Roseberry Primary School

Mental Calculations Policy

Approved by the Governing Body:	**Oct 2014**
Next Interim Review Date:	**Oct 2018**
Next full Review Date:	**Feb 2020**
Head Teacher: Maggie Fearnley	

This policy should be used alongside the 'Progression towards a standard written method of calculation' policy, which outlines the key pencil and paper procedures that will be taught at Roseberry Primary School, and has been written to ensure consistency and progression throughout the school.

Although the focus of the 'Progression towards a standard written method of calculation' policy is on pencil and paper procedure, it is important to recognise that the ability to calculate mentally lies at the heart of the Primary National Strategy for mathematics. Therefore, mental methods of calculations will be taught systematically from Reception onwards and pupils will be given regular opportunities to develop these skills.

It is important that children do not abandon jottings and mental methods once pencil and paper procedures are introduced. Therefore, children will always be encouraged to look at a calculation or problem and then decide which is the best method to choose – pictures or mental calculation with or without jottings.

Our long-term aim is for children to be able to select an efficient method of their choice that is appropriate for a given task. They will do this by always asking themselves:

'Can I do this in my head?'
'Can I do this in my head using drawings or jottings?'
'Do I need to use a pencil and paper procedure?'

Up to Year 3, the emphasis should be on children working mentally. Once written methods are introduced, mental skills must be kept sharp by continuing to develop and apply them with appropriate examples.

Progression through mental calculations for addition

Mental recall of number bonds

6 + 4 = 10 □ + 3 = 10

25 + 75 = 100 19 + □ = 20

Use near doubles

6 + 7 = double 6 + 1 = 13

Addition using partitioning and recombining

34 + 45 = (30 + 40) + (4 + 5) = 79

Counting on or back in repeated steps of 1, 10, 100, 1000

86 + 57 = 143 (by counting on in tens and then in ones)

460 - 300 = 160 (by counting back in hundreds)

Add the nearest multiple of 10, 100 and 1000 and adjust

24 + 19 = 24 + 20 – 1 = 43

458 + 71 = 458 + 70 + 1 = 529

Use the relationship between addition and subtraction

36 + 19 = 55 19 + 36 = 55

55 – 19 = 36 55 – 36 = 19

Progression through mental calculations for subtraction

Mental recall of addition and subtraction facts

10 – 6 = 4 17 - □ = 11

20 - 17 = 3 10 - □ = 2

Find a small difference by counting up

82 – 79 = 3

Counting on or back in repeated steps of 1, 10, 100, 1000

86 - 52 = 34 (by counting back in tens and then in ones)

460 - 300 = 160 (by counting back in hundreds)

Subtract the nearest multiple of 10, 100 and 1000 and adjust

24 - 19 = 24 - 20 + 1 = 5

458 - 71 = 458 - 70 - 1 = 387

Use the relationship between addition and subtraction

36 + 19 = 55 19 + 36 = 55

55 – 19 = 36 55 – 36 = 19

Progression through mental calculations for multiplication

Doubling and halving
Applying the knowledge of doubles and halves to known facts.
e.g. 8 x 4 is double 4 x 4

Using multiplication facts

Tables should be taught everyday from Y2 onwards, either as part of the mental oral starter or other times as appropriate within the day.
Year 2
2, 5 and 10 times tables
Year 3
2, 3, 4, 5, 8 and 10 times tables
Year 4
Derive and recall all multiplication facts up to 12 x 12
Years 5 & 6
Derive and recall quickly all multiplication facts up to 12 x 12.

Using and applying division facts
Children should be able to utilise their tables knowledge to derive other facts.
e.g. If I know 3 x 7 = 21, what else do I know?
30 x 7 = 210, 300 x 7 = 2100, 3000 x 7 = 21 000, 0.3 x 7 = 2.1 etc

Use closely related facts already known
13 x 11 = (13 x 10) + (13 x 1)
= 130 + 13
= 143

Multiplying by 10 or 100
Knowing that the effect of multiplying by 10 is a shift in the digits one place to the left.
Knowing that the effect of multiplying by 100 is a shift in the digits two places to the left.

Partitioning
23 x 4 = (20 x 4) + (3 x 4)
= 80 + 12
= 102

Use of factors
8 x 12 = 8 x 4 x 3

Progression through mental calculations for division

Doubling and halving
Knowing that halving is dividing by 2

Deriving and recalling division facts

Tables should be taught everyday from Y2 onwards, either as part of the mental oral starter or other times as appropriate within the day.
Year 2
2, 5 and 10 times tables
Year 3
2, 3, 4, 5, 8 and 10 times tables
Year 4
Derive and recall all multiplication facts up to 12 x 12
Years 5 & 6
Derive and recall quickly all multiplication facts up to 12 x 12.

Using and applying division facts
Children should be able to utilise their tables knowledge to derive other facts.
e.g. If I know 3 x 7 = 21, what else do I know?
30 x 7 = 210, 300 x 7 = 2100, 3000 x 7 = 21 000, 0.3 x 7 = 2.1 etc

Dividing by 10 or 100
Knowing that the effect of dividing by 10 is a shift in the digits one place to the right.
Knowing that the effect of dividing by 100 is a shift in the digits two places to the right.

Use of factors
378 ÷ 21 378 ÷ 3 = 126 378 ÷ 21 = 18
126 ÷ 7 = 18

Use related facts
Given that 1.4 x 1.1 = 1.54
What is 1.54 ÷ 1.4? or 1.54 ÷ 1.1?

Moving On: How can children's readiness for written calculations be judged?

Judgements will need to be made as to whether pupils possess sufficient of these skills to progress. Different prerequisite skills are needed for each operation.

A short list of criteria for readiness for written methods of addition and subtraction would include:

- Do children know addition and subtraction facts to 20?
- Do they understand place value and can they partition numbers into hundreds, tens and units?
- Do they use and apply the commutative and associative laws of addition?
- Can they add at least three 1-digit numbers mentally?
- Can they add and subtract any pair of 2-digit numbers mentally?
- Can they explain their mental strategies orally and record them using informal jottings?

Corresponding criteria to indicate readiness to learn written methods for multiplication and division are:

- Do the children know the 2, 3, 4, 5 and 10 times tables and corresponding division facts?
- Do they know the result of multiplying by 0 or 1?
- Do they understand place value?
- Do they understand 0 as a place holder?
- Can they multiply 2 and 3 digits mentally by 10 and 100?
- Can they use their knowledge of all the multiplication tables to approximate?
- Can they find products using multiples of 10?
- Do they use the commutative and associative laws of multiplication?
- Can they halve and double 2-digit numbers mentally?
- Can they use multiplication facts to derive mentally, other multiplication facts they don't know?
- Can they explain their mental strategies orally and record them using informal