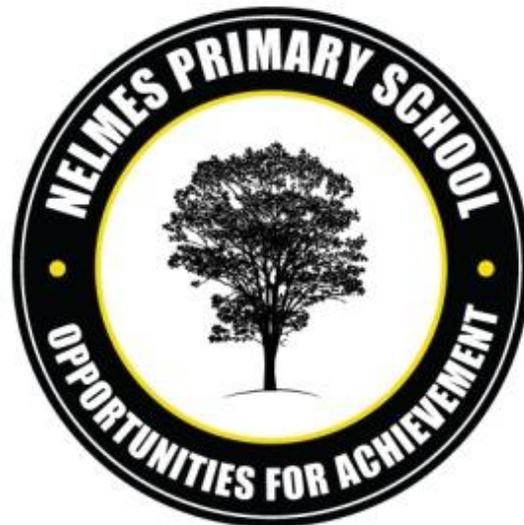


Nelmes Primary School Calculation Policy

Updated September 2016



Nelmes Primary School

Maths Calculation policy.

Introduction.

At Nelmes we believe that children should be introduced to the processes of calculation through practical, oral and mental activities. As children begin to understand the underlying ideas they develop ways of recording to support their thinking and calculation methods, use particular methods that apply to special cases, and learn to interpret and use the signs and symbols involved. Over time children learn how to use models and images, such as empty number lines, to support their mental and informal written methods of calculation. As children's skills strengthen and refined, so too are their informal written methods. These methods become more efficient and succinct and lead to efficient written methods that can be used more generally. By the end of year 6 children are equipped with mental and written methods that they understand and can use correctly.

When faced with a calculation, children are asked to reflect upon the following questions: Can I do this in my head? Can I do this in my head using drawings or jottings? Do I need a pencil and paper procedure? Do I need a calculator because of the size and type of number? Children should also have strategies to check its accuracy. At whatever stage of their learning, and whatever method is being used, it must still be underpinned by a secure and appropriate knowledge of number facts, along with those mental skills that are needed to carry out process and judge if it was successful

The overall aim is that when children leave Nelmes Primary School is that they:

- Have a secure knowledge of number facts and a good understanding of the four operations;
- Are able to use this knowledge and understanding to carry out calculations mentally and to apply general strategies when using one-digit and two-digit numbers and particular strategies to special cases involving bigger numbers.

- Make use of diagrams and informal notes to help record steps and part answers when using mental methods that generate more information that can be kept in their heads.
- Have an efficient, reliable, compact written of calculation for each operation that children can apply with confidence when undertaking calculations that they cannot carry out mentally;

Mental Strategies.

It is essential that rapid recall of key number facts is embedded prior to written calculations begin taught. This is necessary as the written calculations outlined in this policy rely on mental strategies to process numbers efficiently and with confidence.

Addition and subtraction.

- Do they know addition and subtraction facts to 20?
- Do they understand place value and can they partition numbers?
- Can they add three single digit numbers mentally?
- Can they add and subtract any pair of two digit numbers mentally?
- Can they explain their mental strategies orally and record them using informal jottings?

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Multiplication and Division.

- Do they know their times tables?
- Do they know the result of multiplying by 1 and 0?
- Do they understand 0 as a place holder?
- Can they multiply two and three digit numbers by 10 or 100?
- Can they double and halve two digit numbers mentally?
- Can they use multiplication facts they know to derive mentally other multiplication facts that they do not know?
- Can they explain their mental strategies orally and record their using informal jottings?

Mathematical Proficiency

Mathematical proficiency requires a focus on core knowledge and procedural fluency so that pupils can carry out mathematical procedures flexibly, accurately, consistently, efficiently, and appropriately. Procedures and understanding are developed in tandem.

Arithmetic Proficiency: achieving fluency in calculating with understanding

... an appreciation of number and number operations, which enables mental calculations and written procedures to be performed efficiently, fluently and accurately.

Improving children's Arithmetic Proficiency

Findings from Ofsted 2011:

- Practical, hands-on experiences of using, comparing and calculating with numbers and quantities ... are of crucial importance in establishing the best mathematical start ...
- Understanding of place value, fluency in mental methods, and good recall of number facts ... are considered by the schools to be essential precursors for learning traditional vertical algorithms (methods)
- Subtraction is generally introduced alongside its inverse operation, addition, and division alongside its inverse, multiplication
- High-quality teaching secures pupils' understanding of structure and relationships in number ...

Stages in Addition

Foundation Stage	Year 1	Year 2
<p>Children will be encouraged to use practical equipment and then number lines/tracks/ washing lines etc</p> <ul style="list-style-type: none">▪ 1 more up to 20▪ Combining sets of number up to 20▪ Counting on, on a number line up to 20 extending to crossing the tens boundary e.g. $9 + 3 =$▪ Use a number line to count and record and number sentence.▪ Doubling numbers to 10	<p><i>Review foundation stage.</i></p> <ul style="list-style-type: none">▪ Counting on, on a number line▪ Mental calculation; hold the largest number in your head and count on ext to crossing the tens boundary.▪ Adding a 10 using 100 square.▪ Adjusting (to add 9 add 10 then adjust)▪ Near doubles▪ Mini partitioning e.g. $7 + 8 = 7 + 3 = 10 + 5 = 15$▪ Solve missing number problems▪ Use 100 square to add multiples of 10 e.g. $57 + 20$	<p><i>Review Year 1</i></p> <ul style="list-style-type: none">▪ Extend methods from year 1 to larger numbers e.g. $23 + 9$, $34 + 8 =$▪ Partitioning to add two 2 digit numbers e.g. $34 + 32$, extending to crossing the tens boundary.▪ Add three 1 digit numbers▪ Introduce simple column addition (summer term)

Year 3	Year 4
<p data-bbox="568 108 824 140"><i>Review Year 2</i></p> <ul data-bbox="333 153 1102 635" style="list-style-type: none"> <li data-bbox="333 153 1102 288">▪ Extend the use of partitioning to larger numbers e.g. 2 digit number + 3 digit number. <li data-bbox="333 300 1102 392">▪ Compact column addition without carrying (3 digit numbers) <li data-bbox="333 403 1102 496">▪ Compact column addition with carrying (3 digit numbers) <li data-bbox="333 507 1102 635">▪ Introduce adding decimals with column addition (not crossing the tens barrier) 	<p data-bbox="1509 108 1765 140"><i>Review Year 3</i></p> <ul data-bbox="1279 153 2047 539" style="list-style-type: none"> <li data-bbox="1279 153 2047 196">▪ Partitioning <li data-bbox="1279 207 2047 250">▪ Empty number lines. <li data-bbox="1279 261 2047 344">▪ Compact column addition without carrying (4 digit numbers and beyond) <li data-bbox="1279 355 2047 438">▪ Compact column addition with carrying (4 digit numbers and beyond) <li data-bbox="1279 450 2047 539">▪ Add decimals using column addition (crossing the 10s barrier)
Year 5	Year 6
<p data-bbox="568 724 824 756"><i>Review Year 4</i></p> <ul data-bbox="237 769 1070 1050" style="list-style-type: none"> <li data-bbox="237 769 1070 812">▪ Partitioning <li data-bbox="237 823 1070 906">▪ Compact column addition with carrying (5 digits and beyond) <li data-bbox="237 917 1070 960">▪ Adding several numbers <li data-bbox="237 971 1070 1050">▪ Adding decimals e.g. tenths, hundredths and thousandths. 	<p data-bbox="1509 724 1765 756"><i>Review Year 5</i></p> <ul data-bbox="1180 769 2020 1053" style="list-style-type: none"> <li data-bbox="1180 769 2020 812">▪ Partitioning <li data-bbox="1180 823 2020 866">▪ Compact column addition with carrying <li data-bbox="1180 877 2020 920">▪ Adding several numbers <li data-bbox="1180 932 2020 1053">▪ Adding decimals e.g. tenths, hundredths and thousandths. (including a mixture e.g. $4.6 + 5.97$)

Stages in Subtraction.

Foundation Stage	Year 1	Year 2
<p>Children will be encouraged to use practical equipment and then number lines/tracks/washing lines etc</p> <ul style="list-style-type: none">▪ Objects- move from one pile to another.▪ Count backwards from 10▪ Count backwards from 20▪ Use vocabulary one less, subtraction, take away▪ Number sentence e.g. $5 - 4 =$▪ Find one number less than a given number▪ Subtract 2 single digit numbers and count back to find the answer	<p><i>Review Foundation Stage</i></p> <ul style="list-style-type: none">▪ 2 less, 3 less etc▪ Number track, put finger on the number, circle each step as you count back▪ Count back on a 100 square▪ Count back in 10s on a 100 square▪ Partitioning on a 100 square, count back 10s then units e.g. $56 - 23 =$	<p><i>Review Year 1</i></p> <ul style="list-style-type: none">▪ Use of equipment (if needed)▪ Count back on number lines▪ Count back on a 100 square▪ Partitioning on a 100 square crossing a tens boundary e.g. $53 - 27 =$▪ Empty number line T-U, TU-TU ext to crossing the tens boundary e.g. $75-28$ $75-20= 55$ $55-5 = 50$ $50 -3 = 47$▪ Use column subtraction without 'borrowing' exchange (summer term)

Year 3	Year 4
<p style="text-align: center;"><i>Review Year 2</i></p> <ul style="list-style-type: none"> ▪ Review empty number line HTU- TU, ext to crossing the tens boundary. ▪ Partitioning method ▪ Compact Column subtraction without exchange. (3 digit numbers) ▪ Compact Column subtraction ext to exchange. (3 digit numbers) 	<p style="text-align: center;"><i>Review Year 3</i></p> <ul style="list-style-type: none"> ▪ Compact Column subtraction ext to exchange. (4 digit numbers and beyond)
Year 5	Year 6
<p style="text-align: center;"><i>Review Year 4</i></p> <ul style="list-style-type: none"> ▪ Compact column subtraction (5 digit numbers and beyond) ▪ Compact column subtraction using decimals. 	<p style="text-align: center;"><i>Review Year 5</i></p> <ul style="list-style-type: none"> ▪ Compact column subtraction including decimals across 3 places.

Stages in Multiplication

Foundation Stage	Year 1	Year 2
<p>Children will be encouraged to use practical equipment</p> <ul style="list-style-type: none">▪ Children introduced to counting in 2s and 10s.▪ In practical situations introduced to the term 'lots of'▪ Children to know doubles up to 5.	<p><i>Review Foundation Stage</i></p> <ul style="list-style-type: none">▪ Extend counting to steps of 5▪ Use arrays to show multiplication▪ Double numbers up to 10▪ Use terms such as 'lots of', 'groups of'▪ Introduce the 'x' symbol▪ Learn the 2x, 5x, 10x times table in the summer term	<p><i>Review Year 1</i></p> <ul style="list-style-type: none">▪ Use arrays and repeated addition to solve multiplications▪ Count in 3s, then learn the 3 times table.▪ Introduce partitioning for 2 digit numbers up to 20 e.g. 17 x 5 = 10 x 5 = 50 7 x 5 = 35 50 + 35 = 85

Year 3	Year 4
<p style="text-align: center;"><i>Review Year 2</i></p> <ul style="list-style-type: none"> ▪ Extend the use of partitioning ▪ Use related facts e.g. $2 \times 3 = 6$ $2 \times 30 = 60$ ▪ Multiplying by 10 and 100 ▪ Consolidate the 3 times table then learn x4, x8 x9 tables. ▪ Introduce the grid method TU x TU 	<p style="text-align: center;"><i>Review Year 3</i></p> <ul style="list-style-type: none"> ▪ Formal column multiplication for TU x U ▪ Times tables up to 12 times ▪ Understand the terms distributive and associative law.
Year 5	Year 6
<p style="text-align: center;"><i>Review Year 4</i></p> <ul style="list-style-type: none"> ▪ Extend column multiplication ▪ Multiplying by 10, 100, 1000 and multiples of 10 and 100 ▪ Introduce long multiplication (necessary children write the steps alongside the calculation). 	<p style="text-align: center;"><i>Review Year 5</i></p> <ul style="list-style-type: none"> ▪ Long Multiplication including use with decimals ▪ BODMAS ▪ Multiplication of fractions

Stages in Division

Foundation Stage	Year 1	Year 2
<p>Children will be encouraged to use practical equipment</p> <ul style="list-style-type: none">■ Moving objects to group them to a specific sized group■ Sharing between 2, halving■ During practical activities children to be introduced to language such as: share, half, equal same amounts, make it fair.	<p><i>Review Foundation Stage</i></p> <p>Children will be encouraged to use practical equipment</p> <ul style="list-style-type: none">■ Introduce grouping■ Continue with sharing■ During practical activities children to be introduced to language such as: dividing, share, group, lots of, left over■ Introduce the \div symbol	<p><i>Review Year 1</i></p> <ul style="list-style-type: none">■ Use pictorial representations, children to draw their own pictures■ Begin to see that division is the inverse of multiplication.■ Revisit grouping and sharing■ Use the \div symbol■ Apply knowledge of known facts to solve number sentences.■ Count in steps e.g. $12 \div 3 = (3,6,9,12)$ answer 4■ Recall division facts for the x2, x5, x10 tables.

Year 3	Year 4
<p style="text-align: center;"><i>Review Year 2</i></p> <ul style="list-style-type: none"> • Continued to use practical equipment where appropriate • Begin to introduce short division for known tables • e.g. $35 \div 5 = 5 \overline{)35}$ • Use inverse knowledge to solve missing number puzzles • Recall division facts for the x3, x4, x8 tables 	<p style="text-align: center;"><i>Review Year 3</i></p> <ul style="list-style-type: none"> • continue to introduce short division for $TU \div U$ • Introduce, where appropriate, short division with remainders for $TU \div U$ • Where appropriate move to short division for $HTU \div U$ • Introduce remainders as fractions and decimals (summer term where appropriate) • Recall all division facts up to x12
Year 5	Year 6
<p style="text-align: center;"><i>Review Year 4</i></p> <ul style="list-style-type: none"> • Begin to express remainders as fractions. • Use short division for $ThHTU \div U$ • Rounding to solve division worded problems 	<p style="text-align: center;"><i>Review Year 5</i></p> <ul style="list-style-type: none"> • Use short division with bigger numbers • Use short division to answer questions such as $432 \div 15$ • Consolidate remainders as fractions, decimals and using rounding to solve worded problems • Introduce long division.