Kearsley West Written Calculations Policy

- This policy was written in consultation with staff to ensure progression and continuity of pencil and paper procedures throughout the school.

- It is important to note that written calculations are not a replacement for mental calculation. As there is some element of mental calculations in all these pencil and paper methods children need to continue to have rapid recall of number bonds and x tables.

- The following document will outline the pencil and paper procedures taught in school. It will demonstrate which stages the children need to take in order to develop an efficient method for calculating.

- The written methods will start when the children are ready. Children begin by using pictures and jottings to support their learning and when ready move on to more formal recording.

- The stages are progressive and children will only move on as and when they are ready and may move back to a familiar method if needed.

1. **Written calculation methods for the 4 rules of number need to be built on mental strategies.**

Children should always be encouraged to ask-

- Can I do it in my head?
- Do I need jottings to help me use mental methods?
- Would a written method be the most efficient for this calculation?

2. **Estimate. “Is my answer sensible?” Children should be encouraged to estimate from the earliest stages.**

Multiplication and Division

Always build on mental strategies. Assess children's knowledge and understanding.

Can the children

- Count in steps of 2, 5,10, 3 etc – forwards and backwards?
- Group numbers into equal groups?

Do the children

- Use known facts to help with calculations or work out facts needed from known facts?

- Multiply and divide by 10 and 100 confidently?

Always, from the earliest stages, emphasise inverse operations

6x2=12

2x6=12

12÷6=2

12÷2=6

Stages to an efficient method for Multiplication

Stage one: Multiplying TUxU=

Method: **by Partitioning the numbers and then recombining. Start with the units first.**

E.g.

23x4=

20x4=80
3x4=12
} add together

=**92**

Or

23x8=

20x8 = 160
4x8= 24
} add together

=**184**

Stage Two: Multiplying TU x U= and HTU x U=

Method: **compact numbers with extended total recording vertically.**

E.g.

23x4=

	23	
	X 4	
3x4	12	add together
20x4	80	
	92	

346x4=

	346	
	X 4	
6x4	24	add together
40x4	160	
300x4	1200	
	1384	

The same methods will be used for decimals.

Stage Three: **Multiplying TU x U= and HTUxU=**

Method: **compact numbers and compact total.**

E.g.

23x4=

$$\begin{array}{r} 23 \\ \times\ 4 \\ \hline \mathbf{92} \\ \hline 1 \end{array}$$

And

346x4=

$$\begin{array}{r} 346 \\ \times\ 4 \\ \hline \mathbf{1384} \\ \hline \mathbf{12} \end{array}$$

The same methods will be used for decimals.

Stage Four: Multiplying TUxTU= , HTUxTU= and HTUxHTU=

Method: **long Multiplication**; **Grid Method leading to compact method.**

E.g. 42x16=

	40	2	
10	400	20	420
6	240	12	252
			672

add together

372x24=

	300	70	2	
20	6000	1400	40	7440
4	1200	280	8	1488
				8928

add together

124x246=

	200	40	6	
100	20000	4000	600	24600
20	4000	800	120	4920
4	800	160	24	984
				30504

add together

leading to a compact method:

42x16=

	42	
X	16	
	252	
	420	
	672	

372x24=

	372	
x	24	
	1488	
	7440	
	8928	

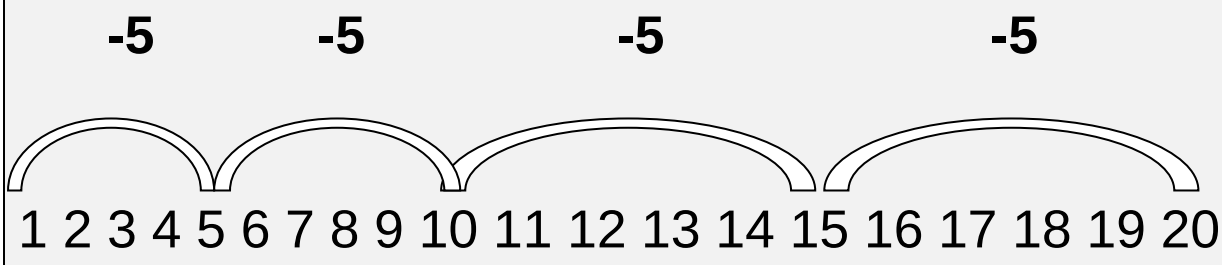
The same methods will be used for decimals.

Stages to an efficient method for division

Stage One: TU÷U=

Method: To use repeated subtraction on a number line.

E.g. **20÷5=**



= **4 groups.**

Leading to using known multiplication facts and inverse operations.

E.g.

28÷7= 28÷7= **4**

7x **4** = 28

When the calculation goes beyond the 12 x a number and the facts they know, then children will need to use 'grouping'. E.g.

96÷6=**16**

add together { **10**x6=60, **6**x6=36

16

Stage Two: TU÷U= and HTU÷U=

Method: **Grouping with expanded total recording vertically.**

E.g.

96÷6=**16**

96		
- 60	**10**x6	**add** the **groups** of **six** together
36		
- 36	**6**x6	
0	**16**	

Then with remainders

E.g. 98÷6=

96÷6=**16 r 2**

98		
- 60	**10**x6	**add** the **groups** of **six** together
38		
- 36	**6**x6	
2	**16**	

E.g. 252÷7=**36**

252		
- 210	**30**x7	**add** the **groups** of **seven** together
42		
- 42	**6**x7	
0	**36**	

Then with remainders

E.g. 256÷7=**36 r 4**

256		
- 210	**30**x7	**add** the **groups** of **seven** together
46		
- 42	**6**x7	
4	**36**	

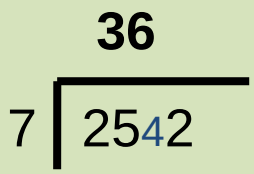
The same methods will be used for decimals.

Stage Three: HTU÷U=

Method: **Bus stop. Compact method.**

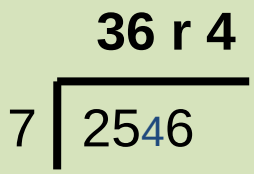
E.g.

252÷7=**36**



Then with remainders

256÷7=**36 r 4**

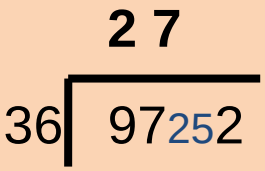


The same methods will be used for decimals.

Stage Four: HTU÷TU

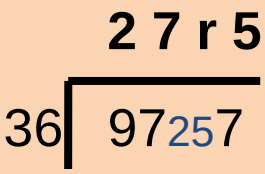
Method: **Long multiplication. Bus stop compact method.**

E.g. 972÷36= **27**



Then with remainders

E.g. 977÷36=**27 r 5**



The same methods will be used for decimals.

Summary

Children should always estimate first.

Always check the answer, preferably using a different method e.g. the inverse operation.

Always decide whether a mental method is appropriate.

Pay attention to language- refer to the actual value of digits.

Children who make persistent mistakes should return to the method that they can use accurately until ready to move on.

Children need to know number and multiplication facts by heart.

Children need models and images to support their understanding

Discuss errors and diagnose problem and then work through problem- do not simply re-teach method.

When revising and extending to harder numbers, refer back to expanded methods. This helps reinforce understanding and reminds children that they have an alternative to fall back on if they are having difficulties.

Written by J Butler 2014