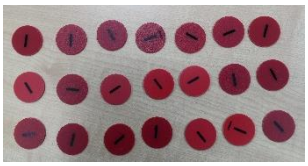
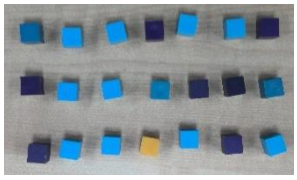
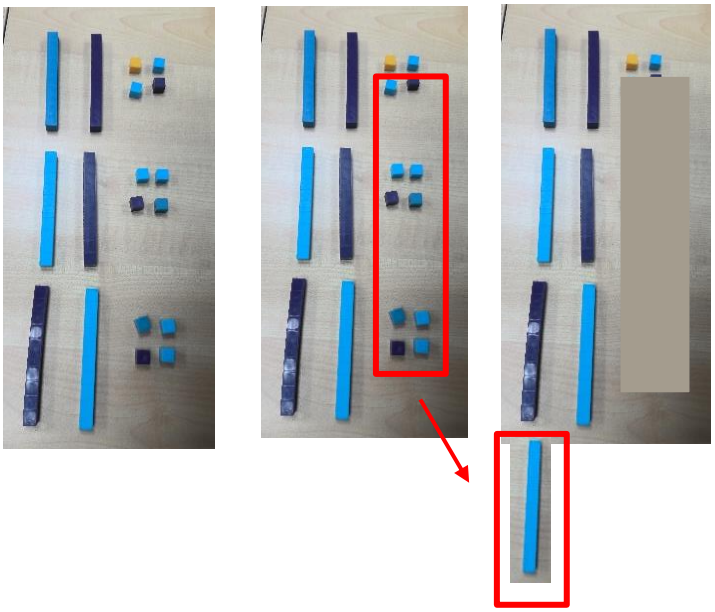
Fair Oak Junior School Calculation Policy (multiplication and division)

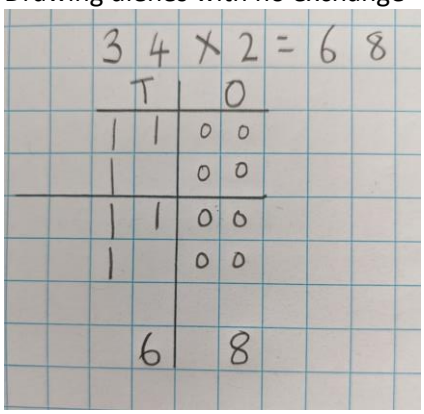
Progression with formal methods for multiplication and division

Multiplication

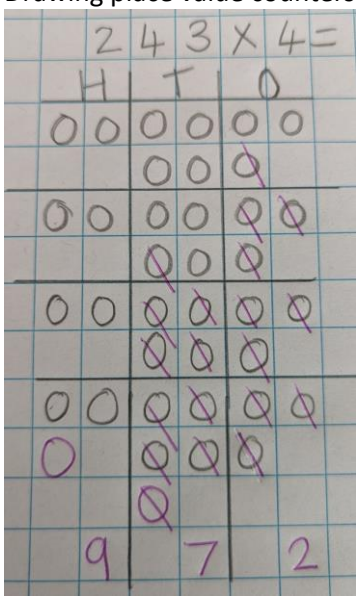
What the method looks like	Language used to teach it
Arrays (1-digit) 3 x 7 = 21  	• 3 and 7 are our factors. When we multiply our factors we get a product. • Multiplication is commutative so we can swap our factors round and we would get the same answer • 3 x 7 = 21 • 7 x 3 = 21 • To make an array we are making 7 groups of 3 or 3 groups of 7
Partition and multiply with dienes/ place value counters (2-digit) 24 x 3 = 	• 24 is the first factor and because it is the greatest number we are going to make 3 groups. • We make the factor (24) 3 times (you can use a tens and ones column to support if it helps children partition accurately) • We add the ones to get 12 ones. • We exchange ten ones for one ten • We add our tens to get 70 so our product is 72

<u>Partition and multiply by drawing</u>

Drawing dienes with no exchange



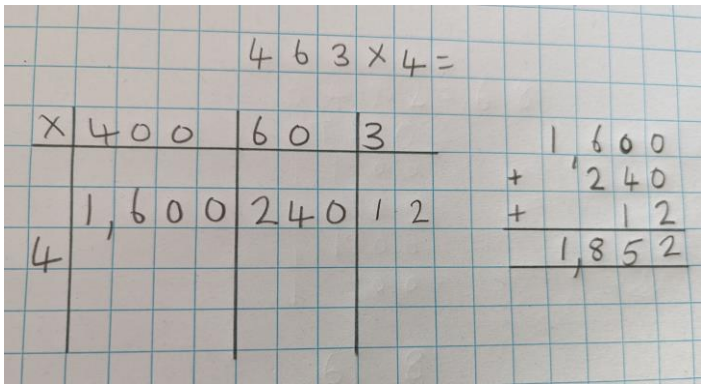
Drawing place value counters with exchange



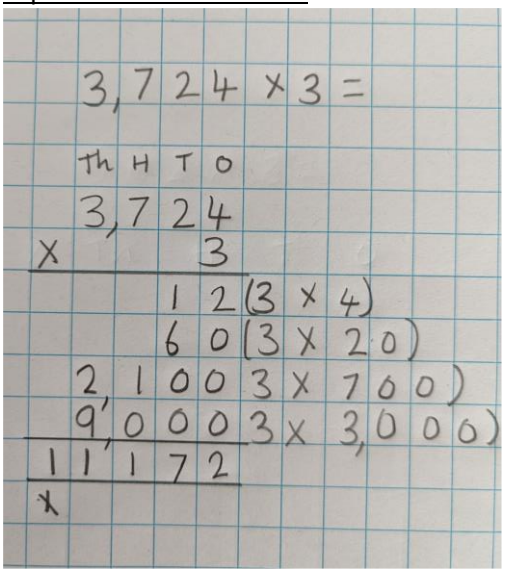
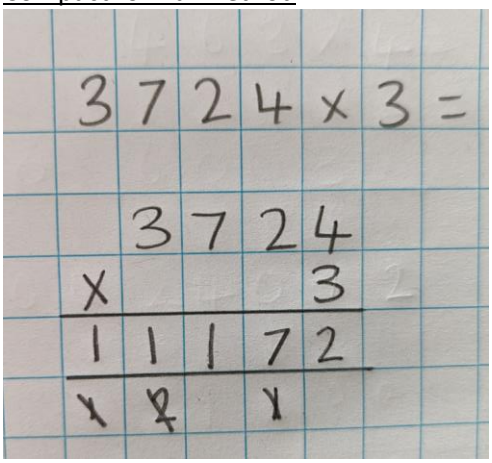
- Make the greatest factor by the other factor (number of groups)
- For 34 x 2 we add the ones then tens
- For 243 x 4 we add the ones to get 12 ones.
- We exchange ten ones for one ten
- We add the tens to get 17 tens
- We exchange ten tens for one hundred
- We add the hundreds to get 9 hundreds
- We have a product of 972

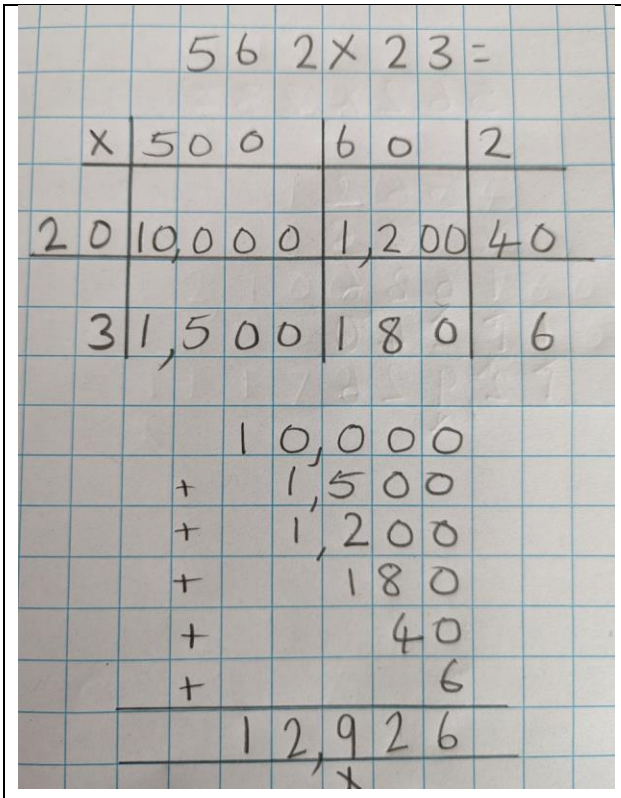
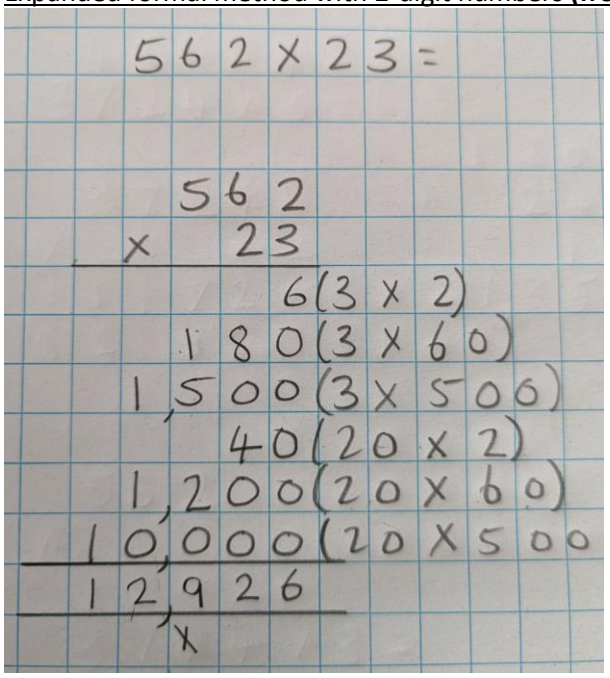
<u>Grid method</u>

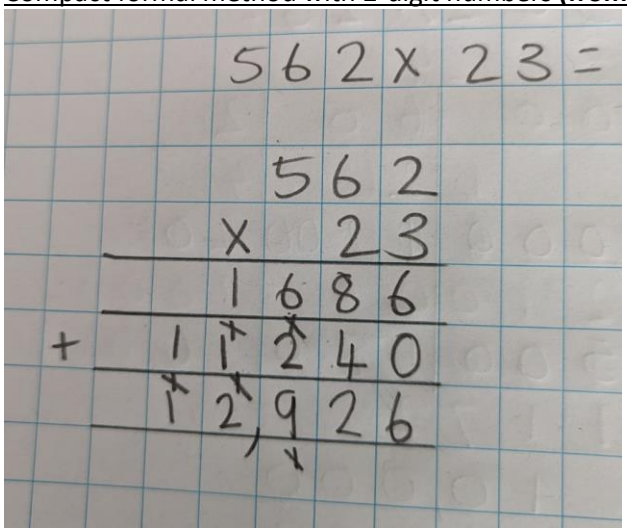
Before children can do this method, they need to be able to scale number facts by 10, 100, 1000 etc. e.g. 3 x 5 = 15 so 3 x 50 = 150



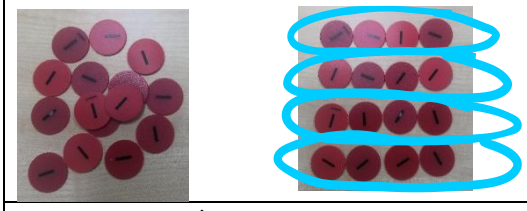
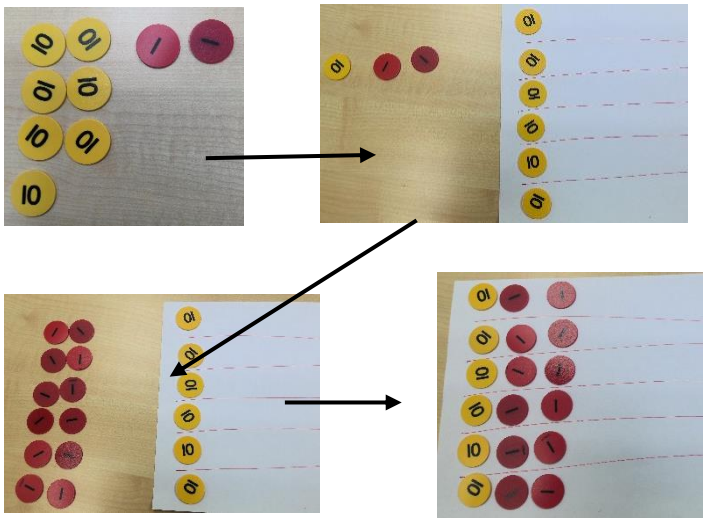
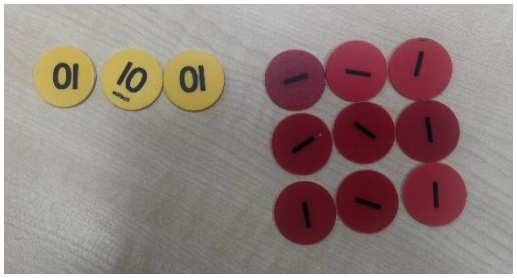
- Our calculation is 463 x 4
- We draw a grid to be able to partition our number
- We write out the partitioned number
- We multiply the hundreds by the other factor (4)
- We can do this by scaling number facts. I know 4 x 4 is 16 so if one of my factors is multiplied by 100, I multiply the product by 100 to get 1,600
- I multiply my tens by 4 and my ones by 4
- I add these up in column method

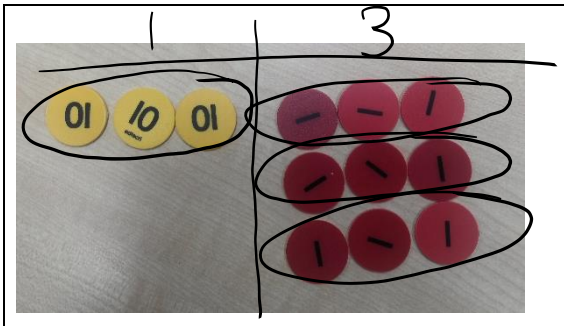
<u>Expanded formal method</u>  	• This method is similar to the grid method in the way the number is partitioned but the way it is written means it is ready for column addition • We write out the brackets of the partitioned calculations • We multiply our ones, tens, hundreds then add these up in column method • We get a product of 11, 172
<u>Compact formal method</u>  	• We write out our calculation • We multiply out ones. 3 x 4 is 12 so we exchange ten ones for one ten and write this in the tens column underneath the line. • We multiply our tens to get 6 tens and add on the exchanged ten and cross this out to get 7 tens • We multiply the hundreds and thousands, exchanging as we go • We get a product of 11,172
<u>Grid method with 2-digit numbers</u> **<u>(from year 5)</u>**	• This is the same as the grid method with 1-digit numbers apart from we have two rows as we are multiplying by a two-digit number. We partition both factors and multiply the parts together in the grid • We then add these up in formal column method for addition

	
Expanded formal method with 2-digit numbers **(from year 5)** 	• The same partitioned calculations as above, but written in a formal way so the numbers can be added up with column method. • We write the calculations in brackets on the right • If children do not write out the calculations, they often don't line the numbers up correctly.

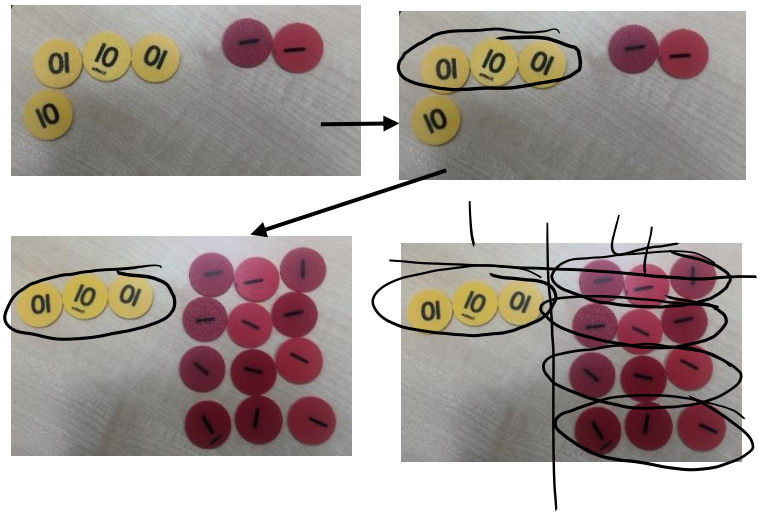
Compact formal method with 2-digit numbers **(from year 5)**  	• We write out our calculation of 562 x 23 • We multiply our 3 by 2 to get 6. • We multiply 3 by 6 tens to get 18 tens. • We exchange ten tens for one hundred and write this on the line underneath and write the 8 tens in the tens column • We multiply 3 by 5 hundreds to get 15 hundreds and add on the extra hundred underneath and cross this out. • We exchange ten hundreds for one thousand and write this on the line underneath • We have no thousands to multiply so we move onto the second digit in the factor we are multiplying by • We multiply 2 tens by 2 to get 40 • We multiply 2 tens by 6 tens to get 120 or 1,200. We exchange ten hundreds for 1 thousand • We multiply 2 tens by 5 hundreds to get 10,000 and add on the exchanged thousand to get 11 thousands or 11,000. • We add both the numbers together using formal column method

Division

What the method looks like	Language used to teach it
Grouping arrays (1-digit) 16 ÷ 4 = 4 	• We make our dividend out of dienes ones/ place value counters or counters/ multilink • We group our dividend by the divisor • 16 into groups of 4 • We get a quotient of 4
Sharing dienes/ place value counters 	• The calculation is 72 ÷ 6 • We make the dividend • We share the greatest value counters first (in this case tens) into the divisor • We are left with one ten so we exchange one ten for ten ones • We now have 12 ones • We share the ones into the divisor • Each group has 12 • The quotient is 12
Grouping dienes/ place value counters (no exchange) 	• The calculation is 39 ÷ 3 • If it is possible, make the tens and ones out into groups of the divisor • You can do this on a place value grid if that supports children • Group the tens. We have one group of the divisor (3) • Group the ones. • We have three groups of the divisor • The quotient is 13

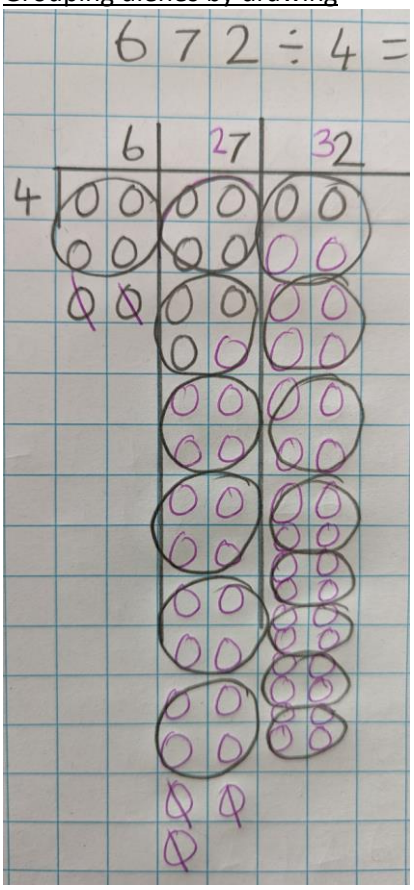


Grouping dienes/ place value counters (with exchange)



- The calculation is 42÷ 3
- If possible, make the dividend (tens and ones) into groups of the divisor
- Group the tens into groups of the divisor (3)
- We have one ten left so we exchange one ten for ten ones
- We now have 12 ones
- Group the ones
- We have one group of tens and 4 groups of ones
- The quotient is 14

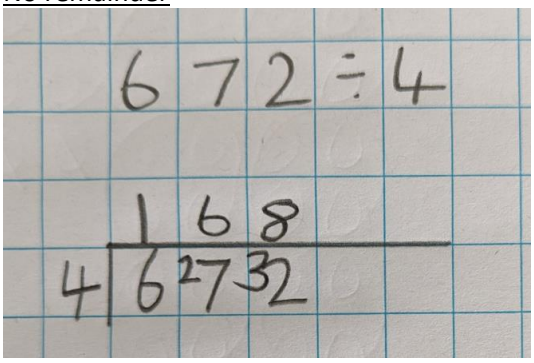
Grouping dienes by drawing



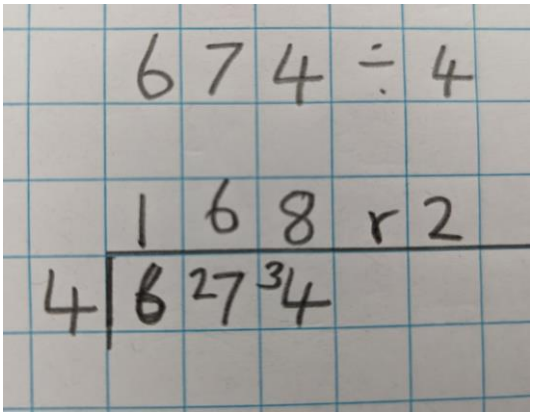
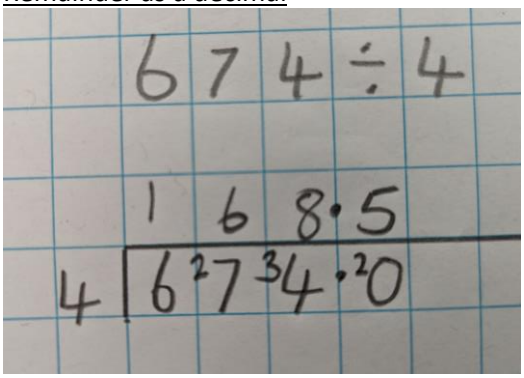
- We draw a place value grid (hundreds, tens and ones) and write our divisor to the left.
- We draw out the hundreds, tens and ones.
- We start with the digit in the highest value column, in this case the hundreds.
- We group the hundreds into groups of the divisor (4)
- There is one group of 4 with 2 hundreds remaining.
- We exchange two hundreds for 20 tens.
- There are 6 groups of tens in 27 tens with 3 remaining
- We exchange 3 tens for 30 ones
- There are 8 groups of ones in 32 ones
- The quotient is 168

Short division (1-digit)

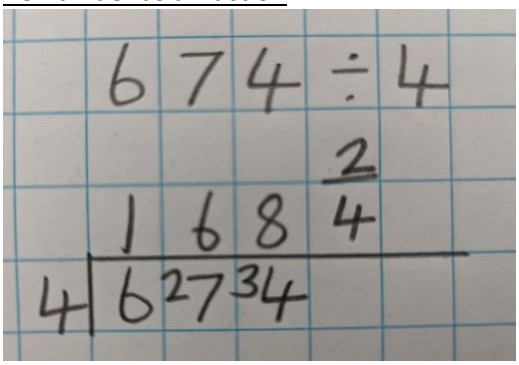
No remainder



- We write the dividend (672) out and draw a division bracket around it
- We write the divisor to the left
- There is one group of 4 hundreds in 6 hundreds with 2 remaining
- We exchange two hundreds for 20 tens
- There are 6 groups of 4 tens in 27 tens
- There are 3 tens remaining which we exchange for 30 ones
- There are 8 groups of 4 ones in 32 ones
- The quotient is 168

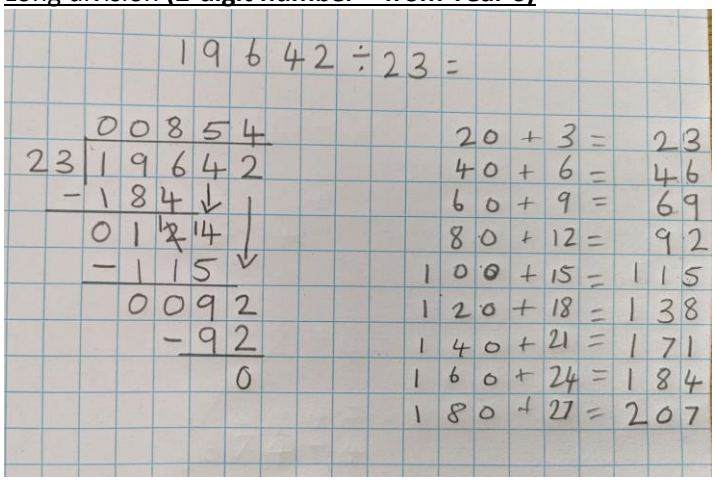
<u>Remainder as an integer (whole number)</u>  	• We write out the dividend (674) and draw a division bracket around it • We write the divisor to the left • There is one group of 4 hundreds in 6 hundreds with a remainder of 2 hundreds • We exchange 2 hundreds for 20 tens • There are 6 groups of 4 tens in 27 tens with a remainder of 3 tens • We exchange 3 tens for 30 ones • There are 8 groups of 4 ones in 34 ones • The quotient is 168 with a remainder of 2
<u>Remainder as a decimal</u>  	• We write out the dividend (674) and draw a division bracket around it • We write the divisor (4) to the left • There is one group of 4 hundreds in 6 hundreds with a remainder of 2 hundreds • We exchange 2 hundreds for 20 tens • There are 6 groups of 4 tens in 27 tens with a remainder of 3 tens • We exchange 3 tens for 30 ones • There are 8 groups of 4 ones in 34 ones with a remainder of 2 • We add a decimal point and a 0 for the tenths column • We exchange 2 ones for 20 tenths • There are 5 groups of 4 tenths in 20 tenths • The quotient is 168.5

Remainder as a fraction



- We write out the dividend (674) and draw a division bracket around it
- We write the divisor (4) to the left
- There is one group of 4 hundreds in 6 hundreds with a remainder of 2 hundreds
- We exchange 2 hundreds for 20 tens
- There are 6 groups of 4 tens in 27 tens with a remainder of 3 tens
- We exchange 3 tens for 30 ones
- There are 8 groups of 4 ones in 34 ones with a remainder of 2
- Because we have 2 out of 4 ones we need to make a group of 4 ones we have a fraction of $\frac{2}{4}$ remaining
- We have a quotient of $168\frac{2}{4}$

Long division **(2-digit number – from Year 6)**



- We have 19,642 divided by 23
- We write out the 23 times tables
- We can write out the 20 times tables, 3 times tables and add these together
- We write out the dividend 19,642 and draw a division bracket around this
- We write the divisor (23) next to this
- We work out how many groups of 23 in one ten thousand which is 0
- We work out how many groups of 23 in 19 thousands which is 0
- We work out how many groups of 23 in 196 hundreds which is 8
- We subtract 184 (which is 8 groups of 23) from 196 leaving us with a reminder of 12 and put 8 in the hundreds column above the division bracket
- We bring down the 4 next to the 12 remainder
- There are 5 groups of 23 in 124 tens
- We subtract 115 from 124 to give us a reminder of 9 and put 5 in the tens column
- We bring down the 2 next to the 9
- There are 4 groups of 23 in 92
- We put a 4 in the ones column above the division bracket
- We have a quotient of 854