = 20 x 4(– 4) = 76

Partitioning: Use partitioning to find partial products then sum

e.g. 123 x 6 = 600 + 6 + 23 x 6 =

20 3

20 x 6 + 3 x 6

120 + 18 = 138 + 600 = 738

Place value
Use place value to divide by 10,100 or 100 e.g. 360 ÷10 = 36 therefore 36 ÷ 10 = 3.6
Use place value to derive unknown facts e.g. 60 ÷5 = 12 therefore 600 ÷5 = 120

Doubling and halving :
Use doubling and halving to calculate unknown facts.
E.g. to divide by 4 – halve and halve again.
280 ÷8 = 280 ÷2 ÷2 =
To divide by 5; divide by 10 and double answer.
e.g. 480 ÷5 = (480 ÷10) x 2 = 96

Partitioning:
Use partitioning to find partial quotients then sum

e.g. 438 ÷6 =

420 18

(420 ÷ 6) + (18 ÷6)

70 + 3 = 73

Year 5

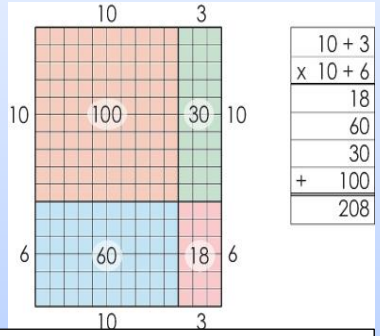
Multiplication - ThHTO x O and T0 x TO, HTO x TO

MULTIPLICATION

Children should be working with calculations to: ThHTO x O and T0 x TO, HTO x TO. Questions should include 'What are some of the similarities /differences in these methods?' Children need to see both methods alongside, Children should be able to identify all methods use part products and recombining. Children should identify that in column methods – you start from the right (i.e. lowest value) – however this is not necessary in grid method.

FORMAL Columnar method:

123
x5
615



10 + 3	
x 10 + 6	
18	
60	
30	
+ 100	
208	

Grid method as stepping stone for long multiplication - model using place value counters

	1	6	
x	1	3	
	1	8	(6 x 3)
	3	0	(10 x 3)
	6	0	(6 x 10)
1	0	0	(10 x 10)
2	0	8	
1			

Expanded long multiplication

	1	6	
x	1	3	
	4	8	(16 x 3)
1	6	0	(16 x 10)
2	0	8	
1			

Moving quickly to contracted long multiplication

Children should move onto multiplying whole numbers and decimal numbers by whole numbers. **Use grid method as stepping stone.**

E.g. 12.62 x 8

X8

Tens	ones	tenths	hundredths
10	2	0.6	0.02
80	16	4.8	0.16

= 80 + 16 + 4.8 + 0.16 + = 100.96

formal column method

12.62
x8
100.96
24 1

Children should estimate first e.g. 12 x 8 = 96 and 13 x 8 = 104 so my answer will lie between these and will have 2 decimal places.

Year 5

Division - HTO ÷ 0 and ThHTO÷O.

DIVISION

Children will be tackling calculations in the form HTO ÷ 0 and ThHTO ÷ U. Please see methods used in Year 4 as a starting point Children should not move onto long division but focus on embedding current understanding and application of all four operations the use of rich tasks. Children need to be secure with partitioning and have a real grasp of place value to understand what happens when number 'carried'. Place value counters should be used alongside written method for short division.

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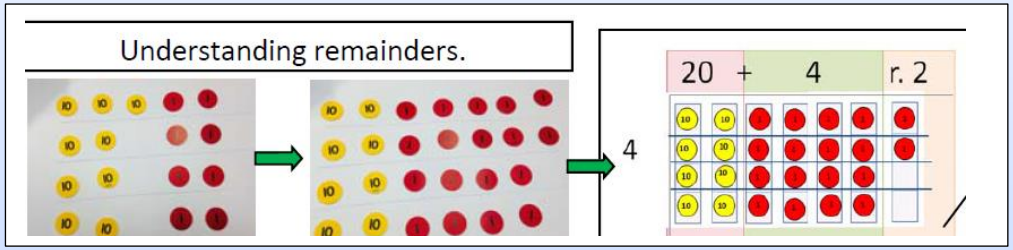
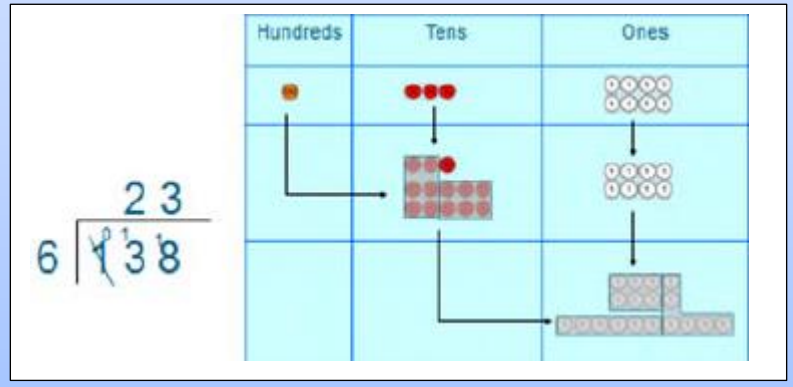
Practical experience with manipulatives is vital for children to talk through the language of division e.g. *exchange remainder*; and to embed conceptual understanding.



$98 \div 4 = \frac{98}{4} = 24 \text{ r } 2 = 24\frac{1}{2} = 24.5$

Can we divide this 100 *token into 6 equal groups? , then we must exchange it for ten* 10 *tokens. Can we divide into 6 groups now?*



Short division

98 ÷ 7 becomes

$$\begin{array}{r} 1\ 4 \\ 7\overline{)\,9^{2}\ 8} \end{array}$$

Answer: 14

432 ÷ 5 becomes

$$\begin{array}{r} 8\ \ 6\ \text{r}2 \\ 5\overline{)\,4\ 3^{3}\ 2} \end{array}$$

Answer: 86 remainder 2

496 ÷ 11 becomes

$$\begin{array}{r} 4\ \ 5\ \text{r}1 \\ 1\ 1\overline{)\,4\ 9^{5}\ 6} \end{array}$$

Answer: $45\frac{1}{11}$

Children should be making a decision as regards to a remainder in the context of problem. 16 pizzas shared equally between 3 people = 5 and one third; £16.00 shared between 4 people = £4.00 . 16 children going on trip – car takes four - how many cars need? 4 Cars. Car takes 4 people, 17 people going on trip – how many cars needed? 5 cars