

Maths Calculation - Policy

Mitcheldean Endowed Primary School

Our Vision

To ensure that every child receives the highest quality education that is engaging, enriching and inclusive, in an environment that works hard to develop, support and care for all its members, with people that foster mutual respect and encouragement in accordance with Christian Values.

1. INTRODUCTION AND AIMS OF THE CALCULATION POLICY



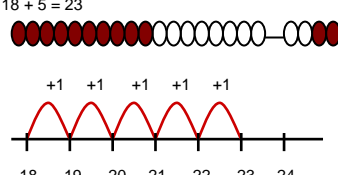
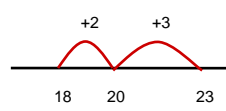
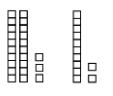
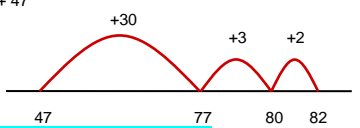
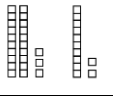
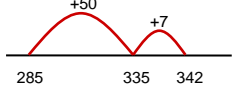
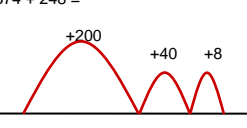
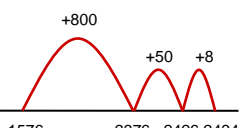
- 1.1 The aim of this policy is to ensure consistency in calculation teaching and standards throughout the school.
- 1.2 The policy shows the main methods of calculation and is underpinned by a variety of teaching methods, skills, apparatus, aids, support and various explanations. These may vary from one teacher to another but all have the same end objective, as per the policy.
- 1.3 The progression from one year group to the next is flexible i.e. if a child is making progress above or below their age related expectation, then reference to the policy, looking at year groups either side, will provide the teacher with the most appropriate skill for that child.



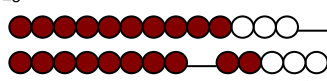
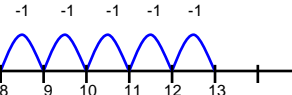
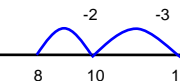
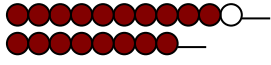
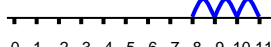
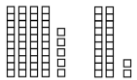
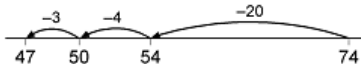
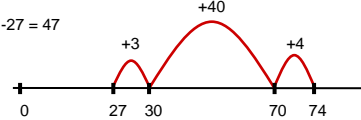
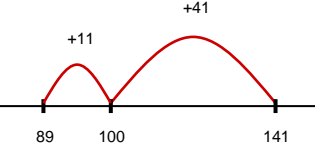
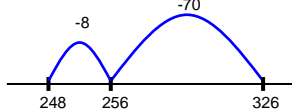
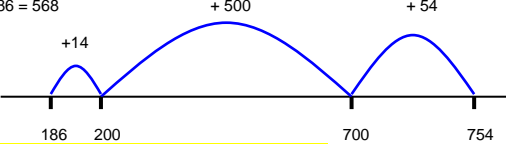
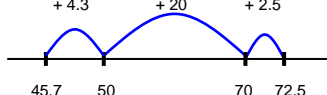
Date of Policy: January 2017

Approved by: _____

Date of renewal: _____

Estimation and checking The use of practical apparatus.



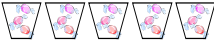
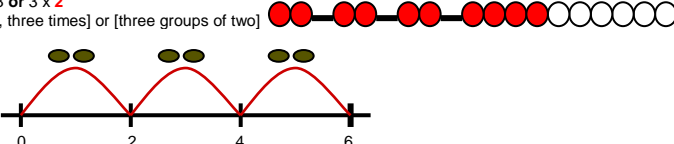
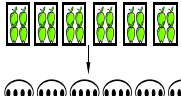
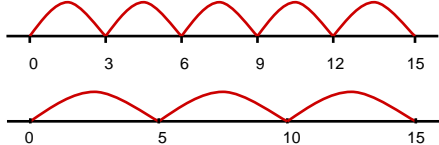
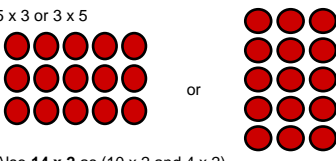

YR	Addition as 'combining 2 groups' What is the most efficient method?	Practical / recorded using ICT (eg digital photos / pictures on IWB)	Pictures / Objects I eat 2 cakes and my friend eats 3. How many cakes did we eat altogether?  Might be recorded as: $2 + 3 = 5$	Symbols 8 people are on the bus. 5 more get on at the next stop. How many people are on the bus now?  [Might be recorded as: $8 + 5 = 13$]	1 more (nos up to 10)	(see recording)	Addition Total Together And More than Add Plus		
Y1	Addition as 'counting on' $U + U$ (bridging 10) $TU + U$ (bridging 20) What is the most efficient method?	Practical / recorded using ICT	Pictures / Symbols (see above) Number track / Number line – jumps of 1 (modelled using bead strings) $18 + 5 = 23$ 	Number line (efficient jumps) $18 + 5$ 	No number line $18 + 5$ $18 + 2 = 20$ $20 + 3 = 23$	Pairs to 10 Facts up to 5 1 / 10 more than a number	$U +$ multiple of 10 $TU +$ multiple of 10 $+9$ (by $+10, -1$)	Addition Total Together And More than Sum Add Plus	
Y2	$TU + TU$ (bridging 10s) What is the most efficient method?	Pictures / Symbols / Apparatus $23 + 12 = 35$ 	Number line (efficient jumps) $35 + 47$  [Also jumps can be in 10s and 1s]	No number line $35 + 47$ $47 + 30 = 77$ $77 + 3 = 80$ $80 + 2 = 82$	Partitioning $35 + 47$ $40 + 30 = 70$ $7 + 5 = 12$	Bonds up to 10 Pairs to 20 Pairs to 100 (using multiples of 10)	$TU + U /$ multiple of 10 $U + U + U$	Addition Increase Total Together And More than Sum Add Plus	
Y3	$TU + TU$ (bridging 100) $HTU + TU$ (not bridging 1000) $HTU + HTU$ (not bridging 1000) What is the most efficient method?	Pictures / Symbols $23 + 12 = 35$ 	Number line $57 + 285 = 342$ 	No number line $57 + 285$ $285 + 50 = 335$ $335 + 7 = 342$	Partitioning $57 + 285$ $200 + 0 = 200$ $80 + 50 = 130$ $5 + 7 = 12$	Compact vertical $\begin{array}{r} 12 \\ + 9 \\ \hline 21 \\ \hline \end{array}$ (Carriers go underneath)	Bonds to 20 / 100 Pairs of two-digit multiples of 10 Multiples of 50 that total 1000	$TU + U / TU$ $TU +$ near multiple of 10	Addition Increase Total Together And More than Sum Add Plus
Y4	$HTU + TU$ $HTU + HTU$ (incl bridging 1000) Decimals: money (£7.85 + £3.49) What is the most efficient method?	Number line $374 + 248 =$ 	No number line (mental models / jottings) $374 + 248$ $374 + 200 = 574$ $574 + 40 = 614$ $614 + 8 = 622$	Partitioning (mental models / jottings) $374 + 248$ $300 + 200 = 500$ $70 + 40 = 110$ $4 + 8 = 12$	Compact vertical starting with units $\begin{array}{r} 374 \\ + 248 \\ \hline 622 \\ \hline \end{array}$ (Carriers go underneath)	Bonds to 1000 Derive sums of pairs of multiples of 10 / 100 / 1000 (Multiples of 50 that total 1000) Pairs of fractions to 1	$TU + TU$ (Pairs of multiples of 10 / 100 / 1000) Three, 2-digit multiples of 10 Two, three-digit multiples of 10	Addition Increase Total Together And More than Sum Add Plus	
Y5	$ThHTU + HTU$ Decimals up to 2dp (23.7 + 48.56) What is the most efficient method?	Number line $1576 + 858 =$ 	No number line (mental models / jottings) $1576 + 858$ $1576 + 800 = 2376$ $2376 + 50 = 2426$ $2426 + 8 = 2434$	Partitioning (mental models / jottings) $1576 + 858$ $1000 + 0 = 1000$ $500 + 800 = 1300$ $70 + 50 = 120$ $6 + 8 = 14$	Compact vertical starting with units $\begin{array}{r} 23.70 \\ + 48.56 \\ \hline 72.26 \\ \hline \end{array}$ (Carriers go underneath)	(derive) Bonds up to 1 (2dp) (derive) Bonds up to 10 (1dp)	Decimal + Decimal (eg 19.7 + 3.4)	Addition Increase Total Together And More than Sum Add Plus	
Y6	Consolidate / extend Y5 including: Three numbers Decimals up to 3dp (context: measures) What is the most efficient method?	Number line $3.243 \text{ km} + 18.07 \text{ km} =$	No number line (mental models / jottings) $3.243 \text{ km} + 18.07 \text{ km}$ $18.07 + 3 = 21.07$ $21.07 + 0.2 = 21.27$ $21.27 + 0.04 = 21.31$ $21.31 + 0.003 = 21.313$	Partitioning (mental models / jottings) $3.243 \text{ km} + 18.07 \text{ km}$ $3 + 18 = 21$ $0.2 + 0.0 = 0.2$ $0.04 + 0.07 = 0.11$ $0.003 + 0 = 0.003$	Compact vertical starting with units $\begin{array}{r} 3.243 \\ + 18.070 \\ \hline 21.313 \\ \hline \end{array}$ (Carriers go underneath)	(as above)	Integer / decimal (1dp) + Integer / decimal (1dp)	Addition Increase Total Together And More than Sum Add Plus	

YR	<p>Subtraction as 'taking away' from a group What is the most efficient method?</p>	<p>Practical or recorded using ICT (eg digital photos / pictures on IWB)</p>	<p>Pictures / Objects I have five cakes. I eat two of them. How many do I have left?  Might be recorded as: $5 - 2 = 3$</p>	<p>Symbols Mum baked 9 biscuits. I ate 5. How many were left? [Might be recorded as: $9 - 5 = 4$] </p>	<p>1 less (nos up to 10)</p>	<p>(see recording)</p>	<p>Subtraction Difference Subtract Fewer Takeaway Take from How many more / less?</p>	
Y1	<p>Subtraction as 'taking away' and 'difference' (by counting on) U - U TU - U (bridging 10) What is the most efficient method?</p>	<p>Practical or recorded using ICT Pictures / Symbols (see above)</p>	<p>Taking away - jumps of 1 (modelled using bead strings) $13 - 5 = 8$  </p>	<p>Taking away (efficient jumps) $13 - 5 = 8$  No number line: $13 - 3 = 10$ $10 - 2 = 8$</p>	<p>Counting on - jumps of 1 (modelled using bead strings) $11 - 8 = 3$  </p>	<p>Counting on (efficient jumps) Number line / no number line $8 + 2 = 10$ $10 + 1 = 11$</p>	<p>Subtraction facts to 10 1 / 10 less than a number</p>	<p>TU - multiple of 10 Subtraction Between Subtract Fewer Take from Minus How many more / less? Difference Takeaway</p>
Y2	<p>Subtraction as inverse of addition TU - TU (bridging 10s) What is the most efficient method?</p>	<p>Pictures / Symbols / Apparatus $45 - 22 = 23$ </p>	<p>Number lines - taking away $74 - 27 = 47$  [Also jumps can be in 10s and 1s]</p>	<p>Partitioning $74 - 27$ $74 - 20 = 54$ $54 - 4 = 50$ $50 - 3 = 47$</p>	<p>Number lines - counting on $74 - 27 = 47$  [Also jumps can be in 10s and 1s]</p>	<p>Subtraction facts to at least 10</p>	<p>Difference by counting up TU - U / multiple of 10</p>	<p>Subtraction Difference Between Reduce Subtract Fewer Takeaway Take from Minus Decrease How many more / less?</p>
Y3	<p>Subtraction TU - TU HTU - TU HTU - HTU What is the most efficient method?</p>	<p>Number line - counting on $141 - 89 = 52$ </p>	<p>Number line - taking away $326 - 78 = 248$  Vertical number line may be used to record calculation</p>	<p>Decomposition (compact method) $\begin{array}{r} 61 \\ 270 \\ - 48 \\ \hline 222 \end{array}$ Key word is "use", number to go above.</p>	<p>Subtraction facts to 20 Differences of multiples of 10</p>	<p>TU - U / TU HTU - HTU (by finding the difference) TU - near multiple of 10 (positive answers)</p>	<p>Subtraction Difference Between Reduce Subtract Fewer Takeaway Take from Minus Decrease How many more / less?</p>	
Y4	<p>Subtraction HTU - TU HTU - HTU Decimals: money (£7.85 - £3.49) What is the most efficient method?</p>	<p>Number lines - counting on $754 - 186 = 568$  Vertical number line may be used to record calculation</p>	<p>Partitioning (mental models / jottings) $754 - 186$ $754 - 100 = 654$ $654 - 80 = 574$ $574 - 6 = 568$</p>	<p>Decomposition (compact method) $\begin{array}{r} 51311 \\ 744 \\ - 367 \\ \hline 374 \end{array}$ Key word is "use", number to go above. e.g. "You haven't got enough to takeaway 7 from 4 so use next column"</p>	<p>Derive differences of pairs of multiples of 10 / 100 / 1000</p>	<p>TU - TU Subtract pairs of multiples of 10 / 100 / 1000 (Th)HTU - (Th)HTU (small difference)</p>	<p>Subtraction Difference Between Reduce Subtract Fewer Takeaway Take from Minus Decrease How many more / less?</p>	
Y5	<p>Subtraction ThHTU - HTU Decimals up to 2dp (72.5 - 45.7) What is the most efficient method?</p>	<p>Number lines - counting on $72.5 - 45.7 = 26.8$ </p>	<p>Partitioning (mental models / jottings) $72.5 - 45.7$ $72.5 - 40 = 32.5$ $32.5 - 5 = 27.5$ $27.5 - 0.7 = 26.8$</p>	<p>Decomposition (compact method) $\begin{array}{r} 5711215 \\ 72.5 - 45.7 \\ - 45.7 \\ \hline 26.8 \end{array}$ Key word is "use", number to go above. e.g. "You haven't got enough to takeaway 7 from 4 so use next column"</p>	<p>Use number facts for mental subtraction $9 - 2 = 7$ $0.9 - 0.2 = 0.7$ $0.09 - 0.02 = 0.07$</p>	<p>Near multiple of 1000 - Near multiple of 1000 (eg 6070 - 4097) Decimal - Decimal (eg 9.5 - 3.7)</p>	<p>Subtraction Difference Between Reduce Subtract Fewer Takeaway Take from Minus Decrease How many more / less?</p>	
Y6	<p>Subtraction Consolidate / extend Y5 including: Decimal to 3 dp relating to measures What is the most efficient method?</p>	<p>Recognise when one written method is more efficient. (See Y5 methods of recording)</p> <ul style="list-style-type: none"> > There was 2.5 litres in the jug. Stuart drank 385 ml. How much was left? > 18.07 km - 3.243 km 			<p>(as above)</p>	<p>Integer / decimal (1dp) - Integer / decimal (1dp)</p>	<p>Subtraction Difference Between Reduce Subtract Fewer Takeaway Take from Minus Decrease How many more / less?</p>	







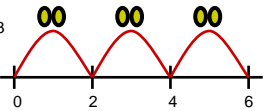
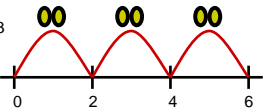


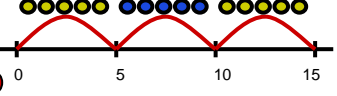
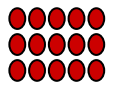
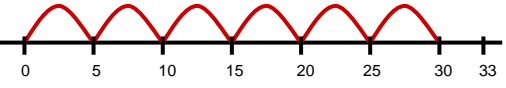

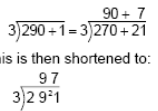



The use of practical apparatus.

MULTIPLICATION
(links with Division)

AGE-RELATED EXPECTATIONS

YR	Count repeated groups of the same size (1s / 2s / 5s / 10s) ref <i>Overview of learning 5</i> What is the most efficient method?	Practical / recorded using ICT (eg digital photos / pictures on IWB)	Pictures / Objects 3 plates, 2 cakes on each plate: 	Symbols 3 plates, 2 cakes on each plate: 	Counting on in 1s and 2s	(see recording)	Multiplication Lots of Groups of Double																
Y1	Solve (practical) problems that involve combining groups of 2, 5 or 10 What is the most efficient method?	Practical / recorded using ICT	Pictures / Symbols There are three sweets in one bag. How many sweets are there in five bags? 	Number tracks / Number line (modelled using bead strings) 2×3 or 3×2 [two, three times] or [three groups of two] 	Count on / back in 1s, 2s, 5s and 10s Doubles of numbers to 10	(see recording)	Multiplication Lots of Groups of Double																
Y2	Multiplication as <i>repeated addition</i> and <i>arrays</i> What is the most efficient method?	Pictures / Symbols There are four apples in each box. How many apples in six boxes? 	Repeated addition 5×3 or 3×5 	Arrays 5×3 or 3×5  Also 14×2 as (10×2 and 4×2)	Count in 2s, 5s and 10s Derive multiples of 2, 5 & 10 Relate to x facts (and derive related + facts) Doubles of numbers to 20	Doubles of TU numbers	Multiplication Multiplied by Lots of Times Groups of Double Multiples Multiply _repeated_times Repeated addition																
Y3	TU x U (eg 13×4) What is the most efficient method?	Arrays 13×4  $10 \times 4 = 40$ $3 \times 4 = 12$ [ref Arrays spreadsheet]	Partitioning (possible use of number line to record steps) $13 \times 4 = 52$ $10 \times 4 = 40$ $3 \times 4 = 12$	Compact grid method 12×4 <table border="1" data-bbox="1055 726 1272 821"><tr><td>X</td><td>10</td><td>2</td></tr><tr><td>4</td><td>40</td><td>8</td></tr></table> [ref Multiplication grid ITP]	X	10	2	4	40	8	Compact vertical $\begin{array}{r} 7 \\ \times 4 \\ \hline 28 \end{array}$	Derive / recall 2, 3, 4, 5, 6 and 10 times tables (Derive related division facts) Recognise multiples of 2, 5 and 10 up to 1000	U / TU x 10 / 100 (describe the effect) Doubles of TU / HTU numbers	Multiplication Multiplied by Lots of Times Groups of Double Multiples Multiply _repeated_times Repeated addition									
X	10	2																					
4	40	8																					
Y4	Record, support and explain: TU x U (eg 16×8 ; 43×6) What is the most efficient method?	Partitioning 43×6 (estimate: $40 \times 6 = 240$) $40 \times 6 = 240$ $3 \times 6 = 18$	Compact grid method 43×6 <table border="1" data-bbox="600 933 817 1029"><tr><td>X</td><td>40</td><td>3</td></tr><tr><td>6</td><td>240</td><td>18</td></tr></table> [ref Multiplication grid ITP]	X	40	3	6	240	18		Compact vertical $\begin{array}{r} 43 \\ \times 6 \\ \hline 258 \\ \hline 1 \end{array}$ "Always start with units"	Derive / recall facts to 10×10 Multiples of numbers to 10 up to the 10 th multiple	Numbers up to $1000 \times 10 / 100$ (whole number answers and understand the effect) Doubles of TU / HTU numbers and multiples of 10 / 100	Multiplication Multiplied by Lots of Times Groups of Double Multiples Multiply _repeated_times Repeated addition									
X	40	3																					
6	240	18																					
Y5	Refine and use efficient methods: HTU x U TU x TU U.t x U What is the most efficient method?	Grid method 47×36 (estimate: $50 \times 40 = 2000$) <table border="1" data-bbox="398 1157 577 1236"><tr><td>x</td><td>40</td><td>7</td><td></td></tr><tr><td>30</td><td>1200</td><td>210</td><td>1410</td></tr><tr><td>6</td><td>240</td><td>42</td><td>282</td></tr><tr><td></td><td></td><td></td><td>1692</td></tr></table>	x	40	7		30	1200	210	1410	6	240	42	282				1692		Compact vertical "Decimals don't move, the numbers do" 4.7×8 (estimate: $5 \times 8 = 40$) $\begin{array}{r} 4.7 \\ \times 8 \\ \hline 37.6 \\ \hline 5 \end{array}$ "Always start with units"	Recall quickly facts to 10×10 Use facts to multiply pairs of multiples of 10 / 100 Use known facts to derive other facts [Find common multiples of two numbers]	TU x U (eg 12×9) TU x TU (eg 16×25) Doubles of U.t / 0.th Multiply whole numbers / decimals by 10 / 100 / 1000	Multiplication Multiplied by Lots of Times Groups of Double Multiples Multiply _repeated_times Repeated addition
x	40	7																					
30	1200	210	1410																				
6	240	42	282																				
			1692																				
Y6	Use efficient methods: Integer x U (eg 2307×8) Decimal x U (eg 31.6×7) TU x TU HTU x TU What is the most efficient method?	Grid method 5.65×9 (estimate: $6 \times 9 = 54$) <table border="1" data-bbox="398 1380 577 1428"><tr><td>x</td><td>5</td><td>0.6</td><td>0.05</td><td></td></tr><tr><td>9</td><td>45</td><td>5.4</td><td>0.45</td><td>50.85</td></tr></table> Answer: $5.65 \times 9 = 50.85$	x	5	0.6	0.05		9	45	5.4	0.45	50.85		Compact vertical 256×18 (estimate: $250 \times 20 = 5000$) $\begin{array}{r} 256 \\ \times 18 \\ \hline 2048 \\ 2560 \\ \hline 4608 \\ \hline 1 \end{array}$ Answer: $256 \times 18 = 4608$ "Always start with units"	Use facts up to 10×10 to derive facts involving multiples of 10 / 100 (eg 80×30) and decimals (eg 0.8×7) Derive squares of numbers to 12×12 Derive corresponding squares of multiples of 10	TU x U U.t x U Integer x 1000 / 100 / 10 / 0.1 / 0.01	Multiplication Multiplied by Lots of Times Groups of Double Multiples Multiply _repeated_times Repeated addition						
x	5	0.6	0.05																				
9	45	5.4	0.45	50.85																			

Estimate first
The use of practical apparatus.

DIVISION (links with multiplication)		AGE-RELATED EXPECTATIONS		Recording		Rapid Recall	Mental calculation	Language
YR	Share objects into equal groups and count how many in each group ref: <i>Overview of learning 10</i> What is the most efficient method?	Practical / recorded using ICT (eg digital photos / pictures on IWB)	Pictures / Objects 6 cakes shared between 2  6 cakes put into groups of 2 	Symbols 6 cakes shared between 2  6 cakes put into groups of 2 			(see recording)	Division Share equally Group Share Divide
Y1	Solve (practical) problems that involve sharing into equal groups What is the most efficient method?	Practical / recorded using ICT	Pictures / Symbols How many apples in each bowl if I share 12 apples between 3 bowls?  	Number tracks / Number line (modelled using bead strings) $8 \div 2 = 4$  $6 \div 2 = 3$ 		Halves of even numbers to 10	(see recording)	Division Share equally Group Share Half How many groups of _make_ Divide
Y2	Division as sharing and grouping (including remainders) $TU \div U$ (where divisor is 2, 5 or 10) What is the most efficient method?	Pictures / Symbols Four eggs fit in a box. How many boxes would you need to pack 20 eggs?  	Number lines / Arrays $15 \div 5$   [ref <i>Grouping</i> ITP]	Partitioning $28 \div 2$ $20 \div 2 = 10$ $8 \div 2 = 4$		Derive / recall \div facts for 2, 5 and 10 tables Derive / recall halves of even numbers to 20	$TU \div 2$	Division Divided Share equally Group Divide Share Divide into How many groups of _make_?
Y3	$TU \div U$ (where divisor is 2, 3, 4, 5, 6 or 10) Round remainders up / down, depending on the context What is the most efficient method?	Number lines (start from zero) $33 \div 5 = 6 \text{ r}3$ 	Partitioning (multiples of the divisor) $50 \div 4 = 12 \text{ r}2$ $10 \times 4 = 40$ $2 \times 4 = 8$ (48) [ref <i>Number dials</i> ITP]			Derive / recall \div facts for 2, 3, 4, 5, 6 and 10 tables Derive / recall halves of even numbers to 40	$TU / HTU \div 2$	Division Divided / divisible by Share equally Group Quotient Divide Share Divide into How many groups of _make_?
Y4	Record, support and explain: $TU \div U$ (eg $98 \div 6$) What is the most efficient method?	Partitioning (multiples of the divisor) $67 \div 4 = 16 \text{ r}3$ $10 \times 4 = 40$ $6 \times 4 = 24$ (64)	'Short' division $96 \div 3$ (estimate: $90 \div 3 = 30$) 			Derive / recall \div facts up to the 10 times table	Numbers up to $1000 \div 10 / 100$ (whole number answers and understand the effect Halves of TU / HTU numbers and multiples of $10 / 100$)	Division Divided / divisible by Share equally Group Quotient Divide Share Divide into How many groups of _make_?
Y5	Refine and use efficient methods: $HTU \div U$ What is the most efficient method?	'Short' division $291 \div 3$ (estimate: $270 \div 3 = 90$)  This is then shortened to: 				Recall quickly \div facts up to 10 times table	Divide using factors of the divisor (eg $\div 8$ by $\div 2$ and then $\div 4$) Divide numbers by $10 / 100 / 1000$ (describe the effect) Halves of $U.t / 0.th$	Division Divided / divisible by Share equally Group Quotient Divide Share Divide into How many groups of _make_?
Y6	Use efficient methods: Integer $\div U$ (eg $123 \div 7$) Decimal $\div U$ (eg $27.6 \div 8$) $HTU \div TU$ What is the most efficient method?	'Short' division $43.4 \div 7$ (estimate: $42 \div 7 = 6$) 	'Compact' Division 			Derive \div facts involving multiples of $10 / 100$ (eg $240 \div 30$) and decimals (eg $4.8 \div 6$)	Divide using factors of the divisor (eg $\div 15$ by $\div 5$ and then $\div 3$) $TU \div U$ $U.t \div U$ Integer $\div 1000 / 100 / 10$	Division Divided / divisible by Share equally Group Quotient Divide Share Divide into How many groups of _make_?

Estimate first
The use of practical apparatus.