Arlecdon Primary School

Calculation Policy

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SMART Maths Calculation Policy

"Everything that is taught earlier paves the way for everything that comes later; and everything that comes later is made accessible to all children by what has been taught earlier." Richard Dunne

Maths is a symbolic, abstract language. To decode this language, symbols need to come alive and speak so clearly to children that maths becomes as easy to understand as reading a story. *Maths Makes Sense* has a unique learning system that truly enables this to happen and provides the core approach for SMART Maths. It makes maths concrete and fully understandable bymaking consistent use of tangible objects such as cups, cards and sticks, combined with exaggerated physical actions and a special vocabulary for each symbol.

Maths Makes Sense children have an active, spoken and visual image of each maths concept.

SMART Maths moves from the cup to wider representations using other manipulatives such as flip counters on 10- frames, place value counters on mats for column / grid followed by pictorial steps eg arrays, towards standard method. Asmathematical concepts are learnt in such a memorable way, they are understood from the start and are never forgotten.

The learning system builds deep understanding and embeds a picture of the maths in children's minds so they progress to thinking without the aid of physical objects; they refer to their mental images instead.

Ten Big Ideas underpin the whole *Maths Makes Sense* learning system and are taught consistently throughout the school.

Introduced by age 7:

- Addition
- Subtraction

- Multiplication

- Division

- Equals

- The symbols speak to you

- The logic of the language tells you the answer

- Denomination

Introduced after age 7:

- Ratio

- Infinity

In essence, this policy captures effective whole-school approaches to developing securely pupils' calculation skills, using the four operations, mental and written.

It contains the key *pencil and paper* procedures that are to be taught throughout Primary School to secure a coherent progression in the Big Ideas.

It has been written to ensure consistency throughout the school.

• Although the main focus of this policy is on pencil and paper procedures it is important to recognise that the ability to calculate mentally lies at the heart of numeracy.

• Mental calculation is not at the exclusion of written recording and should be seen as complementary to and not as separate from it. In every written method there is an element of mental processing.

• Written recording both helps children to clarify their thinking, and supports and extends the development of more fluent and sophisticated mental strategies.

• The long-term aim is for children to be able to select an efficient method that is appropriate for a given task. They should do this by always asking themselves:

- 'Can I do this in my head?'
- 'Can I do this in my head using drawings or right-hand margin jottings?'
- 'Do I need to use a written method?'

Mental Strategies

These are taught in the main teaching blocks and practiced through Daily Practice. The steps are outlined in the small step progression ladders – mainly LO1: A sense of number.

Fluency is achieved by practice *throughout the day*.

The mental strategies used in EYFS, Y1 and Y2 (including counting) are described briefly in the block detail that follows. For Years 3

to 6, these continue to develop through Daily Practice. Jottings should be used to support mental calculation.

Fluency is achieved through the daily rehearsal of addition facts and multiplication facts, progressively introduced. By early KS2, all children should be able to state inverse subtraction facts and division facts and become confident in *Reasoning* with these, and with the Big Ideas of 'The logic of the language' and 'Denomination' to derive other facts for use in calculating with the 4 operations - which obviously covers place value development, including ordering on a number line.

Problem Solving

SMART Maths approaches problem-solving indirectly.

Children are assisted to see how a Maths Story has an associated Real Story (it is about 'cups') which can be converted by simple substitution into a *basic* Real-Life Story (about some real-life object) which can then be *embellished* – a complex piece of writing that needs un-packing. They are then in a better position for solving word problems.

'Problem Solving Approaches' are introduced early and consistently so that all children can use and apply mathematics, *selecting steps appropriate to their stage*, crucially identifying explicit information to work out the implicit: they 'Think Aboutthe Word Problem!'

Refer to Overview Progression in Mathematics - Problem Solving. (hyperlink)

The calculation policy sets out only the mental and written progression in the four operations for Arithmetic and does notspecify U&A examples – please refer to Teacher Guides and Small-step Progression Ladders for detail and further use of concrete materials to secure and deepen steps.

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Overview Progression in calculation strategies for the four operations

Stage	+	−	x	÷
MMS F	Horizontal 1-digit numbers then ½ ¼ Mentally say 1 more than 0-99	Horizontal 1-digit numbers then ½ ¼ Mentally say 1 less than 1-100		Share objects into equal groups count how many in each group.
MMS 1	Horizontal 1-digit numbers, zero and ½ ¼ (inverse −) Horizontal with thousand/hundred/t y Vertical (no problem columns) 2 then 3 then 4-digit	Horizontal 1-digit numbers, zero and ½ ¼ (inverse +) Horizontal with thousand/hundred/t y Vertical (no problem columns) 2 then 3 then 4-digit	Horizontal 1-digit x 1-digit	Horizontal 1 digit ÷ 1-digit (Type 1 Real Stories only) Find ½ and ¼ of shapes
MMS 2	Use commutative law for addition Use inverse of addition to complete subtraction Maths Stories	Vertical (no problem columns) 4-digit Then vertical problem first column only	Horizontal 1-digit, ½, ¼ x 1-digit Use commutative law for multiplication	Horizontal 1-digit, ½, ¼ Introduce grid for 1-digit ÷ 1-digit

	Vertical (no problem columns) 4-digit Horizontally Partition 4-digit towrite addition maths story. Then vertical problem first columnonly		Introduce grid for 1-digitx1-digit Grid for 1000/100/ty x 1-digit (inverse ÷)in preparation for long multiplication Use inverse of multiplication to complete division Maths Stories.	Calculate Type1 and Type 2 DivisionReal Stories Grid for 1000/100/ty ÷ 1-digit (inverse of divide is multiply) in preparation forlong division Find ½ and ¼ of numbers and objectsin a set
MMS 3	Vertical 4-digit with one problematic column, 1st , then 2nd then 3rd Then problematic 1st and 2nd column Partition and rearrange numbers tocalculate sums Horizontal 1-digit numbers, zeroand ½ ¼ and mixed numbers	Vertical 4-digit with one problematic column, 1st , then 2nd then 3rd Partition and rearrange numbers tocalculate differences Horizontal 1-digit numbers, zeroand ½ ¼ and mixed numbers	2-digit x 1-digit by partitioning and calculating sum of products and by agrid Ratio (Fractions of quantities) Percentages Horizontal with 1/5ths 1/7ths then decimal fractions (1dp) then negativenumbers, (neg x positive only)	1-digit with remainder expressed as anumber and as a fraction Grid for 1000/100/ty ÷ 1-digit Horizontal with 1/5ths 1/7ths then decimal fractions (1dp) then negativenumbers (neg ÷ neg only)

	Horizontal with 1/5ths 1/7ths thendecimal fractions (1dp) then negative numbers no tricky + or –	Horizontal with 1/5ths 1/7ths thendecimal fractions(1dp) then negative numbers, no tricky + or -	Type1 and Type 2 Multiplication Realstories.	
MMS 4	Vertical 4-digits with problematic 1st,2nd, 3rd columns

Horizontal with all vulgar fractions,decimal fractions (2dp) and negative numbers

Add terms in expressions

Use x and y to add terms inalgebraic expressions | Vertical 4-digits with problematic 1st,2nd, 3rd columns

Horizontal with all vulgar fractions,decimal fractions (2dp) and negative numbers

Subtract terms in expressions

Use x and y to subtract terms inalgebraic expressions | Grid for 2-digit x 2-digit

Use logic of language to deduce products of two multiples of ten andwith decimal fractions (2dp)

Read/write the value of powers of 10

Identify value of multiplication terms inan expression to add/subt from left to right.

Ratio & percentages (Fractions ofquantities)

Equivalent fractions | Grid for 3-digit ÷ 1-digit Using bothremainders and fractions

Use logic of language to deduce division Maths Stories for products ofof two multiples of ten; and with decimal fractions (2dp)

Horizontal with all vulgar fractions, decimal fractions (2dp) and negativenumbers (neg ÷ neg only as Type 1) |

			Horizontal with all vulgar fractions, decimal fractions (2dp) and negative numbers (neg x positive only)	
MMS 5	Vertical 4-digits and decimals with problematic columns Horizontal with all vulgar fractions, decimal fractions and negative numbers	Vertical 4-digits and decimals with problematic columns Horizontal with all vulgar fractions, decimal fractions and negative numbers	Grid long multiplication up to 3 digits by 2-digit with up to 2 decimal places, answers up to 3 dp Ratio & percentages (Fractions of quantities) Equivalent fractions Conversion of units metric/imperial Identify factors/proper factors Horizontal with all vulgar fractions, decimal fractions and negative numbers (neg x positive only – the progression for neg x neg requires the teaching of the distributive law and further substitutions)	Grid long division with decimals Horizontal with all vulgar fractions, decimal fractions and negative numbers Neg ÷ Neg (Type 1) Neg ÷ Positive (Type 2) Use divisibility tests

			Solve algebraic expressions eg $2x = 6$	
MMS 6	As Y5 Use algebraic notation for sum$m + n$	As Y5 Use algebraic notation for difference $m - n$	Short method 3-digit x 2-digit Use algebraic notation for product mn Ratio – % increase/decrease Measure probability	Short method 3-digit by 2-digit including remainders Use algebraic notation for quotient m/n

Progression in ArithmeticCalculation Strategies

EYFS to Year 6

MMS F		
Block 1	Counting one to one correspondence to 10 (and beyond) Point to resources/maths table How many cups? Say number	
Block 2	Count forward and back on a number line to 10 Say one more/less than for 1 digit numbers Addition one-digit numbers. *Get ready to get some more* *Look at the maths table and count* *How much is there here? Say [number]cups* *Introduce Act the Real story and Act the Basic Real-life story*	$2 + 1 + 1 = 4$
Block 3	Count forward backward 0-30 (and beyond) Addition and subtraction one-digit numbers and zero. *Get ready to take away* *I speak the maths story, you act the real story and vice versa Look at the Maths Story, read what it says* *Look at the Maths Story, read what it means* Introduce '*The board will speak to you!'* Introduce personal maths tables	$3 - 1 + 2 - 0 + 1 = 5$
Block 4	Share up to 15 objects equally Addition and subtraction one-digit and 0 Introduce copy the Maths Story *I act the Real Story you write the Maths Story* Introduce You will write the maths story	$3 - 1 + 2 - 0 + 1 = 5$
Block 5	Say 1 more than for numbers to 20	

	Recognise symbol ½ say *a half or one half* Introduce *'Oooo! The Glue!'* To stick two half cups to make a whole cup Addition and subtraction one-digit and ½ Act out addition and subtraction Real-life Stories	3 – 1 + ½ + 0 + ½ = 3
Block 6	Count to 99 (and beyond) Recognise symbol ¼ and say *a quarter or one quarter* Addition and subtraction one-digit and ½ & ¼	¼ + 1 + ½ - ¼ + ¼ + ¼ = 2

MMS 1		
Block 1	Count on and back in ones on a 0–99 grid Find one more than and add one on a 0–99 grid Find one less than and take away one on a 0–99 grid Addition and subtraction single-digit and ½ & ¼ Distinguish between how many and how much by responding accurately to the questions *How many cups did I count?* eg *Six,* and *How much is there here?* eg *Six cups* Identify and use the phrase *Same Value: Different Appearance* for different arrangements of cups, which have the same value, including half cups and quarter cups	$3 - 1 + ½ + ¼ + ¼ - 1 = 2$
Block 2	Find one more or less than a 2-digit whole number Find one more or less than and add or take away one for 3-digit whole numbers Convert 1-digit Maths Stories into new Maths Stories about ty, hundred and thousand (NB practice number bonds to 10) 1. Add / Sub with thousand / hundred / ty 2. Multiplication (1-digit x 1-digit).	1. $3\,000 + 2\,000 = 5\,000$ $5\,00 - 2\,00 = 3\,00$ $40 - 20 = 20$ 2. $2 \times 4 = 8$

	3. Say and show bigger, smaller and the difference between byencircling cups on the Maths Table Continue to use method in subsequent Daily Practice with subtraction.	3. With 5 cups on Maths tableWrite - Now write 5 – Write 5 – 3 = Write 5 – 3 = 2 Say the difference between 5 and 3 equals 2 using take away action andhand to encircle 'how much' for each part of the Maths Story Now model 5 – 2 = 3
Block 3	Practice addition and subtraction for pairs of numbers with totalsup to ten and twenty 1. Vertical addition (2-digit + 2-digit, no problematic columns). N.B. Continue to practice addition bonds to 10 2. Division (for 1-digit whole numbers).	1. 3 2 + 2 1 5 3 2. 6 ÷ 2 = 3
Block 4	Practise the two, five and ten times tables *and continue throughout KS1 and beyond* Double numbers in different ways to 20 Use number pairs with totals to 20 for doubling Double numbers in different ways Use pairs of numbers with totals to 20 to make Maths stories about ty, hundred *and continue throughout KS1 and beyond* 1. Vertical addition and subtraction (2 and 3-digit) (no problematic columns). 2. Addition and subtraction single-digit and ½ & ¼ 3. Multiplication and division (1-digit).	241 -122 363 3 – 1 + ½ + ¼ + ¼ - 1 = 2 2 x 6 = 12 6 ÷ 2 = 3 3 x 4 = 12 8 ÷ 1 = 8

	Say what a basic Real-life Story is about. Give the context. Drawthe Real-life story. Use a Maths Story to make up a Real-life story and embellish.	
Block 5	Count on and back in 1's on 0-99 gridRecognise odd and even numbers Count & recognise multiples of 2, 5 & 10Shade halves and quarters 1. Vertical additions and subtractions with any pair of 2-digit, 3-digit or 4-digit whole numbers (no problematic columns). From an embellished Real-Life Story, find and write an addition orsubtraction Maths Story with 1-digit whole numbers Give change from ten pence in a shopping context Cut shapes into halves and quarters by drawing lines accuratelyShade half, a quarter and three quarters of a shape.	3486 2143 - 13 + 412 3473 2555
Block 6	Estimate numbers of objects using groups of five Read and complete additions, subtractions and, multiplications onflow diagrams 1. Use the correct operation and calculate vertical additions andsubtractions with 2-digit, 3-digit or 4-digit whole numbers (no tricky columns) Answer a simple word problem Story involving addition or subtraction with 1-digit whole numbers by finding the MathsStory.	3486 2143 - 213 +2412 3273 4555

	MMS 2	
Block 1	Mentally add / subtract 10 or 20 and find 10 or 20 more / less Order 1 and 2 digit numbers on number line 1. Vertical addition and subtraction (4-digit) (no problematic columns). 2. Add / Sub / Mult / Div (1-digit / ½ / ¼)	3486 2143 - 1213 +2412 2273 4555 2 x 4 – 1 x 3 = 5 3 ÷ ½ = 6 ½ ÷ ¼ = 2

Block 2	Add 1 digit number to 8 or 9 use cups / number line
	Use number line for addition strategies
	Practice number pairs with 2-digit totals
	
	1. Vertical addition and subtraction (4-digit) (addition with problematic first column, introduce FUNNY WRITING).
	
	2. Add / Sub / Mult / Div (1-digit).
	
	3. Introduce mult/div grids for 1-digit numbers.
		3 7 3 9
		+ 2 2 2 2
		5 9 6 1
		     1 funny
		
		          writing 1 ½ ÷
		2 x 4 - ½ x 4 = ½ =3
		6
		
		2 x 4 = 8
		x
			4
			2 8
			
			8 ÷ 2 = 4
			÷
				4
				2 8

Block 3	Practice and memorise addition facts at random and addition pairs to 20	

	Memorise 2x table 1. Vertical addition and subtraction (4-digit) (add and sub with problematic first column –use funny writing and introduce funny counting). 2. Add / Sub / Mult / Div (1-digit). 3. Use mult/div grids for 1-digit numbers.	$$\begin{array}{r} 3\ 7\ 3\ 9 \\ +\ 2\ 2\ 2\ 2 \\ \hline 5\ 9\ 6\ 1 \\ \scriptstyle 1 \end{array} \qquad \begin{array}{r} 8\ 3\ \overset{3}{\not{4}}\ \overset{1}{5} \\ -\ 3\ 2\ 2\ 7 \\ \hline 5\ 1\ 1\ 8 \end{array}$$ Funny writing Funny counting $2 \times 4 - \frac{1}{2} \times 4 = 6$ $1\frac{1}{2}$ $\div \frac{1}{2} = 3$ $2 \times 4 = 8$ | x	4
---	---
2	8 | $8 \div 2 = 4$ | $\div$	4
---	---
2	8	
Block 4	Find Complements of 5 and 10 Find missing numbers to make 10; and to complete a multiplication/division Maths story; to complete a sequence; find missing tens or units number to complete a Maths Story Investigate general statement about a missing number Maths Story 1. Vertical addition and subtraction (4-digit) (add and sub with problematic first column –use funny writing and funny counting). 2. Add / Sub / Mult / Div (1-digit).	1 and 2 as above

	3. Use mult/div grids for multiples of 10, 100 and 1000 by 1-digit number	3. $$\begin{array}{c|c} \times & 4 \\ \hline 2000 & 8000 \end{array}$$
	4. Use inverse nature of mult / div.	4. $$\begin{array}{c|c} \div & 3 \\ \hline 200 & 600 \end{array}$$
	5. Say whether a division Real Story is Type 1 or Type 2	5. Type 1 6cups ÷ 2cups = 3 Type 2 6cups ÷ 2 = 3cups
Block 5	Multiply, add & subtract 1-digit whole numbers cumulativelySolve simple equations for all 4 operations Round up / down to nearest 10 Estimate answers to calculations 1. Vertical addition and subtraction (4-digit) (add and sub with problematic first column – use funny writing and funny counting). 2. Add / Sub / Mult / Div (1-digit). 3. Use mult/div grids for multiples of 10,100,1000 by 1-digit no. 4. Use inverse nature of mult / div.	1, 2 and 3 as above 4. 17 x 11 = 187 (given) 187 ÷ 17 = 11 (derived)
Block 6	Use symbols < > for inequality Add 1 and 2-digit numbers mentally Estimate a number of objects and answers to calculations	

Practice using a calculator to multiply and divide	
1. Vertical addition and subtraction (4-digit) (add and sub with problematic first column –use funny writing and funny counting).	1, 2, 3 and 4 as above
2. Add / Sub / Mult / Div (1-digit).	
3. Use mult / div grids for 2 / 3 / 4 -digit numbers by 1-digit no.	
4. Use inverse nature of mult / div.	5. 3000 x 4 = 12000 and 3 x 4000 = 12000 etc
5. Use a Maths story e.g. 3 x 4 = 12 with Type 1 and type 2 Real storiesto write Maths stories about thousand, hundred and ty	

MMS 3 – 6 Mental Strategies

These continue to develop through main teaching and in Daily Practice Years 3-6 and include ordering number, using all four operations in contexts, Geometry facts and measure conversions.

See Small-step progression Ladders (LO1; LO 2; LO3) for detail. Activities of course should be adapted to ensure appropriate challenge for all children.

Identified gaps should be included in daily practice.

Multiplication (and division as inverse) is practised daily:

MMS3 B2 Grade 2 - the 3 and 4 times table are practised alongside 2, 5 and
10MMS3 B5 Grade 5 - the 6 times table (double 3)
MMS4 B1 Grade 7 - doubling is practised (include using known
tables)MMS4 B3 Grade 9 - the 7 and 9 times tables
MMS4 B4 Grade 10 - the 8 times table
MMS5 B1 Grade 13 - the 11 and 12 times table.

No ceiling is applied and the expectation is that all children will learn all table facts to 10 x 10 by the end of Y4. This needs to extend to 12 x 12 tomeet NC2014 and is practised in MMS5 & 6.

MMS 3 - 6 Written strategies follow:

Block 1	1. Copy & calculate vertical add/sub (4-digits) (with problematic first column –use funny writing and funny counting)	1. $$\begin{array}{r} 3\;7\;3\;9 \\ +\;2\;2\;2\;2 \\ \hline 5\;9\;6\;1 \\ \end{array}$$ $$\begin{array}{r} 8\;3\;\overset{3}{\cancel{4}}\;\overset{1}{5} \\ -\;3\;2\;2\;7 \\ \hline 5\;1\;1\;8 \\ \end{array}$$
	2. Understand the difference between 'I will act the real story/ you write the maths story for + and - with 1-digit and halves, quarters and mixed numbers.	2. $1\frac{1}{2} + 2 - \frac{1}{4} = 3\frac{1}{4}$
	3. Calculate fractions of quantities using cups. Spoken instructions are smaller/ bigger/ same – compare ratio sticks. What does it mean? Compare sticks – every time you see…replace with…. Replace cups in response to ratio sticks.	11/7 of 14 = 22
Block 2	1. Write maths stories using vertical add/sub (4-digits) with problematic tens column –use funny writing and funny counting.	1. $$\begin{array}{r} 5\;\overset{3}{\cancel{4}}\overset{1}{}\;5\;4 \\ -\;1\;2\;6\;1 \\ \hline 3 \\ \end{array}$$ *Making the impossible… possible!*
	2. Use + / - / × / ÷ with 1-digit and fifths.	2. 2/5 x 2 = 4/5 6/5 ÷ 1/5 = 6 2/5 x 3 – 4/5 = 2/5
	3. Solve word problems including fractions of quantities. Embellish a basic real life story/ distinguish between explicit & implicit	

	information/ recognise the ratio as smaller/bigger/ same. Use cups orjottings to calculate the answer.	
Block 3	1. Vertical add/sub (4-digits) (with problematic first and second columns –use funny writing and funny counting).	1. as blocks 1 & 2
	2. Multiply a 2-digit by 1-digit number by partitioning and calculate sum of the products.	2. 52 x 7 = 50 x 7 + 2 x 7 = 350 + 14 = 364
	3. Multiply a 2-digit by 1-digit number using a grid method.	3. x | 3 20 | 60 3 | 9 69
	4. Use + / - / × / ÷ with 1-digit and fifths and sevenths and other denominations (not tricky).	4. as Block 3
	5. Round 2 digit numbers to the nearest 10 and 3 digit numbers to the nearest 100 using a number line.	
Block 4	1. Use + / - / × / ÷ with 1-digit negative numbers (no combining negative and positive unless the result is zero).	1. ⁻5 - ⁻2 = ⁻3 2 + ⁻2 = 0 ⁻2 x 4 = ⁻8 ⁻6 ÷ ⁻2 = 3
	2. Write + / - / x / ÷ maths stories including fifths, sevenths & other denominations with mixed numbers (no tricky denominations).	2. 4/5 + 13/5 = 42/5 = 8 2/5 2/11 x 4 – 1/11 x 2 = 4/11

		3. Write maths stories as vertical +/- (with tricky unit & tens columns) & calculate.	3. 2 4/5 + 1 3/5 = 3 7/5 = 4 2/5

	4. Calculate division with remainders and express remainders as afraction.	4. $43 \div 5 = 8$ r 3 or 8 3/5 $8 \div 3 = 2$ r2 or 2 2/3
Block 5	1. Write vertical add/sub (4-digits) (with tricky unit, tens or hundredscolumns –use funny writing and funny counting) & calculate answers.	1. as blocks 1, 2, 3 & 4
	2. Use + / - / × / ÷ with 1-digit negative numbers (with tricky combining positive and negative to give result other than 0).	2. $^-3 + ^-1 = ^-4$ $^-5 - ^-2 = ^-3$
	3. Write + / - / x / ÷ maths stories including fifths, sevenths & otherdenominations with mixed numbers (no tricky denominations). 4. Calculate + / - / × / ÷ with tenths written as decimal fractions.	3. $24/5 + 13/5 = 42/5 = 8$ 2/5 $2/11 \times 4 - 1/11 \times 2 = 4/11$
	5. Calculate vertical + / - including decimals (one decimal pointonly).	4. ·3 + ·1 = ·4 ·7 - ·2 = ·5 ·2 x 3 = ·6 ·6 ÷ ·2 = 3
	6. Write squares & square roots using x maths stories for reference.	
Block 6	1. Use + / - / × / ÷ including negative numbers (tricky for +/-).	1 to 6 as above
	2. Write maths stories to include + / - / × / ÷ using fifths & otherdenominations with mixed numbers (not tricky denominations).	
	3. Write maths stories as vertical + / - (tricky unit, ten or hundredscolumn).	
	4. Recognise what operation is needed to solve a word problem.	

	MMS 4	
Block 1	1. Calculate maths stories + / - / × / ÷ with mixed numbers, 1-digit , halves & quarters using cups.	1. 2 ½ + 1 ¼ + 3 ¼ = 4 ¾
	2. Use mental strategies to calculate maths stories + / - / × / ÷ with mixed numbers, 1-digit , halves & quarters.	2. ½ x 4 – ¼ x 3 = 1 ¼
	3. Use mental strategies to calculate maths stories + / - / × / ÷ with vulgar fractions & mixed numbers & negative numbers.	3. ⁻2 x 3 + ⁻1 x 4 = ⁻10
	4. Multiply 2 digit by 2 digit whole numbers using a grid method.	4. 24 x 25 = 600
		$$\begin{array}{c|cc} x & 20 & 5 \\ 20 & 400 & 80 \quad 500 \\ 4 & \underline{100} & \underline{20} \quad +\underline{100} \\ & \underline{500} & \underline{100} \quad \underline{600} \end{array}$$
Block 2	1. Read & write decimal fractions to 3 decimal places.	1. 0.1, .01, .41, .041, .421
	2. Read & write numbers in decimal notation (3 places) as vulgar fractions using tenths, hundredths or thousandths.	2. read .1 as one tenth & write 1/10
	3. Use mental calculations for combined + / - / x with decimal fractions.	3. .02 x 3 - .01 x 4 = .02
	4. Use mental calculations for dividing decimal fractions (not tricky).	4. .06 ÷ .02 = 3
	5. Use mental calculations for + / - / × / ÷, and combinations of + and – with x, using vulgar fractions, mixed numbers & negative numbers (not tricky	5. 1/2 x 3 – ¼ x 2 = 1 2 3/5 – 1 1/5 = 1 2/5

Block 3	1. Vertical +/- with 4 digit numbers (no tricky columns).	1. 5 4 5
		        8
		+1 1 2 1
		  6 5 7 9

	2. Vertical +/- with decimal fractions (no tricky columns).	2. 5 4. 5 8
		  +1 1. 2 1
		   6 5. 7 9

	3. Multiply 2 digit by 2 digit numbers using a grid.	3. 24 x 25 = 600
		
		  x 20 5
		  20 400 80 500
		  4 100 20 +100
		        500 100 600

	4. Use mental calculations for maths stories using fractions, mixed numbers & negative numbers (not tricky).	4. 3/5 x 6 = 18/5 11/5 + 32/5 = 43/5 = 8 3/5

	5. Rearrange +/- to make calculating easier.	5. 123 – 345 + 425 – 113 =
		  123 + 425 – 345 – 113=
		  55

Block 4	1. Vertical + / - with decimal fractions (any column tricky).	1. as previous blocks but with a tricky column using funny writing **(+)** or funny counting **(-)**

	2. Use a grid for long ÷, dividing 2 or 3 digit number by a 1 digit number, using both remainders & fractions.	2. ÷ |122 ÷ |
		  6 |732 6 |600 100
		         120 20
		         12 2
		              122
		
		See TG for all steps

Block 5	1. Use mental calculations to work out whole number % of a wholenumber quantity (no tricky examples).	1. 4% of 800 = 32
	2. Calculate the decimal number % of a whole number quantity usinga calculator.	2. 5.3 % of 400 = 21.2
	3. Round a decimal fraction using tenths & hundredths to the nearestwhole number.	3. $15.2 \approx 15$
Block 6	1. Use 'one add negative one equals zero' $(1+ ^-1 = 0)$ with tricky +/-.	1. $3 + ^-1 = 2$ and $4 - ^-2 = 6$
	2. Grid to multiply two 2 digit whole numbers (TU x TU).	2. as Blocks 1,3
	3. Grid for long division, dividing a 3 digit whole number by a 1 digitwhole number using both remainders & fractions for remainders.	3. as Block 4 727 ÷ 6 = 121 r1 or 121 1/6
	4. U&A + / - / × / ÷, fractions of quantities, % of quantities & the sumof two products.	4. 3/4 of 12 metres?5.3% of 640? 3 x 23 + 2 x 35 = ?
	5. Use symbol ≈ for 'approximately equal to'.	5. $23.96 \approx 24$
	6. Round an answer with two decimal places to nearest one decimalplace.	6. $33.92 \approx 33.9$
MMS 5		

Block 1	1. Vertical +/- (4-digits) (with more than one tricky column – usefunny writing and funny counting). Use +/ - / ÷ with all vulgar fractions or mixed numbers with the samedenominator. x / ÷ vulgar fractions & mixed numbers by a whole number.	1. see MMS4
Block 2	1. Write 2, 3 or 4 digit numbers vertically, up to 3 decimal places &calculate with more than one tricky column – using + /-. 2. Multiply 2 vulgar fractions where the denominator of one & thenumerator of the other are equal.	1. see MMS4 2. 2/3 x 3/5 = 2/5 replace 5 with 3; replace 3 with 2… SVDA replace 5 with 2.

Block 3	1. Recognise that a ÷ b is SVDA as a/b and that they can be usedinterchangeably.
	
	2. Convert vulgar fractions to finite decimal fractions using thedivision button on a calculator (no vulgar fractions with infinitedecimal equivalents).
	
	3. Use + / - / x / ÷ with combinations of positive & negative numbers, including tricky examples (but not the product of 2 negative numbers).
		1. 5 ÷ 8 = 5/8
		
		2. ¼ = 0.25; 4/5 = 0.8
		
		3. 2 - ⁻3 = 5 1 + ⁻4 = ⁻3
		   ⁻2 x 3 = ⁻6 ⁻4 ÷ ⁻2 = 2 (type 1)
		                ⁻4 ÷ 2 = ⁻2 (type 2)

Block 4	1. Distinguish between a basic product & a derived product. 2. Grid for long x with up to 2 digit by 2 digit whole numbers. 3. Grid for long x up to 3 digit by 2 digit decimal numbers (one or twodecimal places) answers up to 3 decimal places.	1. 7 x 3 = 21 basic product 70 x 3 = 210 (21-ty derived product) 2 and 3 extend MMS4 Blocks 1, 3 use basic & derived products
Block 5	1. Grid for long division including numbers up to 3 digits divided by 1digit whole numbers.	1. as MMS4 Blocks 4,6

	2. Evaluate terms in an expression with brackets	2. (2 x 3) + (1 x 2) = 6 + 2 = 8
	3. Evaluate products in an expression with brackets.	3. 2 x (4 + 1 x 3) = 2 x (4 + 3) = 2 x 7 = 14
Block 6	1. Multiply decimal numbers with up to 3 decimal places by x of powers of 10 (product no > 3 decimal places) using the 'logic of the language'.	1. multiply tenths by tenths, ie a tenth of a tenth is one hundredth multiply tenths by ten, ie a tenth of ten is one 6/10 x 10 = 6
	2. Divide decimal numbers by x of powers of 10 (no numbers > 3 decimal places) using the 'logic of the language'.	
	3. Use derived products to calculate multiplication & division.	3. .06÷.01 = 6 .006÷.001 =6 .4 ÷.02 =20
	4. Evaluate terms in an expression that includes brackets.	4. 5 + 4 + 2 x 5 = 5 + 4 + 10 = 14 5 + (4 + 2) x 5 = 5 + 6 x 5 = 5 + 30 =35
	5. Insert brackets in an expression so that it has a specified value.	5. 2 x 5 + 1 + 2 = 13 and 2 x (5 + 1) + 2 = 14

MMS 6		
Block 1	1. Use Grid for long x of HTU x TU	1. 324 x 23 = 7452

x	20	3	
300	6000	900	6480
20	400	60	+ 972
4	80	12	7452
	6480	972	1 1

×	300	20	2	
40	12000	800	80	13200
				880
4	1200	80	8	+ 88
	13200	880	88	14168
				11

Grid method

2. Estimate value of products by rounding each factor.

2. $3.24 \times 2.3 \approx 3 \times 2 = 6$

3. Use product of a 3 digit whole number & 2 digit whole number & using approximation, work out a related product of that each decimal.

3. $324 \times 23 = 7452$
Use this to derive
$3.24 \times 2.3 = 7.452$

4. Use short method of x for up to 3 digit by 2 digit whole numbers. Remember hidden zeros.

4.
$32 \times 4 = 128$

×	4
30	120
2	8
	128

Grid method

$$\begin{array}{r} 3\ 2 \\ \times \quad 4 \\ \hline 1\ 2\ 8 \end{array}$$

Short method

Short method with funny writing

$$
\begin{array}{r}
3\ 1 \\
\times\quad 2\ 4 \\
\hline
6\ 2\ 0 \\
+\ 1\ 2\ 4 \\
\hline
7\ 4\ 4 \\
\hline
\end{array}
$$

Short method for long multiplication

$$
\begin{array}{r}
3\ 8 \\
\times\quad 2\ 3 \\
\hline
7{,}6\ 0 \\
+\ 1\ 1_2 4 \\
\hline
8\ 7\ 4 \\
\hline
\end{array}
$$

Long multiplication with funny writing

$$
\begin{array}{r}
2\ 8\ 6 \\
\times\qquad 2\ 9 \\
\hline
5{,}7{,}2\ 0 \\
+\ 2\ 5{,}7_8 4 \\
\hline
8\ 2\ 9\ 4 \\
\hline
1
\end{array}
$$

Long multiplication with funny writing

5. Use a short method for division of up to 3 digit by 2 digit whole numbers, including remainders.

5.

$462 \div 3 = 154$

$$3 \overline{)462}$$

$\div$		
3	300	100
	150	50
	12 +	4
		154

Grid method

$462 \div 3 = 154$

$$3 \overline{)4^3 6^{15} 2^1}$$ with answer 1 5 4

Short method

$462 \div 3 = 154$

$$3 \overline{)4\ ^16\ ^12}$$ with answer 1 5 4

Short method with jottings

$852 \div 5 = 170\ r\ 2$

$$5 \overline{)8\ ^35\ 2}$$ with answer 1 7 0 r 2

Short method of division

$822 \div 15 = 54\ r\ 12$

$$15 \overline{)8\ 2\ ^72}$$ with answer 5 4 r 12

Short method for long division

The remainder can be expressed as a fraction 12/15 or as a decimal.

Block 2	1. Grid used for long division of ThHTU by U.	1. $$\frac{\div}{6\,\big|\,3342}$$ $$\frac{\div}{6\,\big|\,3000} \quad \begin{array}{r} 557 \\ \hline 500 \\ 300 \quad 50 \\ 42 \quad +\ \ 7 \\ \hline 557 \end{array}$$
	2. Use explicit information to deduce implicit information, Estimate the value of quotients by rounding.	2. use $6 \times 5 = 30$ to deduce $300 \div 6 = 50$ and $3000 \div 6 = 500$
	3. Use quotient of a 4-digit whole number & a 1-digit whole number & using approx.work out related quotient of decimalnumbers.	3. $63.42 \div .6 = 105.7$ $6342 \div 6 = 1057$ $63.42 \div 6 = 10.57$ $63.42 \div .6 = 105.7$ $634.2 \div 600 = 1.057$ $63.42 \div 60 = 1.057$
Block 3	1. Use + / - / × / ÷ in calculations using equivalent fractions. 2. write the ratio of one quantity to another 3. Write a quantity as a fraction or percentage of the totalquantity 4. Calculate a quantity following a percentage increase ordecrease	$$\frac{3}{2} = \frac{x}{80}$$ $$\frac{3}{2} = \frac{120}{80}$$ $$x = 120$$ 15% of 300 $$= \frac{15}{100} \times 300$$ $$= 15 \times 3$$ $$= 45$$ Of 250g bag of nuts 15% were peanuts, 25% were cashews and the restwere almonds.

		$15\% + 25\%$ $\quad = 40\%$ $100\% - 40\%$ $\quad = 60\%$
Block 4	1. Negative numbers using + / - / × / ÷ (with tricky examples).	1. $^-1 × 5 - {}^-1 = {}^-4$ $\quad ^-2 × 3 - 1 = {}^-7$ $\quad ^-5 - {}^-2 × 2 = {}^-1$ $\quad ^-3 × 2 - {}^-3 × 2 = 0$ $\quad 3 - {}^-1 × 2 = 5$
	2. Vulgar fractions using + / - / × / ÷ (using equivalent fractions & improper fractions & tricky examples).	2. $2\frac{3}{5} - 1\frac{4}{5} = \frac{4}{5}$ $\quad \frac{1}{10} + \frac{3}{5} = \frac{7}{10}$ $\quad \frac{3}{8} ÷ \frac{1}{8} = 3$ $\quad \frac{7}{8} - \frac{1}{4} = \frac{5}{8}$ $\quad \frac{1}{4} × 5 = 1\frac{1}{4}$
	3. Add and subtract 'squares' and 'cubes' of numbers, eg find the sum of 10² and 8.7³	3. $10^2 = 10 × 10 = 100$ $\quad 9.3^2 = 9.3 × 9.3 = 86.49$ $\quad 100 - 86.49 = 13.51$
Block 5	1. Use formulas for diameter, circumference & area of a circle.	1. D = 2 x radius C = 2 x π x r A = π x r²
	2. Use formula to find the area of a triangle.	2. A = ½ x b x h
	3. Use formula to find the volume of a cuboid & a cylinder.	3. V = π x r² x h (cylinder)
Block 6	1. Write vulgar fraction as a decimal fraction to 3 decimal places, using a calculator for division.	1. 7/11 = .636

2. Convert decimal fractions to vulgar fractions using tenths, hundredths & thousandths. 3. Write recurring infinite decimals as abbreviations using 'dots' notation above one or two digit.	2. .625 = 625/1000 3. write .833 333 33$\overset{.}{3}$… as .8$\overset{.}{3}$.